Run-On and Run-Off Control Plan Update – Phase 1, Modules 1 through 6 and Phase 2, Modules 10 through 13

Columbia Dry Ash Disposal Facility
Columbia Energy Center
W8375 Murray Road
Pardeeville, Wisconsin 53954

Prepared for:

Wisconsin Power and Light Company
Columbia Energy Center
W8375 Murray Road
Pardeeville, Wisconsin 53954

SCS ENGINEERS

25224152.00 | June 25, 2025

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PE CERTIFICATION

I, Phillip Gearing, hereby certify that I am a licensed professional engineer in the State of Wisconsin in accordance with the requirements of ch. A–E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A–E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 500 to 538, Wis. Adm. Code.

Specifically,

- This Run-On and Run-Off Control Plan Update was prepared by me or under my direct supervision and meets the requirements of 40 CFR 257.81(c) and NR 514.07(10)(b)

June 25, 2025

(signature) (date)

Phillip E. Gearing

(printed or typed name)

License number E-45115

My license renewal date is July 31, 2026.

Pages or sheets covered by this seal:

Run-On and Run-Off Control Plan Update – Phase 1, Modules 1 through 6 and Phase 2, Modules 10 through 13

Columbia Dry Ash Disposal Facility, Columbia Energy Center

W8375 Murray Road, Pardeeville, Wisconsin 53954

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1.0 INTRODUCTION AND PROJECT SUMMARY

The Columbia Dry Ash Disposal Facility includes an active coal combustion residual (CCR) landfill, which currently consists of the following modules, located in Phase 1 and Phase 2 of the facility.

- **Phase 1, Module 1** – This module has received final cover over completed outer side slope areas that will no longer receive additional CCR; intermediate cover has been placed over remaining areas where CCR may be placed in the future.
- **Phase 1, Module 2** – This module has received final cover over a majority of the west slope that will no longer receive additional CCR; intermediate cover has been placed over a majority of the in-place CCR in areas where CCR may be placed in the future.
- **Phase 1, Module 3** – This module has received intermediate cover over a majority of the in-place CCR. Approximately a quarter of the module is open for active CCR placement.
- **Phase 1, Module 4** – This module has received intermediate cover over a majority of the in-place CCR. A portion of the southern end of the module is currently being filled.
- **Phase 1, Module 5** – This module has received intermediate cover over a majority of the in-place CCR.
- **Phase 1, Module 6** – This module is covered by intermediate cover.
- **Phase 2, Module 10** –This module is currently receiving CCR. A portion of the south slope has received intermediate cover.
- **Phase 2, Module 11** – This module is currently receiving CCR.
- **Phase 2, Module 12** – This module was constructed in 2024 and will start receiving CCR following Wisconsin Department of Natural Resources (DNR) full approval in 2025.
- **Phase 2, Module 13** – This module was constructed in 2024 and will start receiving CCR in 2025 following DNR full approval in 2025.

Phase 1, Modules 1 through 3 were previously described as separate existing CCR landfills although they are contiguous and are managed as a single landfill by the facility and by the DNR. WPL clarified that Modules 1-3 are one existing CCR landfill under the federal CCR Rule. Phase 1, Modules 4 through 6, and Phase 2, Modules 10 and 11 are considered a new CCR landfill that initiated construction after October 19, 2015, and are therefore managed as a separate CCR unit under the federal CCR Rule even though they are contiguous to Modules 1 through 3. Phase 2, Modules 10 and 11, started receiving CCR in 2023. Modules 12 and 13, were constructed in 2024 and should begin receiving CCR in 2025, after DNR approval.

Phase 2, Modules 7 through 9 are permitted with the WDNR, but have not been developed. If developed, the units will also be part of the new CCR landfill, as defined at 40 CFR 257.53 and NR 500.03. Construction of additional modules is not currently planned, however, it may need to be based on future landfill capacity needs.

Figure 1 shows the site location. **Figure 2** shows the run-on and run-off drainage areas.

On behalf of Wisconsin Power and Light Company (WPL), SCS Engineers (SCS) has prepared this Run-On and Run-Off Control Plan Update for the Columbia (COL) Dry Ash Disposal Facility in accordance with 40 CFR 257.81(c)(1) and NR 514.07(10)(b) as follows.

40 CFR 257.81(c)(4). *"The owner or operator of the CCR unit must prepare periodic run-on and run-off control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first subsequent plan. The owner or operator may complete any required plan prior to the required deadline provided the owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed a periodic run-on and run-off control system plan when the plan has been placed in the facility's operating record as required by §257.105(g)(3)."*

NR 514.07(10)(b)(4). *"Modification every 5 years from the date of the most recent plan approval or whenever there is a change in conditions that may substantially affect the written plan in effect. The modification shall be requested by the owner or operator in accordance with s. NR 514.04 (6) prior to the 5-year deadline."*

The initial Run-On and Run-Off Control Plan was completed in 2016, and updates were completed in 2018 prior to receipt of CCR in Phase 1, Module 4, in 2021, prior to receipt of CCR in Phase 1, Modules 5 and 6, and in 2023, prior to receipt of CCR in Phase 2, Modules 10 and 11.

1.1 PERIODIC PLAN UPDATES

The following items have been updated in this plan prior to receipt of CCR in Phase 2, Modules 12 and 13:

- **Run-On and Run-Off Drainage Areas** – **Figure 2** has been updated to show topographic data for active landfill areas based on a survey of the existing landfill in December 2024 including the construction of Phase 2, Modules 12 and 13, and the 2024 Final Cover area. No modules currently have a temporary rain cover; however, rain cover may be used in the future to reduce the area contributing run-off as contact water (refer to **Section 2.0**). Additional intermediate cover will be added to active landfill areas to maintain the contributing run-off area.

- **Storm Water Calculations** – Additional storm water calculations were completed for Modules 12 and 13 as described in **Section 2.0**.

- No other changes impacting the run-on and run-off controls have been identified with this update.

2.0 RUN-ON AND RUN-OFF CONTROL PLAN

40 CFR 257.81(a). "*The owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill must design, construct, operate, and maintain:*

(1) A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm."

NR 514.07(10)(b). *"A run–on and run–off control system plan that includes all of the following:*

(1) A run–on and run–off control system designed in accordance with the requirements under s. NR 504.12 (2)."

NR 504.12 (2). *"An existing or new CCR landfill or any lateral expansion of a CCR landfill shall be designed, constructed, operated, and maintained with a run–off and run–on control system in accordance with the requirements under s. NR 504.09 (1) (f) and (g) and all of the following:*

(a) A run–on control system shall prevent flow onto the active portion of the CCR landfill during the peak discharge from a 24–hour, 25–year storm."

The entire facility has run-on and run-off control in place, as approved by the WDNR and further described below. Run-on is controlled by berms and swales around the perimeter of the landfill that divert storm water away from the landfill to a sedimentation basin south of the landfill and a vegetated low area to the north.

40 CFR 257.81(a)(2) *"A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm."*

NR 504.12 (2)(b) *"A run–off control system from the active portion of the CCR landfill shall collect and control, at a minimum, the water volume resulting from a 24–hour, 25–year storm."*

Run-off from the active portions of the facility is handled as leachate and is collected by a leachate collection system, which route the contact water run-off to the Leachate/Surface Water Pond. Modules 4 through 6 and 10 through 12 and all module fills going forward will have intermediate cover added to reduce contact water that is directed to the pond. The contact water in the basin is used for dust control or other actions within the active landfill or, if needed, is transported with a water wagon to the generating station where it may be discharged through Outfall 003 inside the plant in accordance with a Wisconsin Pollutant Discharge Elimination System (WPDES) permit.

Run-off from areas outside existing CCR units and areas of the existing CCR units where final or intermediate cover is in place is diverted into the perimeter drainage swales, which drain to the South Sedimentation Basin and a lower area north of the landfill. Intermediate swales/berms, flumes, and downslope channels on the final/intermediate cover help minimize erosion of the final/intermediate cover and divert water to the perimeter drainage system, and ultimately to the on-site detention/sedimentation basin or the vegetated low area north of Murray Road. Per 40 CFR 257.81(b), this is consistent with the surface water requirements under 40 CFR 257.3-3.

In addition to these controls, a temporary rain cover may be installed to limit leachate and contact water production when needed. Storm water collected on the rain cover will be diverted to perimeter swales. The rain cover will be removed in sections to accommodate waste placement. As the rain cover is removed, new diversion berms will be constructed to form the perimeter of a storm water containment area. The berms will prevent contact water from running onto the rain cover and will anchor or ballast the rain cover at the new limits. When the rain cover has been fully removed, run-off will be controlled by the limits of the developed modules, and all water inside the lined waste limits will be managed as contact water.

2.1 DESIGN CRITERIA

The storm water features described above are designed to handle run-on and run-off from a 25-year, 24-hour storm event, as required by 40 CFR 257.81(a)(1) and (2) and NR 504.12(2)(a) and (b). Storm water run-off calculations were updated in 2023 through 2025. The calculations were performed assuming a 25-year, 24-hour precipitation depth of 4.91 inches, based on National Oceanic and Atmospheric Administration (NOAA) Atlas 14 precipitation data published in April 2013. The detention/sedimentation basin and north basin (north vegetated low area) and associated basin outlet structures are designed to safely pass run-off from a 100-year, 24-hour storm event.

Table 1. Storm Water Updates

Year Conducted	Description of Update	Included in Appendix A
Run-On and Run-Off		
2000	Run-on calculations performed as part of the 2000 Plan of Operation Update; performed assuming 25-year, 24-hour precipitation depth of 4.7 inches, based on Technical Paper-40 (TP-40) precipitation data published in May 1961.	Yes, Included in Appendix A
2010	Run-off calculations performed as part of the 2010 Plan of Operation Update; performed assuming 25-year, 24-hour precipitation depth of 4.7 inches, based on TP-40 precipitation data published in May 1961.	Superseded by Phase 1, Modules 5 & 6
2015	Update to leachate/surface water pond calculations; performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 1, Module 4
2016	Update to run-on to a ditch along the north end of Module 3; performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 1, Module 4
2016	Calculations to evaluate installation of a rain cover in Module 3; performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 1, Module 4
2017	Update to leachate/surface water pond calculations with consideration of Phase 1, Module 4 construction; performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 1, Modules 5 & 6
2018	Calculations to evaluate installation of a rain cover in Module 4; performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 1, Modules 5 & 6
2018	Calculations to size swales and culverts to divert run-on as part of construction of Module 4, performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 1, Modules 5 & 6

Year Conducted	Description of Update	Included in Appendix A
Run-On and Run-Off		
2021	Update to leachate/surface water pond calculations with consideration of Phase 1, Modules 5 and 6 construction; performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 2, Modules 10 & 11
2021	Calculations to size swales and culverts to divert run-on as part of construction of Modules 5 and 6, performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 2, Modules 10 & 11
2021	Calculations to confirm South Sedimentation Basin can handle storm water after construction of Modules 5 and 6, performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 2, Modules 10 & 11
2022	Update to leachate/surface water pond calculations with consideration of Phase 2, Modules 10 and 11 construction; performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 2, Modules 12 & 13
2022	Calculations to size swales and culverts to divert run-on as part of construction of Modules 10 and 11, performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 2, Modules 12 & 13
2022	Calculations to confirm South Sedimentation Basin can handle storm water after construction of Modules 10 and 11, performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Superseded by Phase 2, Modules 12 & 13
2023	Calculations to size swales and culverts to divert run-on as part of construction of Modules 12 and 13, performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Yes, Included in Appendix A
2023	Calculations to confirm South Sedimentation Basin can handle storm water after construction of Modules 12 and 13, performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Yes, Included in Appendix A
2023	Update to leachate/surface water pond calculation with consideration of Phase 2, Modules 12 and 13 construction; performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Yes, Included in Appendix A
2024	Calculations to confirm North Basin (North low area) can handle additional flow from Interim Cover, performed assuming 25-year, 24-hour precipitation depth of 4.9 inches, based on NOAA Atlas 14 precipitation data published in April 2013.	Yes, Included in Appendix A

2.2 DESIGN WITH CALCULATIONS

Storm water management design calculations are contained in **Appendix A**, as required by 40 CFR 257.81(c)(1) and NR 514.07(10)(b)(2). As described in **Section 2.1**, the calculations from the 2022 Plan of Operation Update and the 2024 calculations describe the storm water management design and provide calculations showing that the run-on control system will prevent flow onto the active portion of the CCR units during the peak discharge from a 25-year, 24-hour storm. The 2024 calculations also describe the storm water management design and provide calculations showing that the run-off control system for the active portions of the CCR units will collect and control the water volume resulting from a 25-year, 24-hour storm. The calculations were performed by or overseen by a professional engineer licensed in the State of Wisconsin.

2.3 CONSTRUCTION

Existing storm water management features were constructed to site specifications with construction oversight directed by a professional engineer licensed in the State of Wisconsin. Construction documentation reports for the storm water management features were prepared, submitted to the WDNR, and approved by the WDNR.

3.0 CERTIFICATIONS

40 CFR 257.81(c)(5). "*The owner or operator must obtain a certification from a qualified professional engineer stating that the initial and periodic run-on and run-off control system plans meet the requirements of this section.*"

Phillip Gearing, PE, a licensed professional engineer in the State of Wisconsin, has overseen the preparation of this Run-On and Run-Off Control Plan. A certification statement is provided on **page iii** of this plan.

4.0 RECORDKEEPING AND PERIODIC UPDATES

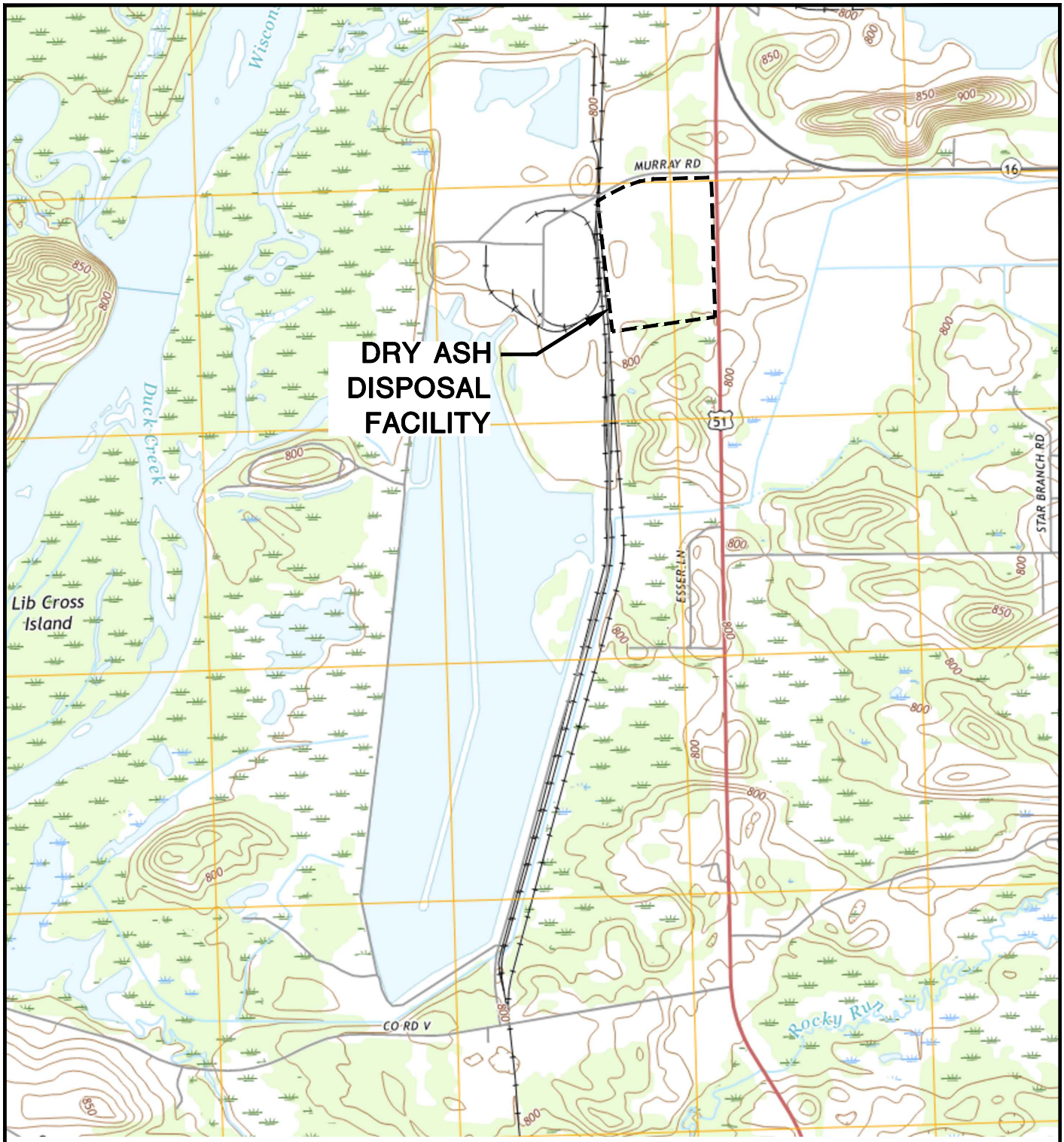
40 CFR 257.81(d). *"The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in section 257.105(g), the notification requirements specified in section 257.106(g), and the internet requirements specified in section 257.107(g)."*

This Run-On and Run-Off Control Plan, and all periodic plans, will be placed in the facility's operating record and on Alliant Energy's CCR Rule Compliance Data and Information website, as will all amendments. Periodic plan updates will be completed at least every 5 years per 40 CFR 257.81(c)(4) and NR 514.07(10)(b)(4).

WPL will notify the State Director when this Run-On and Run-Off Control Plan, and all subsequent updates, are available in the facility's operating record and on the facility's website per 40 CFR 257.105(g), 257.106(g), and 257.107(g) and NR 506.17(2) and (3).

Figures

1 Site Location Map
2 Run-On and Run-Off Control Plan



N

POYNETTE QUADRANGLE
WISCONSIN–COLUMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2022
SCALE: 1" = 2,000'

CLIENT	WISCONSIN POWER AND LIGHT COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WISCONSIN 53954	SITE	RUN–ON AND RUN–OFF CONTROL PLAN COLUMBIA DRY ASH DISPOSAL FACILITY TOWN OF PACIFIC, WISCONSIN

SITE LOCATION MAP

PROJECT NO.	25224152.00	DRAWN BY:	RVG
DRAWN:	06/17/2025	CHECKED BY:	RJG
REVISED:	06/24/2025	APPROVED BY:	PEG 06/25/2025

ENGINEER

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718–6751
PHONE: (608) 224–2830

FIGURE
1

I:\25224152.00\Drawings\CCR Compliance\1_Site Location.dwg, 6/25/2025 3:34:50 PM

540,500 N | 541,000 N | 541,500 N | 542,000 N | 542,500 N | 543,000 N | 543,500 N

2,123,500 E | 2,124,000 E | 2,124,500 E | 2,125,000 E

COAL PILE

WPDES POND

MW-83 | SG-4 | MW-311 | MW-33AR | MW-33B | MW-34A | MW-34B | MW-88B | MW-85B | MW-302 | MW-5R | BM202 | LS-1 | BM6 | MW-310 | MW-309 | SW002 | MW-37A | MW-317 | MW-318 | MW-319 | MW-312

CONC

C. M. ST. P. & P. RR.

ROCK CHUTE

MURRAY ROAD

SW001

SOUTH SEDIMENTATION BASIN

DISCHARGE STRUCTURE

FINAL COVER AREA DRAINS TO PERIMETER SWALES AND SOUTH SEDIMENTATION BASIN

INTERMEDIATE COVER AREA DRAINS TO PERIMETER SWALES TO SW001 TO SW002

2024 FINAL COVER AREA

EXISTING MODULE 1

FINAL COVER AREA

EXISTING MODULE 2

EXISTING MODULE 3

EXISTING MODULE 4

EXISTING MODULE 5

EXISTING MODULE 6

PHASE 1

INTERMEDIATE COVER AREA

MW-92B | MW-92A | LS-3R | LH-2 | LH-5 | LH-6

INTERMEDIATE COVER WITH TOPSOIL AREA DRAINS TO PERIMETER SWALES AND SOUTH SEDIMENTATION BASIN

MW-91AR | MW-91B | MW-16 | MW-89A/B | LP-1

TOP OF POND LINER ELEVATION = 796.97'

LEACHATE/ SURFACE WATER POND

PHASE 2

EXISTING MODULE 10

EXISTING MODULE 11

MODULE 12

MODULE 13

SOUTH GENERAL FILL STOCKPILE (DRAINS TO SOUTH SEDIMENTATION BASIN)

LH-13B | LH-13A | LH-10A | LH-10B | LH-11A | LH-11B | LH-12A | LH-12B | MW-1A | MW-1B | MW-313

MW-301 | MW-17 | BM301 | MW-84A | MW-84B | BM302 (SGR) | MW-93B | MW-93A

ACTIVE AREA DRAINS TO THE LEACHATE COLLECTION SYSTEM AND TO THE LEACHATE/SURFACE WATER POND

ACTIVE AREA DRAINS TO THE LEACHATE COLLECTION SYSTEM AND TO THE LEACHATE/SURFACE WATER POND (SEE NOTE 2)

U.S.H. 51

SITE ENTRANCE

LEGEND

- DRY ASH DISPOSAL FACILITY LIMITS
- LIMITS OF WASTE
- LINER PHASE/MODULE LIMIT
- FINAL COVER DRAINAGE AREAS
- EXISTING INTERMEDIATE COVER DRAINAGE AREA
- EXISTING INTERMEDIATE COVER DRAINAGE AREA WITH TOPSOIL
- ACTIVE CCR PLACEMENT AREA
- CCR PLACEMENT AREA (PENDING APPROVAL, SEE NOTE 2)
- LIMITS OF 2' THICK CLAY LINER
- PAVED ROAD
- UNPAVED ROAD
- RAILROAD TRACKS
- VEGETATION
- FENCE
- LEACHATE FORCEMAIN
- UNDERGROUND ELECTRIC UTILITY
- EXISTING GRADE (10' INTERVAL)
- EXISTING GRADE (2' INTERVAL)
- SWALE
- EDGE OF WATER
- WETLAND
- RIPRAP
- CULVERT
- TRANSMISSION TOWER
- UTILITY POLE
- MONITORING WELL
- PIEZOMETER
- WATER SUPPLY WELL
- STAFF GAUGE
- SURFACE WATER SAMPLE LOCATION
- LEACHATE HEADWELL
- LEACHATE RISER/CLEANOUT
- LYSIMETER MANHOLE
- ABANDONED MONITORING WELL
- ABANDONED PIEZOMETER
- ABANDONED TEMPORARY WATER TABLE WELL
- BENCHMARK

NOTES:

1. IMPERVIOUS AREA INCLUDES GRAVEL ACCESS ROAD, PAVED ACCESS ROAD, AND PORTIONS OF MURRAY ROAD AND US HWY 51.
2. STORM WATER RUNOFF IN MODULE 12 AND 13 IS DIRECTED TO OUTFALL SW001 UNTIL PLACEMENT BEGINS IN 2025. FOLLOWING START OF PLACEMENT CONTACT WATER WILL BE PUMPED TO THE LEACHATE/SURFACE WATER POND.

100 0 100

SCALE: 1" = 100'

N

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DRAWN BY:	KP
CHECKED BY:	RJG
APPROVED BY:	PEG 06/25/2025
PROJECT NO.	25224152.00
DRAWN:	05/17/2018
REVISED:	06/09/2025

CLIENT: Wisconsin Power and Light Company
WISCONSIN POWER AND LIGHT COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WISCONSIN 53954

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

SITE: RUN-ON AND RUN-OFF CONTROL PLAN
COLUMBIA DRY ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

FIGURE: RUN-ON AND RUN-OFF CONTROL PLAN

FIGURE 2

Appendix A

Storm Water Design Calculations

Appendix A1

Plan of Operations Modification Request – Addendum No. 2

Storm Water Management Calculations

Purpose:
The purpose of the storm water runoff calculations is to demonstrate that the existing storm water sedimentation basin and proposed storm water management features included in the Module 12 and 13 Plan Modification Request can accommodate and safely convey the runoff from a 25-year, 24-hour storm event and 100-year, 24-hour storm event during post closure conditions.

Items addressed in these calculations:

- Swales
- Culverts
- Diversion Berms
- Downslope Flumes & Energy Dissipators
- Rock Chutes
- Discharge Aprons
- Sedimentation Basin
- North Infiltration Area

The proposed storm water management conditions are shown on **Figure 1**.
The calculations support the capacity check of the following existing storm water management feature:

Feature	Purpose	Design Method
Swales	Convey storm water runoff from adjacent areas to culverts and offsite during post construction conditions	HydroCAD runoff modeling and Swale Calculation
Culverts	Convey storm water from the final cover perimeter swales during post construction conditions	HydroCAD runoff modeling and HY-8 Culvert Model
Diversion Berms	Reduce storm water runoff from final cover slopes and to divert water to perimeter swales during post construction conditions	HydroCAD runoff modeling and Diversion Berm Calculations
Downslope Flumes & Energy Dissipators	Convey storm water from diversion berms down slope to swales and offsite drainage features during post construction conditions	HydroCAD runoff modeling and Downslope Flume Calculations
Rock Chutes	Erosion protection and convey storm water from energy dissipators to existing swale during post construction conditions	HydroCAD runoff modeling and Rock Chute Calculation
Discharge Aprons	Erosion protection from culvert discharge at culvert outlets	HydroCAD runoff modeling and Riprap Apron Calculation
Sedimentation Basin	To safely handle 25-year, 24-hour storm event without overtopping the 100-year, 24-hour spillway.	HydroCAD runoff modeling
North Infiltration Area	To safely handle 25-year, 24-hour and 100-year, 24-hour storm events without overtopping or backing up the inlet pipe.	HydroCAD runoff modeling

Approach:

Hydrograph Generation

HydroCAD was used to model the storm water management system and develop the hydrographs using TR-20 methodologies. The model is designed to simulate the surface runoff response of a watershed to a precipitation event. Input parameters for the model include precipitation depth for the design storm events from NOAA ATLAS 14, contributing drainage areas, runoff curve numbers, and time of concentration.

Swale Sizing

The proposed swales were sized for the 25-year, 24-hour storm event. A WisDOT HEC-15 spreadsheet based on Manning's equation was used to calculate the depth of flow and velocity in the swales using the swale geometry and peak flow in the swales (as determined by the Hydrograph Generation models).

Culvert Sizing

Culverts were sized for the 25-year, 24-hour storm event using the HY-8 computer model developed by the US Department of Transportation, Federal Highway Administration.

Diversion Berms

Diversion berms were sized for the 25-year, 24-hour storm event. A WisDOT HEC-15 spreadsheet based on Manning's Equation was used to calculate the depth of flow and velocity in the swale using the swale geometry and peak flow for the storm event (as determined by the Hydrograph Generation Calculations).

Downslope Flumes and Energy Dissipators Sizing

Flumes and energy dissipators were sized for the 25-year, 24-hour storm event. Manning's equation and the orifice equation were used to size the flumes. Energy dissipators were sized using tables from the reference book "Hydraulic Design of Energy Dissipators for Culverts and Channels" US Department of Transportation, Federal Highway Administration, July 2006.

Rock Chute Sizing

Rock chutes were sized for the 25-year, 24-hour storm event. Rock Chutes were sized based on the flow to each culvert location. The Iowa NRCS Rock Chute Design spreadsheet was used to size the chute and riprap.

Discharge Apron Sizing

Riprap aprons were sized for the 25-year, 24-hour storm event using equations in Section 5.2 – Riprap Blanket of WisDOT FDM 13-35-5. The riprap aprons were sized based on the flow to the culvert location. The riprap stone sizing was used to specify the thickness and geometry of the riprap discharge apron.

Sedimentation Basin Sizing

Route the proposed construction and existing drainage runoff through the sedimentation basin to confirm the basin can handle the 25-year, 24-hour storm event and to safely pass the 100-year, 24-hour storm event. HydroCAD was used to model the runoff flow through the basin outfall (as determined by the Hydrograph Generation model).

North Infiltration Area Verification

The depressional area located north of the Module 12 Plan Modification construction area acts as a infiltration area and accepts portions of the drainage runoff. Route the proposed construction and existing drainage runoff flowing to the North Infiltration Area to confirm the area can handle the 25-year, 24-hour and 100-year, 24-hour storm events without overtopping or backing up the inlet pipe. HydroCAD was used to model the runoff flow into this area (as determined by the Hydrograph Generation model).

Key Assumptions:

- Drainage areas and time of concentration flow paths are as shown on **Figure 1** for Post Construction Conditions.

- An MSE4 rainfall distribution was used based on NRCS Wisconsin rainfall distribution regions.

  The precipitation depth for the 25-year, 24-hour storm was assumed to be 4.91 inches, based on NOAA ATLAS 14 Point Precipitation Frequency Estimates (NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server).

  The precipitation depth for the 100-year, 24-hour storm was assumed to be 6.59 inches, based on NOAA ATLAS 14 Point Precipitation Frequency Estimates.

- Runoff curve numbers were based on tables presented in Urban Hydrology for Small Watersheds, and were assumed as follows and as listed in the modeling.

Cover Type	CN
Final Cover	69 – Pasture/grassland/range in good condition, hydrologic soil group (HSG) (B/C assumed mid value between each soil group)
Pasture, grassland or range	39 – Pasture/grassland/range, Good, HSG A
Gravel	96 – Gravel, HSG A
Water Surface	98 – Water Surface, HSG A

- Type A soil group for non-disturbed areas outside the landfill as soils are loamy sand.
- Other assumptions are included with the calculations attached to this appendix.

Results:

Hydrograph Generation

The hydrograph modeling results for the 25-year and 100-year, 24-hour storm events are included in the Post Construction Conditions Hydrograph Generation section.

Swale Sizing

The proposed swales will be constructed as shown on the Drawings. The swales have the capacity to safely convey the both the 25-year, 24-hour storm events and maintain a minimum 0.5 foot of freeboard. Refer to the Swale Sizing section.

Appropriate erosion control product was selected based on the velocities and shear stress in the swales. Refer to the Swale Sizing section below for the evaluation.

Culvert Sizing

Culverts will be as shown in the Drawings. The culverts have the capacity to safely convey the 25-year, 24-hour storm event. Refer to the Culvert Sizing Section for the detailed calculations.

Diversion Berm Sizing

The proposed final berms will be constructed as shown on the Drawings. The diversion berms will contain the runoff from the 25-year, 24-hour storm event. Refer to the Diversion Berm Design section.

Downslope Flume and Energy Dissipator Sizing

The downslope flumes and energy dissipaters will be constructed as shown on the Drawings. The downslope flumes are designed to contain the runoff from the 25-year, 24-hour storm event. Energy dissipators at the bottom of the downslope flumes have been designed to handle the peak velocities. Refer to the Downslope Flume and Energy Dissipator Sizing section below for detailed calculations.

Rock Chute Sizing

The proposed rock chutes will be constructed as shown in the Drawings. The rock chutes will accommodate the runoff from the 25-year, 24-hour storm event. Refer to the Rock Chute Sizing section.

Discharge Apron Sizing

The proposed riprap aprons will be constructed as shown in the Drawings. The aprons will accommodate the runoff from the 25-year, 24-hour storm event. Refer to Discharge Apron Sizing for design calculations.

Sedimentation Basin Sizing

The existing sedimentation basin has the capacity to safely contain the 25-year, 24-hour storm event and safely pass the 100-year, 24-hour storm event through the emergency spillway.

As shown in the HydroCAD model, the water elevation in both basin areas for each storm event is provided below:

Basin Area	Basin Crest Elevation (ft MSL)	Basin Spillway Elevation (ft MSL)	Peak Elevation 25-year storm (ft MSL)	Peak Elevation 100-year storm (ft MSL)
Existing Sedimentation Basin	794.00	793.00	792.00	793.20

North Infiltration Area Verification

The North Infiltration Area can safely contain the 25-year, 24-hour storm event and the 100-year, 24-hour storm event without overtopping or backing up the inlet pipe at Murray Road.

As shown in the HydroCAD model, the water elevation in both basin areas for each storm event is provided below:

Basin Area	Basin Crest Elevation (ft MSL)	Basin Inlet Pipe Elevation (ft MSL)	Peak Elevation 25-year storm (ft MSL)	Peak Elevation 100-year storm (ft MSL)
North Basin	810.00	806.81	803.86	805.23

CULVERT C7
2-42" CMPs
INLET INV.: 796.64/796.34
OUTLET INV.: 796.34/796.04
LENGTH: 60.2 FT

CULVERT C8
INLET INV.: 810.70
OUTLET INV.: 808.60
LENGTH: 85.60 FT

CULVERT C9
INLET INV.: 807.54
OUTLET INV.: 806.81
LENGTH: 99.86 FT

CULVERT C2
INLET INV.: 817.83
OUTLET INV.: 814.00
LENGTH: 74.54 FT

CULVERT C1
INLET INV.: 815.70
OUTLET INV.: 814.55
LENGTH: 51.878 FT

CULVERT C6
INLET INV.: 805.40
OUTLET INV.: 804.76/804.71
LENGTH: 104.555 FT

CULVERT C5
INLET INV.: 807.57
OUTLET INV.: 807.15
LENGTH: 50.00 FT

CULVERT C4
INLET INV.: 809.86
OUTLET INV.: 809.60
LENGTH: 50.00 FT

CULVERT C3
INLET INV.: 811.17
OUTLET INV.: 810.90
LENGTH: 50.00 FT

CULVERT C10
INLET INV.: 814.96
OUTLET INV.: 813.36
LENGTH: 50.00 FT

COAL PILE
WPDES POND
SOUTH SEDIMENTATION BASIN
NORTH POND
C. M. ST. P. & P. RR.
MURRAT ROAD

FLUME 1
FLUME 2
FLUME 3 (EXISTING)
FLUME 6
FLUME 7
FLUME 8
FLUME 9
FLUME 10

ROCK CHUTE 1
ROCK CHUTE 2
ROCK CHUTE 3
EXISTING ROCK CHUTE (FLUME 4)
EXISTING ROCK CHUTE (FLUME 5)

ROADSIDE DITCH 1
ROADSIDE DITCH 2
ROADSIDE DITCH 3
ROADSIDE DITCH 4
ROADSIDE DITCH 5
ROCK CHUTE 4

SWALE S1.1
SWALE S1.2
SWALE S1.3
SWALE S1.4
SWALE S1.5
SWALE S1.6
SWALE S1.7
SWALE S1.8
SWALE S2.1
SWALE S2.2
SWALE S2.3
SWALE S3.1
SWALE S3.2
SWALE S3.3
SWALE S3.4
SWALE S3.5
SWALE S4.1
SWALE S4.2
SWALE S4.3
SWALE S4.4
SWALE S4.5
SWALE S4.6
SWALE S5.1

AREA 1
AREA 2
AREA 3
AREA 4
AREA 5
AREA 6
AREA 7
AREA 8
AREA 9
AREA 10
AREA 11
AREA 12
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AREA 56
AREA 57
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AREA 60
AREA 61
AREA 62
AREA 63
AREA 64
AREA 65
AREA 66
AREA 67
AREA 68
AREA 69
AREA 70
AREA 71

AREA TO BE GRADED TO DRAIN AFTER CLOSURE

LEGEND

- DRY ASH DISPOSAL FACILITY LIMITS
- LIMITS OF WASTE
- LINER PHASE/MODULE LIMIT
- FINAL COVER LIMITS
- APPROXIMATE INTERMEDIATE COVER LIMITS/AREA
- PAVED ROAD
- UNPAVED ROAD
- VEGETATION
- FENCE
- EXISTING GRADE (10' INTERVAL)
- EXISTING GRADE (2' INTERVAL)
- SWALE
- EDGE OF WATER
- WETLAND
- PROPOSED PHASE 1 FINAL GRADE (10' INTERVAL)
- PROPOSED PHASE 1 FINAL GRADE (2' INTERVAL)
- PROPOSED GRADE (10' INTERVAL)
- PROPOSED GRADE (2' INTERVAL)
- PROPOSED PERIMETER ROAD
- PROPOSED SWALE
- PROPOSED CULVERT
- PROPOSED LEACHATE COLLECTION SYSTEM CLEANOUT
- PROPOSED LEACHATE VAULT
- PROPOSED LEACHATE FORCEMAIN
- PROPOSED UNDERGROUND ELECTRIC
- PROPOSED DIVERSION BERM
- PROPOSED DOWNSLOPE FLUME
- PROPOSED ENERGY DISSIPATOR
- PROPOSED RIPRAP
- DRAINAGE AREA DIVIDES
- FLOW PATH

NOTES:

1. SEE SHEET 2 OF PLAN OF OPERATION UPDATE (2023) PLAN SET FOR BASE MAP LEGEND ITEMS AND NOTES.
2. PROPOSED GRADES REPRESENT TOP OF FINAL COVER (FINAL GRADE).

N

125 0 125

SCALE: 1" = 125'

S.S.L.
DRAWN BY: MJT
CHECKED BY:
APPROVED BY: MRH 08/31/2023

PROJECT NO. 25222260.01
DRAWN: 08/01/2023
REVISED: 08/31/2023

WISCONSIN POWER AND LIGHT
COLUMBIA ENERGY CENTER
2019 W. CHESTNUT ST.
PARDEEVILLE, WISCONSIN 53954

Wisconsin Power and Light Company

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ENGINEER

PLAN OF OPERATION UPDATE
COLUMBIA ENERGY CENTER
COLUMBIA DRY ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

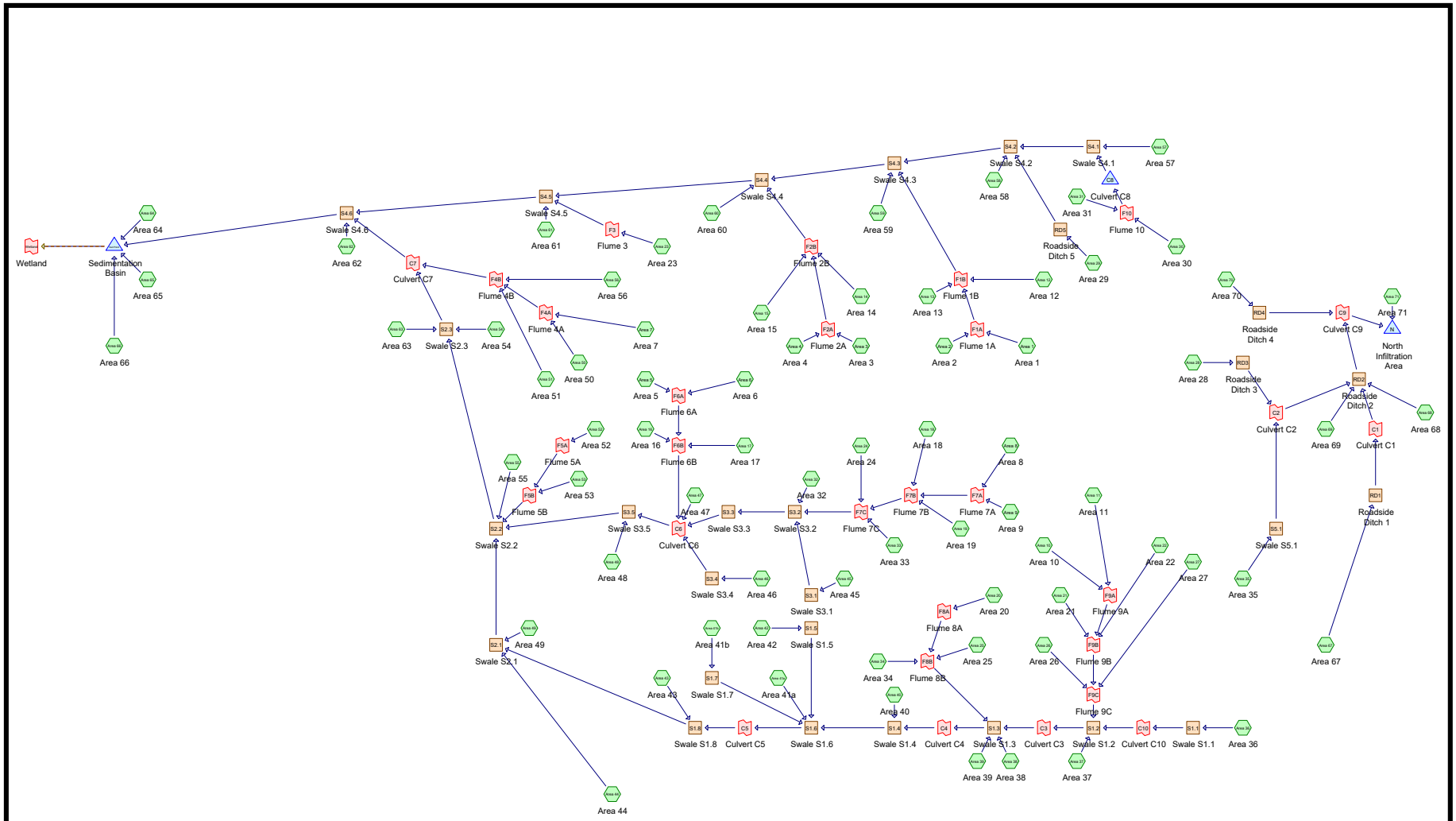
SITE

FINAL GRADES
(MODULES 12 AND 13)

SHEET
1 of 1

Post Construction Conditions Hydrograph Generation

- 25-year, 24-hour Storm Event
- 100-year, 24-hour Storm Event



Routing Diagram for 230828_COL_Mod12+13

Prepared by SCS Engineers, Printed 8/28/2023

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-yr, 24-hr	MSE 24-hr	4	Default	24.00	1	4.91	2
2	100-yr, 24-hr	MSE 24-hr	4	Default	24.00	1	6.59	2

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentArea 1: Area 1 Runoff Area=1.296 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=364' Tc=6.7 min CN=69 Runoff=3.75 cfs 0.204 af

SubcatchmentArea 10: Area 10 Runoff Area=0.573 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=321' Tc=6.4 min CN=69 Runoff=1.68 cfs 0.090 af

SubcatchmentArea 11: Area 11 Runoff Area=1.872 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=796' Tc=7.6 min CN=69 Runoff=5.22 cfs 0.295 af

SubcatchmentArea 12: Area 12 Runoff Area=1.610 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=712' Tc=5.3 min CN=69 Runoff=4.83 cfs 0.254 af

SubcatchmentArea 13: Area 13 Runoff Area=0.626 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=333' Tc=4.5 min CN=69 Runoff=1.94 cfs 0.099 af

SubcatchmentArea 14: Area 14 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=331' Tc=4.4 min CN=69 Runoff=1.93 cfs 0.098 af

SubcatchmentArea 15: Area 15 Runoff Area=0.943 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=464' Tc=5.9 min CN=69 Runoff=2.80 cfs 0.149 af

SubcatchmentArea 16: Area 16 Runoff Area=0.571 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=315' Tc=4.4 min CN=69 Runoff=1.78 cfs 0.090 af

SubcatchmentArea 17: Area 17 Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=424' Tc=4.7 min CN=69 Runoff=3.04 cfs 0.156 af

SubcatchmentArea 18: Area 18 Runoff Area=1.656 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=508' Tc=4.8 min CN=69 Runoff=5.06 cfs 0.261 af

SubcatchmentArea 19: Area 19 Runoff Area=0.689 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=286' Tc=4.3 min CN=69 Runoff=2.16 cfs 0.109 af

SubcatchmentArea 2: Area 2 Runoff Area=0.557 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=303' Tc=4.7 min CN=69 Runoff=1.71 cfs 0.088 af

SubcatchmentArea 20: Area 20 Runoff Area=0.381 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=306' Tc=4.3 min CN=69 Runoff=1.19 cfs 0.060 af

SubcatchmentArea 21: Area 21 Runoff Area=0.516 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=312' Tc=4.3 min CN=69 Runoff=1.62 cfs 0.081 af

SubcatchmentArea 22: Area 22 Runoff Area=2.579 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=1,146' Tc=6.4 min CN=69 Runoff=7.54 cfs 0.407 af

SubcatchmentArea 23: Area 23 Runoff Area=0.427 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=362' Tc=3.8 min CN=69 Runoff=1.38 cfs 0.067 af

SubcatchmentArea 24: Area 24 Runoff Area=1.177 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=385' Tc=4.7 min CN=69 Runoff=3.61 cfs 0.186 af

SubcatchmentArea 25: Area 25 Runoff Area=0.682 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=349' Tc=4.5 min CN=69 Runoff=2.12 cfs 0.108 af

SubcatchmentArea 26: Area 26 Runoff Area=0.677 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=341' Tc=4.5 min CN=69 Runoff=2.10 cfs 0.107 af

SubcatchmentArea 27: Area 27 Runoff Area=2.594 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=1,357' Tc=6.9 min CN=69 Runoff=7.46 cfs 0.409 af

SubcatchmentArea 28: Area 28 Runoff Area=2.159 ac 0.00% Impervious Runoff Depth=2.29"
Flow Length=125' Slope=0.2500 '/' Tc=3.9 min CN=74 Runoff=8.44 cfs 0.412 af

SubcatchmentArea 29: Area 29 Runoff Area=0.616 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=109' Slope=0.2500 '/' Tc=3.8 min CN=72 Runoff=2.25 cfs 0.109 af

SubcatchmentArea 3: Area 3 Runoff Area=0.348 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=298' Tc=4.8 min CN=69 Runoff=1.06 cfs 0.055 af

SubcatchmentArea 30: Area 30 Runoff Area=0.149 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=211' Tc=1.2 min CN=69 Runoff=0.52 cfs 0.023 af

SubcatchmentArea 31: Area 31 Runoff Area=0.126 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=59' Slope=0.2500 '/' Tc=2.5 min CN=69 Runoff=0.44 cfs 0.020 af

SubcatchmentArea 32: Area 32 Runoff Area=0.457 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=122' Slope=0.2500 '/' Tc=3.9 min CN=70 Runoff=1.53 cfs 0.075 af

SubcatchmentArea 33: Area 33 Runoff Area=1.056 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=419' Tc=4.7 min CN=69 Runoff=3.24 cfs 0.167 af

SubcatchmentArea 34: Area 34 Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=374' Tc=4.5 min CN=69 Runoff=1.35 cfs 0.068 af

SubcatchmentArea 35: Area 35 Runoff Area=1.218 ac 0.00% Impervious Runoff Depth=2.29"
Flow Length=104' Tc=4.6 min CN=74 Runoff=4.58 cfs 0.233 af

SubcatchmentArea 36: Area 36 Runoff Area=1.185 ac 0.00% Impervious Runoff Depth=1.59"
Flow Length=106' Tc=4.1 min CN=65 Runoff=3.12 cfs 0.157 af

SubcatchmentArea 37: Area 37 Runoff Area=1.291 ac 0.00% Impervious Runoff Depth=1.38"
Flow Length=120' Slope=0.2500 '/' Tc=3.9 min CN=62 Runoff=2.93 cfs 0.149 af

SubcatchmentArea 38: Area 38 Runoff Area=0.795 ac 0.00% Impervious Runoff Depth=1.45"
Flow Length=155' Tc=4.3 min CN=63 Runoff=1.86 cfs 0.096 af

SubcatchmentArea 39: Area 39 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=168' Tc=9.6 min CN=56 Runoff=0.72 cfs 0.051 af

SubcatchmentArea 4: Area 4 Runoff Area=0.288 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=296' Tc=4.0 min CN=69 Runoff=0.92 cfs 0.045 af

SubcatchmentArea 40: Area 40 Runoff Area=0.739 ac 0.00% Impervious Runoff Depth=1.00"
Flow Length=141' Tc=7.2 min CN=56 Runoff=0.98 cfs 0.061 af

SubcatchmentArea 41a: Area 41a Runoff Area=0.871 ac 0.00% Impervious Runoff Depth=1.59"
Flow Length=144' Slope=0.0500 '/' Tc=7.8 min CN=65 Runoff=2.00 cfs 0.116 af

SubcatchmentArea 41b: Area 41b Runoff Area=0.712 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=102' Slope=0.0500 '/' Tc=7.3 min CN=71 Runoff=2.19 cfs 0.122 af

SubcatchmentArea 42: Area 42 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=2.14 cfs 0.121 af

SubcatchmentArea 43: Area 43 Runoff Area=2.792 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=419' Tc=14.7 min CN=61 Runoff=3.88 cfs 0.306 af

SubcatchmentArea 44: Area 44 Runoff Area=1.416 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=941' Slope=0.0260 '/' Tc=22.0 min CN=39 Runoff=0.06 cfs 0.022 af

SubcatchmentArea 45: Area 45 Runoff Area=2.044 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=138' Tc=4.0 min CN=69 Runoff=6.52 cfs 0.322 af

SubcatchmentArea 46: Area 46 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=2.14 cfs 0.121 af

SubcatchmentArea 47: Area 47 Runoff Area=0.079 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=143' Tc=5.1 min CN=72 Runoff=0.27 cfs 0.014 af

SubcatchmentArea 48: Area 48 Runoff Area=3.726 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=391' Tc=11.1 min CN=71 Runoff=9.80 cfs 0.636 af

SubcatchmentArea 49: Area 49 Runoff Area=0.698 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=100' Slope=0.0600 '/' Tc=6.8 min CN=39 Runoff=0.03 cfs 0.011 af

SubcatchmentArea 5: Area 5 Runoff Area=0.504 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=258' Tc=3.4 min CN=69 Runoff=1.66 cfs 0.079 af

SubcatchmentArea 50: Area 50 Runoff Area=0.223 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=296' Tc=3.7 min CN=69 Runoff=0.72 cfs 0.035 af

SubcatchmentArea 51: Area 51 Runoff Area=0.655 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=642' Tc=5.0 min CN=69 Runoff=1.98 cfs 0.103 af

SubcatchmentArea 52: Area 52 Runoff Area=0.237 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=348' Tc=4.0 min CN=69 Runoff=0.76 cfs 0.037 af

SubcatchmentArea 53: Area 53 Runoff Area=0.475 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=425' Tc=4.5 min CN=69 Runoff=1.48 cfs 0.075 af

SubcatchmentArea 54: Area 54 Runoff Area=1.618 ac 0.00% Impervious Runoff Depth=1.18"
Flow Length=384' Tc=4.2 min CN=59 Runoff=2.98 cfs 0.160 af

SubcatchmentArea 55: Area 55 Runoff Area=0.826 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=126' Slope=0.2500 '/' Tc=3.9 min CN=58 Runoff=1.45 cfs 0.077 af

SubcatchmentArea 56: Area 56 Runoff Area=1.228 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=647' Tc=5.7 min CN=69 Runoff=3.66 cfs 0.194 af

SubcatchmentArea 57: Area 57 Runoff Area=1.089 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=158' Tc=4.3 min CN=58 Runoff=1.86 cfs 0.102 af

SubcatchmentArea 58: Area 58 Runoff Area=1.194 ac 0.00% Impervious Runoff Depth=1.18"
Flow Length=221' Tc=4.4 min CN=59 Runoff=2.17 cfs 0.118 af

SubcatchmentArea 59: Area 59 Runoff Area=2.220 ac 0.00% Impervious Runoff Depth=0.88"
Flow Length=240' Tc=4.6 min CN=54 Runoff=2.69 cfs 0.162 af

SubcatchmentArea 6: Area 6 Runoff Area=0.936 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=541' Tc=5.3 min CN=69 Runoff=2.81 cfs 0.148 af

SubcatchmentArea 60: Area 60 Runoff Area=2.476 ac 0.00% Impervious Runoff Depth=1.12"
Flow Length=263' Tc=4.7 min CN=58 Runoff=4.13 cfs 0.231 af

SubcatchmentArea 61: Area 61 Runoff Area=1.683 ac 0.00% Impervious Runoff Depth=0.82"
Flow Length=146' Slope=0.2345 '/' Tc=4.1 min CN=53 Runoff=1.90 cfs 0.115 af

SubcatchmentArea 62: Area 62 Runoff Area=2.001 ac 0.00% Impervious Runoff Depth=0.33"
Flow Length=318' Tc=20.8 min CN=43 Runoff=0.24 cfs 0.055 af

SubcatchmentArea 63: Area 63 Runoff Area=2.177 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=149' Tc=8.2 min CN=39 Runoff=0.09 cfs 0.033 af

SubcatchmentArea 64: Area 64 Runoff Area=0.594 ac 0.00% Impervious Runoff Depth=0.66"
Flow Length=147' Slope=0.0544 '/' Tc=7.6 min CN=50 Runoff=0.39 cfs 0.032 af

SubcatchmentArea 65: Area 65 Runoff Area=1.509 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=10.73 cfs 0.588 af

SubcatchmentArea 66: Area 66 Runoff Area=5.227 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=701' Tc=7.9 min CN=39 Runoff=0.22 cfs 0.079 af

SubcatchmentArea 67: Area 67 Runoff Area=3.035 ac 0.00% Impervious Runoff Depth=0.51"
Flow Length=886' Slope=0.0068 '/' Tc=38.9 min CN=47 Runoff=0.61 cfs 0.128 af

SubcatchmentArea 68: Area 68 Runoff Area=0.251 ac 0.00% Impervious Runoff Depth=0.29"
Flow Length=52' Slope=0.1154 '/' Tc=3.1 min CN=42 Runoff=0.03 cfs 0.006 af

SubcatchmentArea 69: Area 69 Runoff Area=0.913 ac 0.00% Impervious Runoff Depth=0.46"
Flow Length=86' Slope=0.2326 '/' Tc=3.5 min CN=46 Runoff=0.36 cfs 0.035 af

SubcatchmentArea 7: Area 7 Runoff Area=0.986 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=608' Tc=6.6 min CN=69 Runoff=2.87 cfs 0.155 af

SubcatchmentArea 70: Area 70 Runoff Area=1.671 ac 0.00% Impervious Runoff Depth=0.71"
Flow Length=126' Tc=4.0 min CN=51 Runoff=1.52 cfs 0.099 af

SubcatchmentArea 71: Area 71 Runoff Area=9.875 ac 0.00% Impervious Runoff Depth=0.29"
Flow Length=1,337' Tc=16.6 min CN=42 Runoff=0.99 cfs 0.238 af

SubcatchmentArea 8: Area 8 Runoff Area=35,545 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=348' Tc=3.6 min CN=69 Runoff=2.66 cfs 0.129 af

SubcatchmentArea 9: Area 9 Runoff Area=10,716 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=144' Tc=2.3 min CN=69 Runoff=0.86 cfs 0.039 af

Reach RD1: Roadside Ditch 1 Avg. Flow Depth=0.10' Max Vel=1.34 fps Inflow=0.61 cfs 0.128 af
n=0.030 L=440.6' S=0.0188 '/' Capacity=47.16 cfs Outflow=0.60 cfs 0.128 af

Reach RD2: Roadside Ditch 2 Avg. Flow Depth=0.39' Max Vel=2.69 fps Inflow=11.23 cfs 0.814 af
n=0.030 L=433.0' S=0.0162 '/' Capacity=72.77 cfs Outflow=10.38 cfs 0.814 af

Reach RD3: Roadside Ditch 3 Avg. Flow Depth=0.67' Max Vel=3.99 fps Inflow=8.44 cfs 0.412 af
n=0.030 L=821.0' S=0.0288 '/' Capacity=20.76 cfs Outflow=7.09 cfs 0.412 af

Reach RD4: Roadside Ditch 4 Avg. Flow Depth=0.12' Max Vel=1.05 fps Inflow=1.52 cfs 0.099 af
n=0.030 L=495.6' S=0.0090 '/' Capacity=54.26 cfs Outflow=0.92 cfs 0.099 af

Reach RD5: Roadside Ditch 5 Avg. Flow Depth=0.38' Max Vel=3.65 fps Inflow=2.25 cfs 0.109 af
n=0.030 L=288.0' S=0.0531 '/' Capacity=28.18 cfs Outflow=2.01 cfs 0.109 af

Reach S1.1: Swale S1.1 Avg. Flow Depth=0.14' Max Vel=2.32 fps Inflow=3.12 cfs 0.157 af
n=0.030 L=321.0' S=0.0319 '/' Capacity=338.34 cfs Outflow=2.76 cfs 0.157 af

Reach S1.2: Swale S1.2 Avg. Flow Depth=0.76' Max Vel=3.60 fps Inflow=30.31 cfs 1.696 af
n=0.030 L=202.8' S=0.0108 '/' Capacity=196.86 cfs Outflow=28.58 cfs 1.696 af

Reach S1.3: Swale S1.3 Avg. Flow Depth=0.76' Max Vel=4.15 fps Inflow=34.68 cfs 2.079 af
n=0.030 L=72.2' S=0.0144 '/' Capacity=227.36 cfs Outflow=34.14 cfs 2.079 af

Reach S1.4: Swale S1.4 Avg. Flow Depth=1.03' Max Vel=2.73 fps Inflow=35.12 cfs 2.141 af
n=0.030 L=148.0' S=0.0045 '/' Capacity=126.50 cfs Outflow=33.65 cfs 2.141 af

Reach S1.5: Swale S1.5 Avg. Flow Depth=0.20' Max Vel=1.12 fps Inflow=2.14 cfs 0.121 af
n=0.030 L=179.7' S=0.0050 '/' Capacity=134.06 cfs Outflow=1.95 cfs 0.121 af

Reach S1.6: Swale S1.6 Avg. Flow Depth=1.04' Max Vel=3.05 fps Inflow=39.20 cfs 2.499 af
n=0.030 L=252.0' S=0.0054 '/' Capacity=139.68 cfs Outflow=37.41 cfs 2.499 af

Reach S1.7: Swale S1.7 Avg. Flow Depth=0.31' Max Vel=1.88 fps Inflow=2.19 cfs 0.122 af
n=0.030 L=245.8' S=0.0099 '/' Capacity=90.14 cfs Outflow=1.99 cfs 0.122 af

Reach S1.8: Swale S1.8 Avg. Flow Depth=0.98' Max Vel=3.45 fps Inflow=41.27 cfs 2.805 af
n=0.030 L=422.0' S=0.0075 '/' Capacity=163.67 cfs Outflow=39.57 cfs 2.805 af

Reach S2.1: Swale S2.1 Avg. Flow Depth=1.31' Max Vel=3.17 fps Inflow=39.58 cfs 2.837 af
n=0.030 L=389.0' S=0.0054 '/' Capacity=97.05 cfs Outflow=38.03 cfs 2.837 af

Reach S2.2: Swale S2.2 Avg. Flow Depth=1.29' Max Vel=3.33 fps Inflow=65.64 cfs 5.558 af
n=0.030 L=411.0' S=0.0049 '/' Capacity=152.61 cfs Outflow=64.61 cfs 5.558 af

Reach S2.3: Swale S2.3 Avg. Flow Depth=0.99' Max Vel=4.71 fps Inflow=65.54 cfs 5.750 af
n=0.030 L=307.0' S=0.0130 '/' Capacity=249.72 cfs Outflow=64.79 cfs 5.750 af

Reach S3.1: Swale S3.1 Avg. Flow Depth=0.37' Max Vel=1.62 fps Inflow=6.52 cfs 0.322 af
n=0.030 L=357.0' S=0.0050 '/' Capacity=133.76 cfs Outflow=5.46 cfs 0.322 af

Reach S3.2: Swale S3.2 Avg. Flow Depth=0.79' Max Vel=2.48 fps Inflow=22.25 cfs 1.287 af
n=0.030 L=34.0' S=0.0050 '/' Capacity=133.95 cfs Outflow=21.76 cfs 1.287 af

Reach S3.3: Swale S3.3 Avg. Flow Depth=0.60' Max Vel=3.48 fps Inflow=21.76 cfs 1.287 af
n=0.030 L=200.0' S=0.0130 '/' Capacity=215.99 cfs Outflow=20.93 cfs 1.287 af

Reach S3.4: Swale S3.4 Avg. Flow Depth=0.33' Max Vel=1.67 fps Inflow=2.14 cfs 0.121 af
n=0.030 L=283.0' S=0.0071 '/' Capacity=76.21 cfs Outflow=1.94 cfs 0.121 af

Reach S3.5: Swale S3.5 Avg. Flow Depth=1.27' Max Vel=2.26 fps Inflow=39.57 cfs 2.531 af
n=0.030 L=318.5' S=0.0024 '/' Capacity=93.14 cfs Outflow=36.85 cfs 2.531 af

Reach S4.1: Swale S4.1 Avg. Flow Depth=0.14' Max Vel=1.62 fps Inflow=2.74 cfs 0.145 af
n=0.030 L=240.0' S=0.0153 '/' Capacity=70.22 cfs Outflow=2.38 cfs 0.145 af

Reach S4.2: Swale S4.2 Avg. Flow Depth=0.26' Max Vel=2.12 fps Inflow=6.29 cfs 0.372 af
n=0.030 L=259.3' S=0.0127 '/' Capacity=63.88 cfs Outflow=5.84 cfs 0.372 af

Reach S4.3: Swale S4.3 Avg. Flow Depth=0.74' Max Vel=1.83 fps Inflow=19.18 cfs 1.179 af
n=0.030 L=362.9' S=0.0027 '/' Capacity=108.12 cfs Outflow=17.09 cfs 1.179 af

Reach S4.4: Swale S4.4 Avg. Flow Depth=0.75' Max Vel=2.28 fps Inflow=22.46 cfs 1.757 af
n=0.030 L=495.6' S=0.0040 '/' Capacity=132.85 cfs Outflow=21.52 cfs 1.757 af

Reach S4.5: Swale S4.5 Avg. Flow Depth=0.60' Max Vel=3.08 fps Inflow=22.64 cfs 1.939 af
n=0.030 L=411.1' S=0.0097 '/' Capacity=465.89 cfs Outflow=22.15 cfs 1.939 af

Reach S4.6: Swale S4.6 Avg. Flow Depth=1.24' Max Vel=5.00 fps Inflow=89.26 cfs 8.232 af
n=0.030 L=537.0' S=0.0112 '/' Capacity=499.25 cfs Outflow=87.87 cfs 8.232 af

Reach S5.1: Swale S5.1 Avg. Flow Depth=0.22' Max Vel=2.09 fps Inflow=4.58 cfs 0.233 af
n=0.030 L=478.0' S=0.0154 '/' Capacity=235.22 cfs Outflow=3.89 cfs 0.233 af

Pond C8: Culvert C8 Peak Elev=811.21' Storage=0.000 af Inflow=0.95 cfs 0.043 af
12.0" Round Culvert n=0.012 L=85.6' S=0.0245 '/' Outflow=0.96 cfs 0.043 af

Pond N: North Infiltration Area Peak Elev=803.86' Storage=20,107 cf Inflow=11.66 cfs 1.151 af
Outflow=1.38 cfs 1.151 af

Pond Sed Pond: Sedimentation Basin Peak Elev=792.00' Storage=164,114 cf Inflow=89.59 cfs 8.931 af
6.100 af Primary=10.00 cfs 2.831 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=15.47 cfs 8.931 af

Link C1: Culvert C1 Inflow=0.60 cfs 0.128 af
Primary=0.60 cfs 0.128 af

Link C10: Culvert C10 Inflow=2.76 cfs 0.157 af
Primary=2.76 cfs 0.157 af

Link C2: Culvert C2 Inflow=10.95 cfs 0.645 af
Primary=10.95 cfs 0.645 af

Link C3: Culvert C3 Inflow=28.58 cfs 1.696 af
Primary=28.58 cfs 1.696 af

Link C4: Culvert C4 Inflow=34.14 cfs 2.079 af
Primary=34.14 cfs 2.079 af

Link C5: Culvert C5 Inflow=37.41 cfs 2.499 af
Primary=37.41 cfs 2.499 af

Link C6: Culvert C6 Inflow=30.67 cfs 1.895 af
Primary=30.67 cfs 1.895 af

Link C7: Culvert C7 Inflow=67.17 cfs 6.238 af
Primary=67.17 cfs 6.238 af

Link C9: Culvert C9 Inflow=11.16 cfs 0.913 af
Primary=11.16 cfs 0.913 af

Link F10: Flume 10 Inflow=0.95 cfs 0.043 af
Primary=0.95 cfs 0.043 af

Link F1A: Flume 1A Inflow=5.38 cfs 0.292 af
Primary=5.38 cfs 0.292 af

Link F1B: Flume 1B Inflow=12.06 cfs 0.645 af
Primary=12.06 cfs 0.645 af

Link F2A: Flume 2A Inflow=1.98 cfs 0.100 af
Primary=1.98 cfs 0.100 af

Link F2B: Flume 2B Inflow=6.58 cfs 0.347 af
Primary=6.58 cfs 0.347 af

Link F3: Flume 3 Inflow=1.38 cfs 0.067 af
Primary=1.38 cfs 0.067 af

Link F4A: Flume 4A Inflow=3.47 cfs 0.191 af
Primary=3.47 cfs 0.191 af

Link F4B: Flume 4B Inflow=9.10 cfs 0.488 af
Primary=9.10 cfs 0.488 af

Link F5A: Flume 5A Inflow=0.76 cfs 0.037 af
Primary=0.76 cfs 0.037 af

Link F5B: Flume 5B Inflow=2.23 cfs 0.112 af
Primary=2.23 cfs 0.112 af

Link F6A: Flume 6A Inflow=4.38 cfs 0.227 af
Primary=4.38 cfs 0.227 af

Link F6B: Flume 6B Inflow=9.20 cfs 0.473 af
Primary=9.20 cfs 0.473 af

Link F7A: Flume 7A Inflow=3.51 cfs 0.167 af
Primary=3.51 cfs 0.167 af

Link F7B: Flume 7B Inflow=10.65 cfs 0.537 af
Primary=10.65 cfs 0.537 af

Link F7C: Flume 7C Inflow=17.47 cfs 0.889 af
Primary=17.47 cfs 0.889 af

Link F8A: Flume 8A Inflow=1.19 cfs 0.060 af
Primary=1.19 cfs 0.060 af

Link F8B: Flume 8B Inflow=4.66 cfs 0.236 af
Primary=4.66 cfs 0.236 af

Link F9A: Flume 9A Inflow=6.88 cfs 0.386 af
Primary=6.88 cfs 0.386 af

Link F9B: Flume 9B Inflow=15.84 cfs 0.874 af
Primary=15.84 cfs 0.874 af

Link F9C: Flume 9C Inflow=25.24 cfs 1.389 af
Primary=25.24 cfs 1.389 af

Link Wetland: Wetland Inflow=10.00 cfs 2.831 af
Primary=10.00 cfs 2.831 af

Summary for Subcatchment Area 1: Area 1

Runoff = 3.75 cfs @ 12.14 hrs, Volume= 0.204 af, Depth= 1.89"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.296	69	Pasture/grassland/range, Fair, HSG B
1.296		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	93	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	7	0.2500	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	151	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	113	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.7	364	Total			

Summary for Subcatchment Area 10: Area 10

Runoff = 1.68 cfs @ 12.14 hrs, Volume= 0.090 af, Depth= 1.89"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.573	69	Pasture/grassland/range, Fair, HSG B
0.573		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	79	0.1000	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.1	21	0.2500	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	53	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	168	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	321	Total			

Summary for Subcatchment Area 11: Area 11

Runoff = 5.22 cfs @ 12.15 hrs, Volume= 0.295 af, Depth= 1.89"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.872	69	Pasture/grassland/range, Fair, HSG B
1.872		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	96	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	4	0.2500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	90	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	606	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
7.6	796	Total			

Summary for Subcatchment Area 12: Area 12

Runoff = 4.83 cfs @ 12.13 hrs, Volume= 0.254 af, Depth= 1.89"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.610	69	Pasture/grassland/range, Fair, HSG B
1.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	31	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	581	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	712	Total			

Summary for Subcatchment Area 13: Area 13

Runoff = 1.94 cfs @ 12.11 hrs, Volume= 0.099 af, Depth= 1.89"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.626	69	Pasture/grassland/range, Fair, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	183	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	333	Total			

Summary for Subcatchment Area 14: Area 14

Runoff = 1.93 cfs @ 12.11 hrs, Volume= 0.098 af, Depth= 1.89"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.620	69	Pasture/grassland/range, Fair, HSG B
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	331	Total			

Summary for Subcatchment Area 15: Area 15

Runoff = 2.80 cfs @ 12.14 hrs, Volume= 0.149 af, Depth= 1.89"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.943	69	Pasture/grassland/range, Fair, HSG B
0.943		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	95	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	269	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.9	464	Total			

Summary for Subcatchment Area 16: Area 16

Runoff = 1.78 cfs @ 12.11 hrs, Volume= 0.090 af, Depth= 1.89"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.571	69	Pasture/grassland/range, Fair, HSG B
0.571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	44	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	171	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	315	Total			

Summary for Subcatchment Area 17: Area 17

Runoff = 3.04 cfs @ 12.12 hrs, Volume= 0.156 af, Depth= 1.89"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.990	69	Pasture/grassland/range, Fair, HSG B
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	278	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	424	Total			

Summary for Subcatchment Area 18: Area 18

Runoff = 5.06 cfs @ 12.12 hrs, Volume= 0.261 af, Depth= 1.89"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.656	69	Pasture/grassland/range, Fair, HSG B
1.656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	88	0.2045	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	420	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	508	Total			

Summary for Subcatchment Area 19: Area 19

Runoff = 2.16 cfs @ 12.11 hrs, Volume= 0.109 af, Depth= 1.89"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.689	69	Pasture/grassland/range, Fair, HSG B
0.689		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	136	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	286	Total			

Summary for Subcatchment Area 2: Area 2

Runoff = 1.71 cfs @ 12.12 hrs, Volume= 0.088 af, Depth= 1.89"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.557	69	Pasture/grassland/range, Fair, HSG B
0.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	303	Total			

Summary for Subcatchment Area 20: Area 20

Runoff = 1.19 cfs @ 12.11 hrs, Volume= 0.060 af, Depth= 1.89"
Routed to Link F8A : Flume 8A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.381	69	Pasture/grassland/range, Fair, HSG B
0.381		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	306	Total			

Summary for Subcatchment Area 21: Area 21

Runoff = 1.62 cfs @ 12.11 hrs, Volume= 0.081 af, Depth= 1.89"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.516	69	Pasture/grassland/range, Fair, HSG B
0.516		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	205	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	312	Total			

Summary for Subcatchment Area 22: Area 22

Runoff = 7.54 cfs @ 12.14 hrs, Volume= 0.407 af, Depth= 1.89"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.579	69	Pasture/grassland/range, Fair, HSG B
2.579		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	21	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	1,025	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	1,146	Total			

Summary for Subcatchment Area 23: Area 23

Runoff = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af, Depth= 1.89"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.427	69	Pasture/grassland/range, Fair, HSG B
0.427		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	70	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	227	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	65	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.8	362	Total			

Summary for Subcatchment Area 24: Area 24

Runoff = 3.61 cfs @ 12.12 hrs, Volume= 0.186 af, Depth= 1.89"
Routed to Link F7C : Flume 7C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.177	69	Pasture/grassland/range, Fair, HSG B
1.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	60	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	225	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	385	Total			

Summary for Subcatchment Area 25: Area 25

Runoff = 2.12 cfs @ 12.11 hrs, Volume= 0.108 af, Depth= 1.89"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.682	69	Pasture/grassland/range, Fair, HSG B
0.682		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	349	Total			

Summary for Subcatchment Area 26: Area 26

Runoff = 2.10 cfs @ 12.11 hrs, Volume= 0.107 af, Depth= 1.89"
Routed to Link F9C : Flume 9C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.677	69	Pasture/grassland/range, Fair, HSG B
0.677		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	191	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	341	Total			

Summary for Subcatchment Area 27: Area 27

Runoff = 7.46 cfs @ 12.15 hrs, Volume= 0.409 af, Depth= 1.89"
Routed to Link F9C : Flume 9C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.594	69	Pasture/grassland/range, Fair, HSG B
2.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	99	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
3.1	1,258	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.9	1,357	Total			

Summary for Subcatchment Area 28: Area 28

Runoff = 8.44 cfs @ 12.10 hrs, Volume= 0.412 af, Depth= 2.29"
Routed to Reach RD3 : Roadside Ditch 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.735	69	Pasture/grassland/range, Fair, HSG B
0.424	96	Gravel surface, HSG A
2.159	74	Weighted Average
2.159		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	25	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	125	Total			

Summary for Subcatchment Area 29: Area 29

Runoff = 2.25 cfs @ 12.10 hrs, Volume= 0.109 af, Depth= 2.13"
Routed to Reach RD5 : Roadside Ditch 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.543	69	Pasture/grassland/range, Fair, HSG B
0.073	96	Gravel surface, HSG A
0.616	72	Weighted Average
0.616		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.8	109	Total			

Summary for Subcatchment Area 3: Area 3

Runoff = 1.06 cfs @ 12.12 hrs, Volume= 0.055 af, Depth= 1.89"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.348	69	Pasture/grassland/range, Fair, HSG B
0.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	36	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	162	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	298	Total			

Summary for Subcatchment Area 30: Area 30

Runoff = 0.52 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 1.89"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.149	69	Pasture/grassland/range, Fair, HSG B
0.149		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	12	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
1.2	211	Total			

Summary for Subcatchment Area 31: Area 31

Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.020 af, Depth= 1.89"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.126	69	Pasture/grassland/range, Fair, HSG B
0.126		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	59	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 32: Area 32

Runoff = 1.53 cfs @ 12.11 hrs, Volume= 0.075 af, Depth= 1.97"
Routed to Reach S3.2 : Swale S3.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.435	69	Pasture/grassland/range, Fair, HSG B
0.022	96	Gravel surface, HSG A
0.457	70	Weighted Average
0.457		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	122	Total			

Summary for Subcatchment Area 33: Area 33

Runoff = 3.24 cfs @ 12.12 hrs, Volume= 0.167 af, Depth= 1.89"
Routed to Link F7C : Flume 7C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.056	69	Pasture/grassland/range, Fair, HSG B
1.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	57	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	262	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	419	Total			

Summary for Subcatchment Area 34: Area 34

Runoff = 1.35 cfs @ 12.11 hrs, Volume= 0.068 af, Depth= 1.89"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.434	69	Pasture/grassland/range, Fair, HSG B
0.434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	15	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	259	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	374	Total			

Summary for Subcatchment Area 35: Area 35

Runoff = 4.58 cfs @ 12.11 hrs, Volume= 0.233 af, Depth= 2.29"
Routed to Reach S5.1 : Swale S5.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.232	96	Gravel surface, HSG A
1.218	74	Weighted Average
1.218		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	70	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.7	10	0.1766	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	4	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	104	Total			

Summary for Subcatchment Area 36: Area 36

Runoff = 3.12 cfs @ 12.11 hrs, Volume= 0.157 af, Depth= 1.59"
Routed to Reach S1.1 : Swale S1.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.322	39	Pasture/grassland/range, Good, HSG A
0.696	69	Pasture/grassland/range, Fair, HSG B
0.167	96	Gravel surface, HSG A
1.185	65	Weighted Average
1.185		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	72	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	14	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	106	Total			

Summary for Subcatchment Area 37: Area 37

Runoff = 2.93 cfs @ 12.11 hrs, Volume= 0.149 af, Depth= 1.38"
Routed to Reach S1.2 : Swale S1.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.415	39	Pasture/grassland/range, Good, HSG A
0.743	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
1.291	62	Weighted Average
1.291		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	20	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	120	Total			

Summary for Subcatchment Area 38: Area 38

Runoff = 1.86 cfs @ 12.11 hrs, Volume= 0.096 af, Depth= 1.45"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.263	39	Pasture/grassland/range, Good, HSG A
0.409	69	Pasture/grassland/range, Fair, HSG B
0.123	96	Gravel surface, HSG A
0.795	63	Weighted Average
0.795		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	14	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	17	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	24	0.0833	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	155	Total			

Summary for Subcatchment Area 39: Area 39

Runoff = 0.72 cfs @ 12.19 hrs, Volume= 0.051 af, Depth= 1.00"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.317	39	Pasture/grassland/range, Good, HSG A
0.243	69	Pasture/grassland/range, Fair, HSG B
0.060	96	Gravel surface, HSG A
0.620	56	Weighted Average
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	81	0.0245	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	19	0.2500	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	29	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	20	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	19	0.1053	2.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	168	Total			

Summary for Subcatchment Area 4: Area 4

Runoff = 0.92 cfs @ 12.11 hrs, Volume= 0.045 af, Depth= 1.89"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.288	69	Pasture/grassland/range, Fair, HSG B
0.288		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	49	0.0820	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	247	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.0	296	Total			

Summary for Subcatchment Area 40: Area 40

Runoff = 0.98 cfs @ 12.16 hrs, Volume= 0.061 af, Depth= 1.00"
Routed to Reach S1.4 : Swale S1.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.389	39	Pasture/grassland/range, Good, HSG A
0.270	69	Pasture/grassland/range, Fair, HSG B
0.080	96	Gravel surface, HSG A
0.739	56	Weighted Average
0.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	49	0.0408	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.1	47	0.2500	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	4	0.0050	0.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	19	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	22	0.1136	2.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.2	141	Total			

Summary for Subcatchment Area 41a: Area 41a

Runoff = 2.00 cfs @ 12.16 hrs, Volume= 0.116 af, Depth= 1.59"
Routed to Reach S1.6 : Swale S1.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.249	39	Pasture/grassland/range, Good, HSG A
0.489	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
0.871	65	Weighted Average
0.871		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	44	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.8	144	Total			

Summary for Subcatchment Area 41b: Area 41b

Runoff = 2.19 cfs @ 12.15 hrs, Volume= 0.122 af, Depth= 2.05"
Routed to Reach S1.7 : Swale S1.7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
0.712	71	Weighted Average
0.712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	2	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	102	Total			

Summary for Subcatchment Area 42: Area 42

Runoff = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af, Depth= 1.89"
Routed to Reach S1.5 : Swale S1.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 43: Area 43

Runoff = 3.88 cfs @ 12.25 hrs, Volume= 0.306 af, Depth= 1.32"
Routed to Reach S1.8 : Swale S1.8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.797	39	Pasture/grassland/range, Good, HSG A
1.938	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
2.792	61	Weighted Average
2.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	119	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	22	0.1905	3.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	419	Total			

Summary for Subcatchment Area 44: Area 44

Runoff = 0.06 cfs @ 13.20 hrs, Volume= 0.022 af, Depth= 0.18"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.416	39	Pasture/grassland/range, Good, HSG A
1.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0260	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.9	194	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	647	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.0	941	Total			

Summary for Subcatchment Area 45: Area 45

Runoff = 6.52 cfs @ 12.11 hrs, Volume= 0.322 af, Depth= 1.89"
Routed to Reach S3.1 : Swale S3.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.044	69	Pasture/grassland/range, Fair, HSG B
2.044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	38	0.2632	3.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	138	Total			

Summary for Subcatchment Area 46: Area 46

Runoff = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af, Depth= 1.89"
Routed to Reach S3.4 : Swale S3.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 47: Area 47

Runoff = 0.27 cfs @ 12.12 hrs, Volume= 0.014 af, Depth= 2.13"
Routed to Link C6 : Culvert C6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.070	69	Pasture/grassland/range, Fair, HSG B
0.009	96	Gravel surface, HSG A
0.079	72	Weighted Average
0.079		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.2	10	0.0500	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	18	0.1390	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.1	143	Total			

Summary for Subcatchment Area 48: Area 48

Runoff = 9.80 cfs @ 12.20 hrs, Volume= 0.636 af, Depth= 2.05"
Routed to Reach S3.5 : Swale S3.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
3.470	69	Pasture/grassland/range, Fair, HSG B
0.256	96	Gravel surface, HSG A
3.726	71	Weighted Average
3.726		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	83	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.9	208	0.0289	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	391	Total			

Summary for Subcatchment Area 49: Area 49

Runoff = 0.03 cfs @ 12.51 hrs, Volume= 0.011 af, Depth= 0.18"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.698	39	Pasture/grassland/range, Good, HSG A
0.698		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 5: Area 5

Runoff = 1.66 cfs @ 12.10 hrs, Volume= 0.079 af, Depth= 1.89"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.504	69	Pasture/grassland/range, Fair, HSG B
0.504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	72	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	186	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.4	258	Total			

Summary for Subcatchment Area 50: Area 50

Runoff = 0.72 cfs @ 12.10 hrs, Volume= 0.035 af, Depth= 1.89"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.223	69	Pasture/grassland/range, Fair, HSG B
0.223		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	157	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	62	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.7	296	Total			

Summary for Subcatchment Area 51: Area 51

Runoff = 1.98 cfs @ 12.12 hrs, Volume= 0.103 af, Depth= 1.89"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	11	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	314	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
0.3	217	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
5.0	642	Total			

Summary for Subcatchment Area 52: Area 52

Runoff = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af, Depth= 1.89"
Routed to Link F5A : Flume 5A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.237	69	Pasture/grassland/range, Fair, HSG B
0.237		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	83	0.2500	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	138	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	127	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.0	348	Total			

Summary for Subcatchment Area 53: Area 53

Runoff = 1.48 cfs @ 12.11 hrs, Volume= 0.075 af, Depth= 1.89"
Routed to Link F5B : Flume 5B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.475	69	Pasture/grassland/range, Fair, HSG B
0.475		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	219	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	116	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.5	425	Total			

Summary for Subcatchment Area 54: Area 54

Runoff = 2.98 cfs @ 12.12 hrs, Volume= 0.160 af, Depth= 1.18"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.079	69	Pasture/grassland/range, Fair, HSG B
0.539	39	Pasture/grassland/range, Good, HSG A
1.618	59	Weighted Average
1.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	237	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.3	70	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	384	Total			

Summary for Subcatchment Area 55: Area 55

Runoff = 1.45 cfs @ 12.11 hrs, Volume= 0.077 af, Depth= 1.12"
Routed to Reach S2.2 : Swale S2.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.520	69	Pasture/grassland/range, Fair, HSG B
0.306	39	Pasture/grassland/range, Good, HSG A
0.826	58	Weighted Average
0.826		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	26	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	126	Total			

Summary for Subcatchment Area 56: Area 56

Runoff = 3.66 cfs @ 12.13 hrs, Volume= 0.194 af, Depth= 1.89"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.228	69	Pasture/grassland/range, Fair, HSG B
1.228		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	6	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	541	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
5.7	647	Total			

Summary for Subcatchment Area 57: Area 57

Runoff = 1.86 cfs @ 12.12 hrs, Volume= 0.102 af, Depth= 1.12"
Routed to Reach S4.1 : Swale S4.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.526	39	Pasture/grassland/range, Good, HSG A
0.405	69	Pasture/grassland/range, Fair, HSG B
0.158	96	Gravel surface, HSG A
1.089	58	Weighted Average
1.089		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	80	0.2000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	20	0.0500	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	10	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	48	0.0625	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	158	Total			

Summary for Subcatchment Area 58: Area 58

Runoff = 2.17 cfs @ 12.12 hrs, Volume= 0.118 af, Depth= 1.18"
Routed to Reach S4.2 : Swale S4.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.580	39	Pasture/grassland/range, Good, HSG A
0.433	69	Pasture/grassland/range, Fair, HSG B
0.181	96	Gravel surface, HSG B
1.194	59	Weighted Average
1.194		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	121	0.2314	3.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	221	Total			

Summary for Subcatchment Area 59: Area 59

Runoff = 2.69 cfs @ 12.13 hrs, Volume= 0.162 af, Depth= 0.88"
Routed to Reach S4.3 : Swale S4.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.134	39	Pasture/grassland/range, Good, HSG A
1.086	69	Pasture/grassland/range, Fair, HSG B
2.220	54	Weighted Average
2.220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	140	0.1857	3.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	240	Total			

Summary for Subcatchment Area 6: Area 6

Runoff = 2.81 cfs @ 12.13 hrs, Volume= 0.148 af, Depth= 1.89"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.936	69	Pasture/grassland/range, Fair, HSG B
0.936		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	100	0.2070	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	395	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	541	Total			

Summary for Subcatchment Area 60: Area 60

Runoff = 4.13 cfs @ 12.13 hrs, Volume= 0.231 af, Depth= 1.12"
Routed to Reach S4.4 : Swale S4.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.939	39	Pasture/grassland/range, Good, HSG A
1.537	69	Pasture/grassland/range, Fair, HSG B
2.476	58	Weighted Average
2.476		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	163	0.1718	2.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	263	Total			

Summary for Subcatchment Area 61: Area 61

Runoff = 1.90 cfs @ 12.12 hrs, Volume= 0.115 af, Depth= 0.82"
Routed to Reach S4.5 : Swale S4.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.898	39	Pasture/grassland/range, Good, HSG A
0.785	69	Pasture/grassland/range, Fair, HSG B
1.683	53	Weighted Average
1.683		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2345	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2345	3.39		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	146	Total			

Summary for Subcatchment Area 62: Area 62

Runoff = 0.24 cfs @ 12.55 hrs, Volume= 0.055 af, Depth= 0.33"
Routed to Reach S4.6 : Swale S4.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.871	39	Pasture/grassland/range, Good, HSG A
0.000	96	Gravel surface, HSG A
0.130	96	Gravel surface, HSG A
2.001	43	Weighted Average
2.001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0074	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
4.7	169	0.0074	0.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	49	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.8	318	Total			

Summary for Subcatchment Area 63: Area 63

Runoff = 0.09 cfs @ 12.53 hrs, Volume= 0.033 af, Depth= 0.18"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.177	39	Pasture/grassland/range, Good, HSG A
2.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	66	0.0303	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.6	34	0.2500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	49	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	149	Total			

Summary for Subcatchment Area 64: Area 64

Runoff = 0.39 cfs @ 12.18 hrs, Volume= 0.032 af, Depth= 0.66"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.479	39	Pasture/grassland/range, Good, HSG A
0.115	96	Gravel surface, HSG A
0.594	50	Weighted Average
0.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0544	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	47	0.0544	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.6	147	Total			

Summary for Subcatchment Area 65: Area 65

Runoff = 10.73 cfs @ 12.04 hrs, Volume= 0.588 af, Depth= 4.67"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.509	98	Water Surface, HSG A
1.509		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment Area 66: Area 66

Runoff = 0.22 cfs @ 12.53 hrs, Volume= 0.079 af, Depth= 0.18"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
5.227	39	Pasture/grassland/range, Good, HSG A
5.227		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.0933	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	25	0.2500	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	10	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	381	0.0265	7.85	109.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.8	162	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	48	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.9	701	Total			

Summary for Subcatchment Area 67: Area 67

Runoff = 0.61 cfs @ 12.73 hrs, Volume= 0.128 af, Depth= 0.51"
Routed to Reach RD1 : Roadside Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
2.616	39	Pasture/grassland/range, Good, HSG A
0.039	69	Pasture/grassland/range, Fair, HSG B
0.380	96	Gravel surface, HSG A
3.035	47	Weighted Average
3.035		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0068	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
22.7	786	0.0068	0.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	886	Total			

Summary for Subcatchment Area 68: Area 68

Runoff = 0.03 cfs @ 12.29 hrs, Volume= 0.006 af, Depth= 0.29"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.227	39	Pasture/grassland/range, Good, HSG A
0.024	69	Pasture/grassland/range, Fair, HSG B
0.251	42	Weighted Average
0.251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.1154	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 69: Area 69

Runoff = 0.36 cfs @ 12.14 hrs, Volume= 0.035 af, Depth= 0.46"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.695	39	Pasture/grassland/range, Good, HSG A
0.218	69	Pasture/grassland/range, Fair, HSG B
0.913	46	Weighted Average
0.913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	86	0.2326	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 7: Area 7

Runoff = 2.87 cfs @ 12.14 hrs, Volume= 0.155 af, Depth= 1.89"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.986		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	31	0.1000	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.8	69	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	419	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	80	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
6.6	608	Total			

Summary for Subcatchment Area 70: Area 70

Runoff = 1.52 cfs @ 12.12 hrs, Volume= 0.099 af, Depth= 0.71"
Routed to Reach RD4 : Roadside Ditch 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
1.016	39	Pasture/grassland/range, Good, HSG A
0.620	69	Pasture/grassland/range, Fair, HSG B
0.035	96	Gravel surface, HSG A
1.671	51	Weighted Average
1.671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	26	0.1538	2.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	126	Total			

Summary for Subcatchment Area 71: Area 71

Runoff = 0.99 cfs @ 12.52 hrs, Volume= 0.238 af, Depth= 0.29"
Routed to Pond N : North Infiltration Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (ac)	CN	Description
9.360	39	Pasture/grassland/range, Good, HSG A
0.515	96	Gravel surface, HSG A
9.875	42	Weighted Average
9.875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	1,137	0.0193	4.31	32.30	**Trap/Vee/Rect Channel Flow, Roadside Ditch** Bot.W=0.00' D=1.00' Z= 5.0 & 10.0 '/' Top.W=15.00' n= 0.030
16.6	1,337	Total			

Summary for Subcatchment Area 8: Area 8

Runoff = 2.66 cfs @ 12.10 hrs, Volume= 0.129 af, Depth= 1.89"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
35,545	69	Pasture/grassland/range, Fair, HSG B
35,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	59	0.1695	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	289	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.6	348	Total			

Summary for Subcatchment Area 9: Area 9

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 1.89"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
10,716	69	Pasture/grassland/range, Fair, HSG B
10,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	48	0.2500	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	96	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
2.3	144	Total			

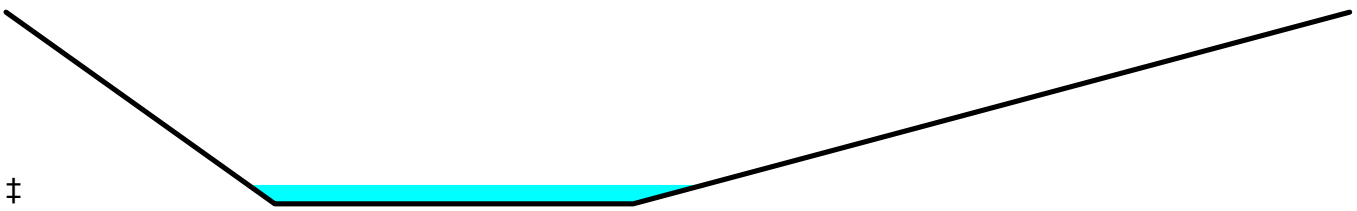
Summary for Reach RD1: Roadside Ditch 1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 0.51" for 25-yr, 24-hr event
Inflow = 0.61 cfs @ 12.73 hrs, Volume= 0.128 af
Outflow = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af, Atten= 2%, Lag= 9.5 min
Routed to Link C1 : Culvert C1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.34 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 11.8 min

Peak Storage= 197 cf @ 12.80 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 5.08'
Bank-Full Depth= 1.00' Flow Area= 9.5 sf, Capacity= 47.16 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 8.0 '/' Top Width= 15.00'
Length= 440.6' Slope= 0.0188 '/'
Inlet Invert= 824.00', Outlet Invert= 815.70'



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Summary for Reach RD2: Roadside Ditch 2

Inflow Area = 7.576 ac, 0.00% Impervious, Inflow Depth = 1.29" for 25-yr, 24-hr event
Inflow = 11.23 cfs @ 12.20 hrs, Volume= 0.814 af
Outflow = 10.38 cfs @ 12.28 hrs, Volume= 0.814 af, Atten= 8%, Lag= 4.8 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.69 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 9.1 min

Peak Storage= 1,686 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 13.85'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 72.77 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 433.0' Slope= 0.0162 '/'
Inlet Invert= 814.55', Outlet Invert= 807.54'

‡

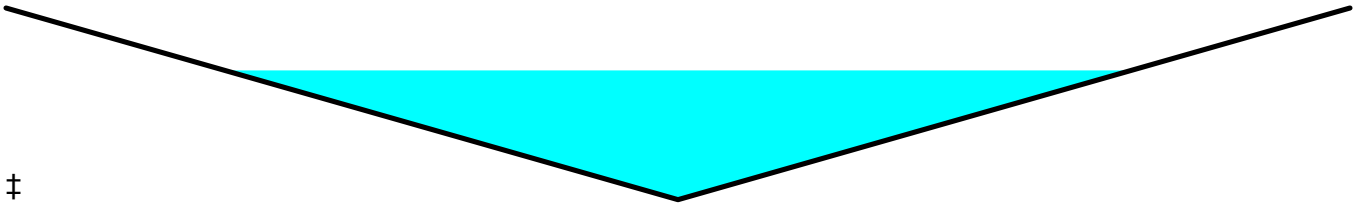
Summary for Reach RD3: Roadside Ditch 3

Inflow Area = 2.159 ac, 0.00% Impervious, Inflow Depth = 2.29" for 25-yr, 24-hr event
Inflow = 8.44 cfs @ 12.10 hrs, Volume= 0.412 af
Outflow = 7.09 cfs @ 12.20 hrs, Volume= 0.412 af, Atten= 16%, Lag= 5.7 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.99 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 10.2 min

Peak Storage= 1,491 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.67' , Surface Width= 5.39'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.76 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 821.0' Slope= 0.0288 '/'
Inlet Invert= 841.47', Outlet Invert= 817.83'



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Summary for Reach RD4: Roadside Ditch 4

Inflow Area = 1.671 ac, 0.00% Impervious, Inflow Depth = 0.71" for 25-yr, 24-hr event
Inflow = 1.52 cfs @ 12.12 hrs, Volume= 0.099 af
Outflow = 0.92 cfs @ 12.35 hrs, Volume= 0.099 af, Atten= 39%, Lag= 13.6 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.05 fps, Min. Travel Time= 7.9 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 22.6 min

Peak Storage= 447 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 8.49'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 54.26 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 495.6' Slope= 0.0090 '/'
Inlet Invert= 812.00', Outlet Invert= 807.54'

‡

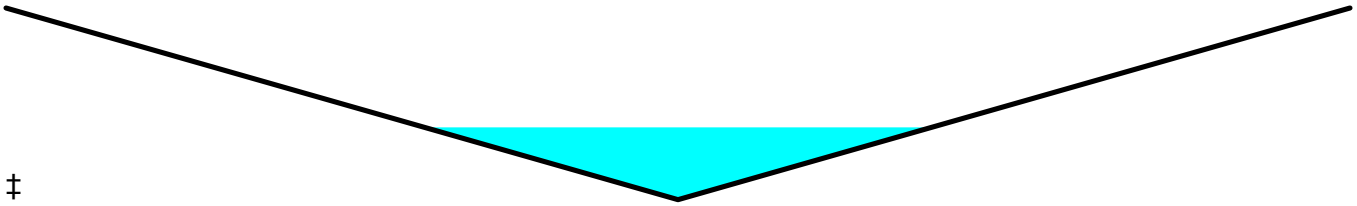
Summary for Reach RD5: Roadside Ditch 5

Inflow Area = 0.616 ac, 0.00% Impervious, Inflow Depth = 2.13" for 25-yr, 24-hr event
Inflow = 2.25 cfs @ 12.10 hrs, Volume= 0.109 af
Outflow = 2.01 cfs @ 12.14 hrs, Volume= 0.109 af, Atten= 11%, Lag= 2.5 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.65 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 3.5 min

Peak Storage= 164 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 3.02'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 28.18 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 288.0' Slope= 0.0531 '/'
Inlet Invert= 841.47', Outlet Invert= 826.18'



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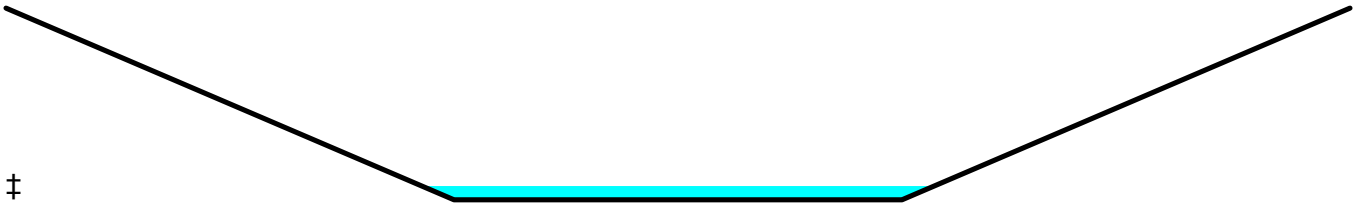
Summary for Reach S1.1: Swale S1.1

Inflow Area = 1.185 ac, 0.00% Impervious, Inflow Depth = 1.59" for 25-yr, 24-hr event
Inflow = 3.12 cfs @ 12.11 hrs, Volume= 0.157 af
Outflow = 2.76 cfs @ 12.18 hrs, Volume= 0.157 af, Atten= 12%, Lag= 4.2 min
Routed to Link C10 : Culvert C10

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.32 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 7.3 min

Peak Storage= 398 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 9.16'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 338.34 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 321.0' Slope= 0.0319 '/'
Inlet Invert= 825.20', Outlet Invert= 814.96'



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Summary for Reach S1.2: Swale S1.2

Inflow Area = 11.287 ac, 0.00% Impervious, Inflow Depth = 1.80" for 25-yr, 24-hr event
Inflow = 30.31 cfs @ 12.14 hrs, Volume= 1.696 af
Outflow = 28.58 cfs @ 12.17 hrs, Volume= 1.696 af, Atten= 6%, Lag= 1.5 min
Routed to Link C3 : Culvert C3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.60 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 3.4 min

Peak Storage= 1,690 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 14.05'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 196.86 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 202.8' Slope= 0.0108 '/'
Inlet Invert= 813.36', Outlet Invert= 811.17'

‡

Summary for Reach S1.3: Swale S1.3

Inflow Area = 14.199 ac, 0.00% Impervious, Inflow Depth = 1.76" for 25-yr, 24-hr event
Inflow = 34.68 cfs @ 12.16 hrs, Volume= 2.079 af
Outflow = 34.14 cfs @ 12.16 hrs, Volume= 2.079 af, Atten= 2%, Lag= 0.4 min
Routed to Link C4 : Culvert C4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.15 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 1.0 min

Peak Storage= 602 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 14.05'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 227.36 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 72.2' Slope= 0.0144 '/'
Inlet Invert= 810.90', Outlet Invert= 809.86'

‡

Summary for Reach S1.4: Swale S1.4

Inflow Area = 14.938 ac, 0.00% Impervious, Inflow Depth = 1.72" for 25-yr, 24-hr event
Inflow = 35.12 cfs @ 12.16 hrs, Volume= 2.141 af
Outflow = 33.65 cfs @ 12.19 hrs, Volume= 2.141 af, Atten= 4%, Lag= 1.8 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.73 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 3.1 min

Peak Storage= 1,854 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.03' , Surface Width= 16.27'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 126.50 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 148.0' Slope= 0.0045 '/'
Inlet Invert= 809.60', Outlet Invert= 808.94'

‡

Summary for Reach S1.5: Swale S1.5

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af
Outflow = 1.95 cfs @ 12.23 hrs, Volume= 0.121 af, Atten= 9%, Lag= 4.7 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.12 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 9.2 min

Peak Storage= 316 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 9.60'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 134.06 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 179.7' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.95'

‡

Summary for Reach S1.6: Swale S1.6

Inflow Area = 17.290 ac, 0.00% Impervious, Inflow Depth = 1.73" for 25-yr, 24-hr event
Inflow = 39.20 cfs @ 12.19 hrs, Volume= 2.499 af
Outflow = 37.41 cfs @ 12.24 hrs, Volume= 2.499 af, Atten= 5%, Lag= 2.6 min
Routed to Link C5 : Culvert C5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.05 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 4.9 min

Peak Storage= 3,198 cf @ 12.21 hrs
Average Depth at Peak Storage= 1.04' , Surface Width= 16.34'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 139.68 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 252.0' Slope= 0.0054 '/'
Inlet Invert= 808.94', Outlet Invert= 807.57'

‡

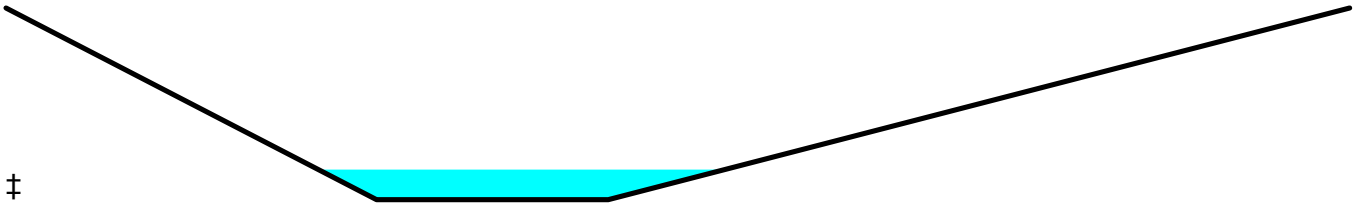
Summary for Reach S1.7: Swale S1.7

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 2.05" for 25-yr, 24-hr event
Inflow = 2.19 cfs @ 12.15 hrs, Volume= 0.122 af
Outflow = 1.99 cfs @ 12.21 hrs, Volume= 0.122 af, Atten= 9%, Lag= 3.8 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.88 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 7.3 min

Peak Storage= 265 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 4.38'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 90.14 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 245.8' Slope= 0.0099 '/'
Inlet Invert= 810.00', Outlet Invert= 807.57'



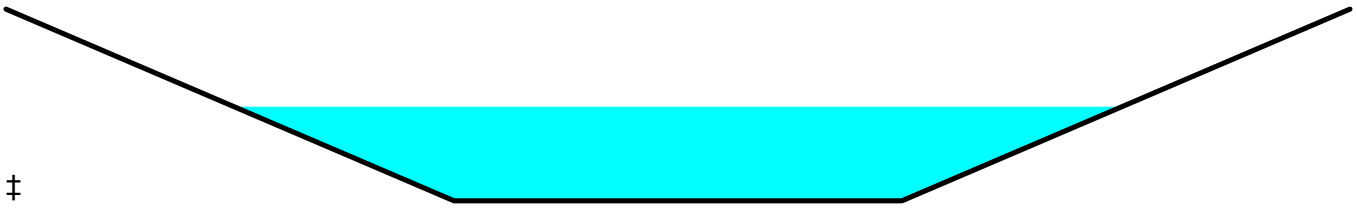
Summary for Reach S1.8: Swale S1.8

Inflow Area = 20.082 ac, 0.00% Impervious, Inflow Depth = 1.68" for 25-yr, 24-hr event
Inflow = 41.27 cfs @ 12.24 hrs, Volume= 2.805 af
Outflow = 39.57 cfs @ 12.30 hrs, Volume= 2.805 af, Atten= 4%, Lag= 3.7 min
Routed to Reach S2.1 : Swale S2.1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.45 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 7.4 min

Peak Storage= 4,932 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.98' , Surface Width= 15.84'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 163.67 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 422.0' Slope= 0.0075 '/'
Inlet Invert= 807.15', Outlet Invert= 804.00'



Summary for Reach S2.1: Swale S2.1

Inflow Area = 22.196 ac, 0.00% Impervious, Inflow Depth = 1.53" for 25-yr, 24-hr event
Inflow = 39.58 cfs @ 12.30 hrs, Volume= 2.837 af
Outflow = 38.03 cfs @ 12.36 hrs, Volume= 2.837 af, Atten= 4%, Lag= 3.7 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.17 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 6.7 min

Peak Storage= 4,707 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.31' , Surface Width= 14.48'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 97.05 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 389.0' Slope= 0.0054 '/'
Inlet Invert= 806.10', Outlet Invert= 804.00'

‡

Summary for Reach S2.2: Swale S2.2

Inflow Area = 39.450 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25-yr, 24-hr event
Inflow = 65.64 cfs @ 12.31 hrs, Volume= 5.558 af
Outflow = 64.61 cfs @ 12.37 hrs, Volume= 5.558 af, Atten= 2%, Lag= 3.6 min
Routed to Reach S2.3 : Swale S2.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 7.7 min

Peak Storage= 8,029 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.29' , Surface Width= 20.31'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 152.61 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 411.0' Slope= 0.0049 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

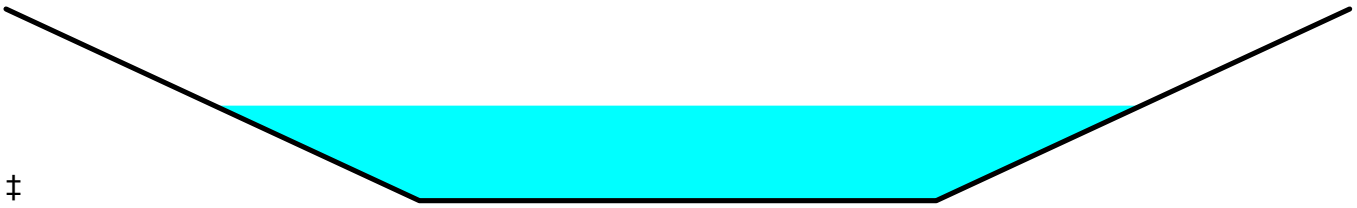
Summary for Reach S2.3: Swale S2.3

Inflow Area = 43.245 ac, 0.00% Impervious, Inflow Depth = 1.60" for 25-yr, 24-hr event
Inflow = 65.54 cfs @ 12.37 hrs, Volume= 5.750 af
Outflow = 64.79 cfs @ 12.40 hrs, Volume= 5.750 af, Atten= 1%, Lag= 1.9 min
Routed to Link C7 : Culvert C7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.71 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.26 fps, Avg. Travel Time= 4.0 min

Peak Storage= 4,252 cf @ 12.38 hrs
Average Depth at Peak Storage= 0.99' , Surface Width= 17.93'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 249.72 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 307.0' Slope= 0.0130 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'



‡

Summary for Reach S3.1: Swale S3.1

Inflow Area = 2.044 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 6.52 cfs @ 12.11 hrs, Volume= 0.322 af
Outflow = 5.46 cfs @ 12.21 hrs, Volume= 0.322 af, Atten= 16%, Lag= 5.9 min
Routed to Reach S3.2 : Swale S3.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 14.2 min

Peak Storage= 1,242 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.37' , Surface Width= 10.94'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.76 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 357.0' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.07'

‡

Summary for Reach S3.2: Swale S3.2

Inflow Area = 8.141 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25-yr, 24-hr event
Inflow = 22.25 cfs @ 12.12 hrs, Volume= 1.287 af
Outflow = 21.76 cfs @ 12.13 hrs, Volume= 1.287 af, Atten= 2%, Lag= 0.6 min
Routed to Reach S3.3 : Swale S3.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.48 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 0.9 min

Peak Storage= 299 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.79' , Surface Width= 14.30'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.95 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 34.0' Slope= 0.0050 '/'
Inlet Invert= 798.00', Outlet Invert= 797.83'

‡

Summary for Reach S3.3: Swale S3.3

Inflow Area = 8.141 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25-yr, 24-hr event
Inflow = 21.76 cfs @ 12.13 hrs, Volume= 1.287 af
Outflow = 20.93 cfs @ 12.16 hrs, Volume= 1.287 af, Atten= 4%, Lag= 1.7 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.48 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 3.7 min

Peak Storage= 1,253 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 12.82'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 215.99 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 200.0' Slope= 0.0130 '/'
Inlet Invert= 808.00', Outlet Invert= 805.40'

‡

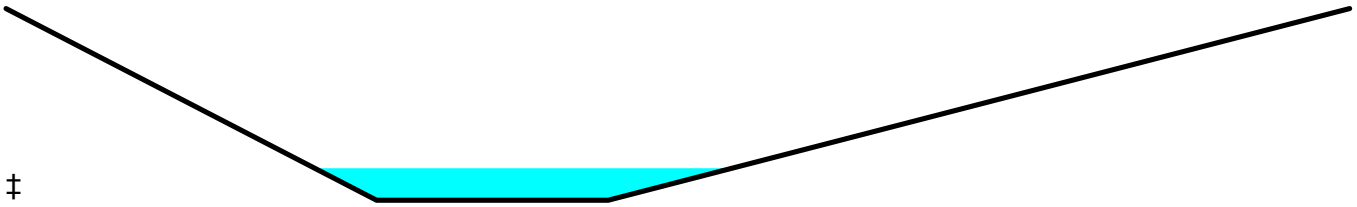
Summary for Reach S3.4: Swale S3.4

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.14 cfs @ 12.15 hrs, Volume= 0.121 af
Outflow = 1.94 cfs @ 12.24 hrs, Volume= 0.121 af, Atten= 9%, Lag= 5.0 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.67 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 9.5 min

Peak Storage= 332 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 4.51'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 76.21 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 283.0' Slope= 0.0071 '/'
Inlet Invert= 810.00', Outlet Invert= 808.00'



‡

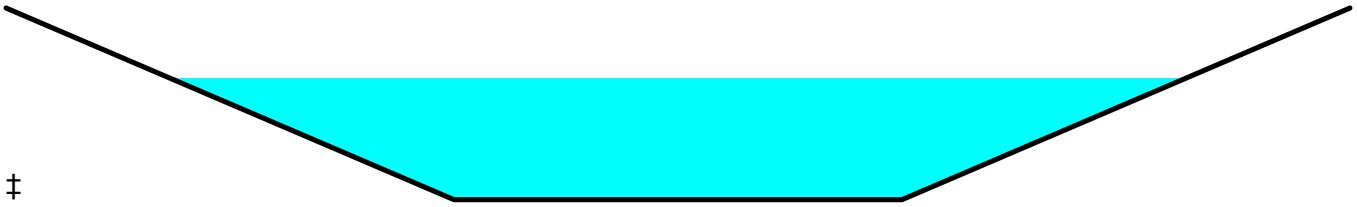
Summary for Reach S3.5: Swale S3.5

Inflow Area = 15.716 ac, 0.00% Impervious, Inflow Depth = 1.93" for 25-yr, 24-hr event
Inflow = 39.57 cfs @ 12.15 hrs, Volume= 2.531 af
Outflow = 36.85 cfs @ 12.23 hrs, Volume= 2.531 af, Atten= 7%, Lag= 4.3 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 8.9 min

Peak Storage= 5,280 cf @ 12.19 hrs
Average Depth at Peak Storage= 1.27' , Surface Width= 18.15'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 93.14 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 318.5' Slope= 0.0024 '/'
Inlet Invert= 804.76', Outlet Invert= 803.99'



‡

Summary for Reach S4.1: Swale S4.1

Inflow Area = 1.364 ac, 0.00% Impervious, Inflow Depth = 1.28" for 25-yr, 24-hr event
Inflow = 2.74 cfs @ 12.10 hrs, Volume= 0.145 af
Outflow = 2.38 cfs @ 12.18 hrs, Volume= 0.145 af, Atten= 13%, Lag= 4.4 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.43 fps, Avg. Travel Time= 9.3 min

Peak Storage= 363 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 11.01'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 70.22 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 240.0' Slope= 0.0153 '/'
Inlet Invert= 811.94', Outlet Invert= 808.26'

‡

Summary for Reach S4.2: Swale S4.2

Inflow Area = 3.174 ac, 0.00% Impervious, Inflow Depth = 1.41" for 25-yr, 24-hr event
Inflow = 6.29 cfs @ 12.15 hrs, Volume= 0.372 af
Outflow = 5.84 cfs @ 12.21 hrs, Volume= 0.372 af, Atten= 7%, Lag= 3.6 min
Routed to Reach S4.3 : Swale S4.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.12 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 8.1 min

Peak Storage= 732 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 11.81'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 63.88 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 259.3' Slope= 0.0127 '/'
Inlet Invert= 808.26', Outlet Invert= 804.97'

‡

Summary for Reach S4.3: Swale S4.3

Inflow Area = 9.483 ac, 0.00% Impervious, Inflow Depth = 1.49" for 25-yr, 24-hr event
Inflow = 19.18 cfs @ 12.14 hrs, Volume= 1.179 af
Outflow = 17.09 cfs @ 12.24 hrs, Volume= 1.179 af, Atten= 11%, Lag= 5.7 min
Routed to Reach S4.4 : Swale S4.4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 13.1 min

Peak Storage= 3,406 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.74' , Surface Width= 15.21'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 108.12 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 362.9' Slope= 0.0027 '/'
Inlet Invert= 804.97', Outlet Invert= 804.00'

‡

Summary for Reach S4.4: Swale S4.4

Inflow Area = 14.158 ac, 0.00% Impervious, Inflow Depth = 1.49" for 25-yr, 24-hr event
Inflow = 22.46 cfs @ 12.20 hrs, Volume= 1.757 af
Outflow = 21.52 cfs @ 12.31 hrs, Volume= 1.757 af, Atten= 4%, Lag= 6.4 min
Routed to Reach S4.5 : Swale S4.5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.28 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 14.2 min

Peak Storage= 4,726 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.75' , Surface Width= 15.28'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 132.85 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 495.6' Slope= 0.0040 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S4.5: Swale S4.5

Inflow Area = 16.268 ac, 0.00% Impervious, Inflow Depth = 1.43" for 25-yr, 24-hr event
Inflow = 22.64 cfs @ 12.30 hrs, Volume= 1.939 af
Outflow = 22.15 cfs @ 12.37 hrs, Volume= 1.939 af, Atten= 2%, Lag= 3.9 min
Routed to Reach S4.6 : Swale S4.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.08 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 8.0 min

Peak Storage= 2,967 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 14.18'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 465.89 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 411.1' Slope= 0.0097 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S4.6: Swale S4.6

Inflow Area = 64.606 ac, 0.00% Impervious, Inflow Depth = 1.53" for 25-yr, 24-hr event
Inflow = 89.26 cfs @ 12.39 hrs, Volume= 8.232 af
Outflow = 87.87 cfs @ 12.44 hrs, Volume= 8.232 af, Atten= 2%, Lag= 3.2 min
Routed to Pond Sed Pond : Sedimentation Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.00 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 6.5 min

Peak Storage= 9,534 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.24' , Surface Width= 18.67'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 499.25 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 537.0' Slope= 0.0112 '/'
Inlet Invert= 798.00', Outlet Invert= 792.00'

‡

Summary for Reach S5.1: Swale S5.1

Inflow Area = 1.218 ac, 0.00% Impervious, Inflow Depth = 2.29" for 25-yr, 24-hr event
Inflow = 4.58 cfs @ 12.11 hrs, Volume= 0.233 af
Outflow = 3.89 cfs @ 12.21 hrs, Volume= 0.233 af, Atten= 15%, Lag= 6.0 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.09 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 14.0 min

Peak Storage= 926 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 9.75'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 235.22 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 478.0' Slope= 0.0154 '/'
Inlet Invert= 825.20', Outlet Invert= 817.83'

‡

Summary for Pond C8: Culvert C8

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af
Outflow = 0.96 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.1 min
Primary = 0.96 cfs @ 12.08 hrs, Volume= 0.043 af
Routed to Reach S4.1 : Swale S4.1

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 811.21' @ 12.08 hrs Surf.Area= 0.000 ac Storage= 0.000 af
Flood Elev= 819.00' Surf.Area= 0.000 ac Storage= 0.001 af

Plug-Flow detention time= 0.2 min calculated for 0.043 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (830.2 - 830.0)

Volume	Invert	Avail.Storage	Storage Description
#1	810.70'	0.001 af	**3.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	810.70'	**12.0" Round Culvert** L= 85.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 810.70' / 808.60' S= 0.0245 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.89 cfs @ 12.08 hrs HW=811.18' (Free Discharge)
1=Culvert (Inlet Controls 0.89 cfs @ 2.37 fps)

Summary for Pond N: North Infiltration Area

Inflow Area = 19.122 ac, 0.00% Impervious, Inflow Depth = 0.72" for 25-yr, 24-hr event
Inflow = 11.66 cfs @ 12.29 hrs, Volume= 1.151 af
Outflow = 1.38 cfs @ 13.97 hrs, Volume= 1.151 af, Atten= 88%, Lag= 100.5 min
Primary = 1.38 cfs @ 13.97 hrs, Volume= 1.151 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 803.86' @ 13.97 hrs Surf.Area= 16,535 sf Storage= 20,107 cf

Plug-Flow detention time= 176.3 min calculated for 1.150 af (100% of inflow)
Center-of-Mass det. time= 176.2 min (1,062.2 - 886.0)

Volume	Invert	Avail.Storage	Storage Description
#1	802.00'	256,569 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
802.00	5,140	0	0
804.00	17,424	22,564	22,564
806.00	32,191	49,615	72,179
808.00	46,130	78,321	150,500
810.00	59,939	106,069	256,569

Device	Routing	Invert	Outlet Devices
#1	Primary	802.00'	**3.600 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.38 cfs @ 13.97 hrs HW=803.86' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.38 cfs)

Summary for Pond Sed Pond: Sedimentation Basin

Inflow Area = 71.936 ac, 2.10% Impervious, Inflow Depth = 1.49" for 25-yr, 24-hr event
Inflow = 89.59 cfs @ 12.44 hrs, Volume= 8.931 af
Outflow = 15.47 cfs @ 13.52 hrs, Volume= 8.931 af, Atten= 83%, Lag= 64.8 min
Discarded = 5.48 cfs @ 13.52 hrs, Volume= 6.100 af
Primary = 10.00 cfs @ 13.52 hrs, Volume= 2.831 af
Routed to Link Wetland : Wetland
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link Wetland : Wetland
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link Wetland : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 792.00' @ 13.52 hrs Surf.Area= 65,709 sf Storage= 164,114 cf
Flood Elev= 794.00' Surf.Area= 75,797 sf Storage= 304,443 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 185.0 min (1,047.1 - 862.1)

Volume	Invert	Avail.Storage	Storage Description
#1	789.00'	304,443 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
789.00	27,325	0	0
790.00	55,972	41,649	41,649
791.00	61,532	58,752	100,401
792.00	65,703	63,618	164,018
793.00	69,675	67,689	231,707
794.00	75,797	72,736	304,443

Device	Routing	Invert	Outlet Devices
#1	Primary	787.70'	**15.0" Round Culvert** L= 40.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 787.70' / 787.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	791.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	790.50'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	790.00'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	789.00'	**0.5" Vert. Orifice/Grate X 14.00 columns** X 6 rows with 6.0" cc spacing C= 0.600

			Limited to weir flow at low heads
#6	Secondary	792.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#7	Tertiary	793.00'	**158.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#8	Discarded	789.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=5.48 cfs @ 13.52 hrs HW=792.00' (Free Discharge)
└**8=Exfiltration** (Exfiltration Controls 5.48 cfs)

Primary OutFlow Max=10.00 cfs @ 13.52 hrs HW=792.00' (Free Discharge)
└**1=Culvert** (Inlet Controls 10.00 cfs @ 8.15 fps)
  ├**2=Orifice/Grate** (Passes < 23.65 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 0.08 cfs potential flow)
  ├**4=Orifice/Grate** (Passes < 0.09 cfs potential flow)
  └**5=Orifice/Grate** (Passes < 0.70 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=789.00' (Free Discharge)
└**6=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=789.00' (Free Discharge)
└**7=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Link C1: Culvert C1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 0.51" for 25-yr, 24-hr event
Inflow = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af
Primary = 0.60 cfs @ 12.89 hrs, Volume= 0.128 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C10: Culvert C10

Inflow Area = 1.185 ac, 0.00% Impervious, Inflow Depth = 1.59" for 25-yr, 24-hr event
Inflow = 2.76 cfs @ 12.18 hrs, Volume= 0.157 af
Primary = 2.76 cfs @ 12.18 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C2: Culvert C2

Inflow Area = 3.377 ac, 0.00% Impervious, Inflow Depth = 2.29" for 25-yr, 24-hr event
Inflow = 10.95 cfs @ 12.20 hrs, Volume= 0.645 af
Primary = 10.95 cfs @ 12.20 hrs, Volume= 0.645 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C3: Culvert C3

Inflow Area = 11.287 ac, 0.00% Impervious, Inflow Depth = 1.80" for 25-yr, 24-hr event
Inflow = 28.58 cfs @ 12.17 hrs, Volume= 1.696 af
Primary = 28.58 cfs @ 12.17 hrs, Volume= 1.696 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C4: Culvert C4

Inflow Area = 14.199 ac, 0.00% Impervious, Inflow Depth = 1.76" for 25-yr, 24-hr event
Inflow = 34.14 cfs @ 12.16 hrs, Volume= 2.079 af
Primary = 34.14 cfs @ 12.16 hrs, Volume= 2.079 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.4 : Swale S1.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C5: Culvert C5

Inflow Area = 17.290 ac, 0.00% Impervious, Inflow Depth = 1.73" for 25-yr, 24-hr event
Inflow = 37.41 cfs @ 12.24 hrs, Volume= 2.499 af
Primary = 37.41 cfs @ 12.24 hrs, Volume= 2.499 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.8 : Swale S1.8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C6: Culvert C6

Inflow Area = 11.990 ac, 0.00% Impervious, Inflow Depth = 1.90" for 25-yr, 24-hr event
Inflow = 30.67 cfs @ 12.15 hrs, Volume= 1.895 af
Primary = 30.67 cfs @ 12.15 hrs, Volume= 1.895 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.5 : Swale S3.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C7: Culvert C7

Inflow Area = 46.337 ac, 0.00% Impervious, Inflow Depth = 1.62" for 25-yr, 24-hr event
Inflow = 67.17 cfs @ 12.39 hrs, Volume= 6.238 af
Primary = 67.17 cfs @ 12.39 hrs, Volume= 6.238 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.6 : Swale S4.6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C9: Culvert C9

Inflow Area = 9.247 ac, 0.00% Impervious, Inflow Depth = 1.18" for 25-yr, 24-hr event
Inflow = 11.16 cfs @ 12.29 hrs, Volume= 0.913 af
Primary = 11.16 cfs @ 12.29 hrs, Volume= 0.913 af, Atten= 0%, Lag= 0.0 min
Routed to Pond N : North Infiltration Area

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F10: Flume 10

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af
Primary = 0.95 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min
Routed to Pond C8 : Culvert C8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1A: Flume 1A

Inflow Area = 1.853 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 5.38 cfs @ 12.14 hrs, Volume= 0.292 af
Primary = 5.38 cfs @ 12.14 hrs, Volume= 0.292 af, Atten= 0%, Lag= 0.0 min
Routed to Link F1B : Flume 1B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1B: Flume 1B

Inflow Area = 4.089 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 12.06 cfs @ 12.13 hrs, Volume= 0.645 af
Primary = 12.06 cfs @ 12.13 hrs, Volume= 0.645 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.3 : Swale S4.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2A: Flume 2A

Inflow Area = 0.636 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 1.98 cfs @ 12.11 hrs, Volume= 0.100 af
Primary = 1.98 cfs @ 12.11 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min
Routed to Link F2B : Flume 2B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2B: Flume 2B

Inflow Area = 2.199 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 6.58 cfs @ 12.12 hrs, Volume= 0.347 af
Primary = 6.58 cfs @ 12.12 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.4 : Swale S4.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F3: Flume 3

Inflow Area = 0.427 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af
Primary = 1.38 cfs @ 12.10 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.5 : Swale S4.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4A: Flume 4A

Inflow Area = 1.209 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 3.47 cfs @ 12.14 hrs, Volume= 0.191 af
Primary = 3.47 cfs @ 12.14 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.0 min
Routed to Link F4B : Flume 4B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4B: Flume 4B

Inflow Area = 3.092 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 9.10 cfs @ 12.13 hrs, Volume= 0.488 af
Primary = 9.10 cfs @ 12.13 hrs, Volume= 0.488 af, Atten= 0%, Lag= 0.0 min
Routed to Link C7 : Culvert C7

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5A: Flume 5A

Inflow Area = 0.237 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af
Primary = 0.76 cfs @ 12.11 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Routed to Link F5B : Flume 5B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5B: Flume 5B

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.23 cfs @ 12.11 hrs, Volume= 0.112 af
Primary = 2.23 cfs @ 12.11 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S2.2 : Swale S2.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6A: Flume 6A

Inflow Area = 1.440 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 4.38 cfs @ 12.11 hrs, Volume= 0.227 af
Primary = 4.38 cfs @ 12.11 hrs, Volume= 0.227 af, Atten= 0%, Lag= 0.0 min
Routed to Link F6B : Flume 6B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6B: Flume 6B

Inflow Area = 3.001 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 9.20 cfs @ 12.11 hrs, Volume= 0.473 af
Primary = 9.20 cfs @ 12.11 hrs, Volume= 0.473 af, Atten= 0%, Lag= 0.0 min
Routed to Link C6 : Culvert C6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7A: Flume 7A

Inflow Area = 1.062 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 3.51 cfs @ 12.10 hrs, Volume= 0.167 af
Primary = 3.51 cfs @ 12.10 hrs, Volume= 0.167 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7B : Flume 7B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7B: Flume 7B

Inflow Area = 3.407 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 10.65 cfs @ 12.11 hrs, Volume= 0.537 af
Primary = 10.65 cfs @ 12.11 hrs, Volume= 0.537 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7C : Flume 7C

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7C: Flume 7C

Inflow Area = 5.640 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 17.47 cfs @ 12.11 hrs, Volume= 0.889 af
Primary = 17.47 cfs @ 12.11 hrs, Volume= 0.889 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.2 : Swale S3.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8A: Flume 8A

Inflow Area = 0.381 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 1.19 cfs @ 12.11 hrs, Volume= 0.060 af
Primary = 1.19 cfs @ 12.11 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min
Routed to Link F8B : Flume 8B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8B: Flume 8B

Inflow Area = 1.497 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 4.66 cfs @ 12.11 hrs, Volume= 0.236 af
Primary = 4.66 cfs @ 12.11 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9A: Flume 9A

Inflow Area = 2.445 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 6.88 cfs @ 12.15 hrs, Volume= 0.386 af
Primary = 6.88 cfs @ 12.15 hrs, Volume= 0.386 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9B : Flume 9B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9B: Flume 9B

Inflow Area = 5.540 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 15.84 cfs @ 12.14 hrs, Volume= 0.874 af
Primary = 15.84 cfs @ 12.14 hrs, Volume= 0.874 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9C : Flume 9C

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9C: Flume 9C

Inflow Area = 8.811 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 25.24 cfs @ 12.14 hrs, Volume= 1.389 af
Primary = 25.24 cfs @ 12.14 hrs, Volume= 1.389 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link Wetland: Wetland

Inflow Area = 71.936 ac, 2.10% Impervious, Inflow Depth = 0.47" for 25-yr, 24-hr event
Inflow = 10.00 cfs @ 13.52 hrs, Volume= 2.831 af
Primary = 10.00 cfs @ 13.52 hrs, Volume= 2.831 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentArea 1: Area 1 Runoff Area=1.296 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=364' Tc=6.7 min CN=69 Runoff=6.34 cfs 0.344 af

SubcatchmentArea 10: Area 10 Runoff Area=0.573 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=321' Tc=6.4 min CN=69 Runoff=2.83 cfs 0.152 af

SubcatchmentArea 11: Area 11 Runoff Area=1.872 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=796' Tc=7.6 min CN=69 Runoff=8.84 cfs 0.496 af

SubcatchmentArea 12: Area 12 Runoff Area=1.610 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=712' Tc=5.3 min CN=69 Runoff=8.11 cfs 0.427 af

SubcatchmentArea 13: Area 13 Runoff Area=0.626 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=333' Tc=4.5 min CN=69 Runoff=3.29 cfs 0.166 af

SubcatchmentArea 14: Area 14 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=331' Tc=4.4 min CN=69 Runoff=3.27 cfs 0.164 af

SubcatchmentArea 15: Area 15 Runoff Area=0.943 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=464' Tc=5.9 min CN=69 Runoff=4.72 cfs 0.250 af

SubcatchmentArea 16: Area 16 Runoff Area=0.571 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=315' Tc=4.4 min CN=69 Runoff=3.01 cfs 0.151 af

SubcatchmentArea 17: Area 17 Runoff Area=0.990 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=424' Tc=4.7 min CN=69 Runoff=5.14 cfs 0.262 af

SubcatchmentArea 18: Area 18 Runoff Area=1.656 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=508' Tc=4.8 min CN=69 Runoff=8.56 cfs 0.439 af

SubcatchmentArea 19: Area 19 Runoff Area=0.689 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=286' Tc=4.3 min CN=69 Runoff=3.65 cfs 0.183 af

SubcatchmentArea 2: Area 2 Runoff Area=0.557 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=303' Tc=4.7 min CN=69 Runoff=2.89 cfs 0.148 af

SubcatchmentArea 20: Area 20 Runoff Area=0.381 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=306' Tc=4.3 min CN=69 Runoff=2.02 cfs 0.101 af

SubcatchmentArea 21: Area 21 Runoff Area=0.516 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=312' Tc=4.3 min CN=69 Runoff=2.74 cfs 0.137 af

SubcatchmentArea 22: Area 22 Runoff Area=2.579 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=1,146' Tc=6.4 min CN=69 Runoff=12.74 cfs 0.684 af

SubcatchmentArea 23: Area 23 Runoff Area=0.427 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=362' Tc=3.8 min CN=69 Runoff=2.33 cfs 0.113 af

SubcatchmentArea 24: Area 24 Runoff Area=1.177 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=385' Tc=4.7 min CN=69 Runoff=6.11 cfs 0.312 af

SubcatchmentArea 25: Area 25 Runoff Area=0.682 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=349' Tc=4.5 min CN=69 Runoff=3.58 cfs 0.181 af

SubcatchmentArea 26: Area 26 Runoff Area=0.677 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=341' Tc=4.5 min CN=69 Runoff=3.56 cfs 0.179 af

SubcatchmentArea 27: Area 27 Runoff Area=2.594 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=1,357' Tc=6.9 min CN=69 Runoff=12.62 cfs 0.688 af

SubcatchmentArea 28: Area 28 Runoff Area=2.159 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=125' Slope=0.2500 '/' Tc=3.9 min CN=74 Runoff=13.48 cfs 0.663 af

SubcatchmentArea 29: Area 29 Runoff Area=0.616 ac 0.00% Impervious Runoff Depth=3.48"
Flow Length=109' Slope=0.2500 '/' Tc=3.8 min CN=72 Runoff=3.67 cfs 0.179 af

SubcatchmentArea 3: Area 3 Runoff Area=0.348 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=298' Tc=4.8 min CN=69 Runoff=1.80 cfs 0.092 af

SubcatchmentArea 30: Area 30 Runoff Area=0.149 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=211' Tc=1.2 min CN=69 Runoff=0.86 cfs 0.039 af

SubcatchmentArea 31: Area 31 Runoff Area=0.126 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=59' Slope=0.2500 '/' Tc=2.5 min CN=69 Runoff=0.74 cfs 0.033 af

SubcatchmentArea 32: Area 32 Runoff Area=0.457 ac 0.00% Impervious Runoff Depth=3.28"
Flow Length=122' Slope=0.2500 '/' Tc=3.9 min CN=70 Runoff=2.55 cfs 0.125 af

SubcatchmentArea 33: Area 33 Runoff Area=1.056 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=419' Tc=4.7 min CN=69 Runoff=5.48 cfs 0.280 af

SubcatchmentArea 34: Area 34 Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=374' Tc=4.5 min CN=69 Runoff=2.28 cfs 0.115 af

SubcatchmentArea 35: Area 35 Runoff Area=1.218 ac 0.00% Impervious Runoff Depth=3.69"
Flow Length=104' Tc=4.6 min CN=74 Runoff=7.33 cfs 0.374 af

SubcatchmentArea 36: Area 36 Runoff Area=1.185 ac 0.00% Impervious Runoff Depth=2.79"
Flow Length=106' Tc=4.1 min CN=65 Runoff=5.57 cfs 0.275 af

SubcatchmentArea 37: Area 37 Runoff Area=1.291 ac 0.00% Impervious Runoff Depth=2.50"
Flow Length=120' Slope=0.2500 '/' Tc=3.9 min CN=62 Runoff=5.48 cfs 0.269 af

SubcatchmentArea 38: Area 38 Runoff Area=0.795 ac 0.00% Impervious Runoff Depth=2.60"
Flow Length=155' Tc=4.3 min CN=63 Runoff=3.43 cfs 0.172 af

SubcatchmentArea 39: Area 39 Runoff Area=0.620 ac 0.00% Impervious Runoff Depth=1.96"
Flow Length=168' Tc=9.6 min CN=56 Runoff=1.57 cfs 0.101 af

SubcatchmentArea 4: Area 4 Runoff Area=0.288 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=296' Tc=4.0 min CN=69 Runoff=1.55 cfs 0.076 af

SubcatchmentArea 40: Area 40 Runoff Area=0.739 ac 0.00% Impervious Runoff Depth=1.96"
Flow Length=141' Tc=7.2 min CN=56 Runoff=2.11 cfs 0.120 af

SubcatchmentArea 41a: Area 41a Runoff Area=0.871 ac 0.00% Impervious Runoff Depth=2.79"
Flow Length=144' Slope=0.0500 '/' Tc=7.8 min CN=65 Runoff=3.58 cfs 0.202 af

SubcatchmentArea 41b: Area 41b Runoff Area=0.712 ac 0.00% Impervious Runoff Depth=3.38"
Flow Length=102' Slope=0.0500 '/' Tc=7.3 min CN=71 Runoff=3.63 cfs 0.201 af

SubcatchmentArea 42: Area 42 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=3.63 cfs 0.204 af

SubcatchmentArea 43: Area 43 Runoff Area=2.792 ac 0.00% Impervious Runoff Depth=2.41"
Flow Length=419' Tc=14.7 min CN=61 Runoff=7.53 cfs 0.561 af

SubcatchmentArea 44: Area 44 Runoff Area=1.416 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=941' Slope=0.0260 '/' Tc=22.0 min CN=39 Runoff=0.43 cfs 0.074 af

SubcatchmentArea 45: Area 45 Runoff Area=2.044 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=138' Tc=4.0 min CN=69 Runoff=11.02 cfs 0.542 af

SubcatchmentArea 46: Area 46 Runoff Area=0.769 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=139' Slope=0.0500 '/' Tc=7.7 min CN=69 Runoff=3.63 cfs 0.204 af

SubcatchmentArea 47: Area 47 Runoff Area=0.079 ac 0.00% Impervious Runoff Depth=3.48"
Flow Length=143' Tc=5.1 min CN=72 Runoff=0.44 cfs 0.023 af

SubcatchmentArea 48: Area 48 Runoff Area=3.726 ac 0.00% Impervious Runoff Depth=3.38"
Flow Length=391' Tc=11.1 min CN=71 Runoff=16.26 cfs 1.050 af

SubcatchmentArea 49: Area 49 Runoff Area=0.698 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=100' Slope=0.0600 '/' Tc=6.8 min CN=39 Runoff=0.32 cfs 0.036 af

SubcatchmentArea 5: Area 5 Runoff Area=0.504 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=258' Tc=3.4 min CN=69 Runoff=2.81 cfs 0.134 af

SubcatchmentArea 50: Area 50 Runoff Area=0.223 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=296' Tc=3.7 min CN=69 Runoff=1.22 cfs 0.059 af

SubcatchmentArea 51: Area 51 Runoff Area=0.655 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=642' Tc=5.0 min CN=69 Runoff=3.35 cfs 0.174 af

SubcatchmentArea 52: Area 52 Runoff Area=0.237 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=348' Tc=4.0 min CN=69 Runoff=1.28 cfs 0.063 af

SubcatchmentArea 53: Area 53 Runoff Area=0.475 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=425' Tc=4.5 min CN=69 Runoff=2.50 cfs 0.126 af

SubcatchmentArea 54: Area 54 Runoff Area=1.618 ac 0.00% Impervious Runoff Depth=2.23"
Flow Length=384' Tc=4.2 min CN=59 Runoff=5.93 cfs 0.300 af

SubcatchmentArea 55: Area 55 Runoff Area=0.826 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=126' Slope=0.2500 '/' Tc=3.9 min CN=58 Runoff=2.95 cfs 0.147 af

SubcatchmentArea 56: Area 56 Runoff Area=1.228 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=647' Tc=5.7 min CN=69 Runoff=6.17 cfs 0.325 af

SubcatchmentArea 57: Area 57 Runoff Area=1.089 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=158' Tc=4.3 min CN=58 Runoff=3.79 cfs 0.194 af

SubcatchmentArea 58: Area 58 Runoff Area=1.194 ac 0.00% Impervious Runoff Depth=2.23"
Flow Length=221' Tc=4.4 min CN=59 Runoff=4.33 cfs 0.221 af

SubcatchmentArea 59: Area 59 Runoff Area=2.220 ac 0.00% Impervious Runoff Depth=1.78"
Flow Length=240' Tc=4.6 min CN=54 Runoff=6.17 cfs 0.330 af

SubcatchmentArea 6: Area 6 Runoff Area=0.936 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=541' Tc=5.3 min CN=69 Runoff=4.72 cfs 0.248 af

SubcatchmentArea 60: Area 60 Runoff Area=2.476 ac 0.00% Impervious Runoff Depth=2.13"
Flow Length=263' Tc=4.7 min CN=58 Runoff=8.43 cfs 0.441 af

SubcatchmentArea 61: Area 61 Runoff Area=1.683 ac 0.00% Impervious Runoff Depth=1.70"
Flow Length=146' Slope=0.2345 '/' Tc=4.1 min CN=53 Runoff=4.54 cfs 0.238 af

SubcatchmentArea 62: Area 62 Runoff Area=2.001 ac 0.00% Impervious Runoff Depth=0.90"
Flow Length=318' Tc=20.8 min CN=43 Runoff=1.18 cfs 0.150 af

SubcatchmentArea 63: Area 63 Runoff Area=2.177 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=149' Tc=8.2 min CN=39 Runoff=0.97 cfs 0.114 af

SubcatchmentArea 64: Area 64 Runoff Area=0.594 ac 0.00% Impervious Runoff Depth=1.44"
Flow Length=147' Slope=0.0544 '/' Tc=7.6 min CN=50 Runoff=1.14 cfs 0.071 af

SubcatchmentArea 65: Area 65 Runoff Area=1.509 ac 100.00% Impervious Runoff Depth=6.35"
Tc=0.0 min CN=98 Runoff=14.43 cfs 0.799 af

SubcatchmentArea 66: Area 66 Runoff Area=5.227 ac 0.00% Impervious Runoff Depth=0.63"
Flow Length=701' Tc=7.9 min CN=39 Runoff=2.36 cfs 0.273 af

SubcatchmentArea 67: Area 67 Runoff Area=3.035 ac 0.00% Impervious Runoff Depth=1.20"
Flow Length=886' Slope=0.0068 '/' Tc=38.9 min CN=47 Runoff=1.99 cfs 0.304 af

SubcatchmentArea 68: Area 68 Runoff Area=0.251 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=52' Slope=0.1154 '/' Tc=3.1 min CN=42 Runoff=0.26 cfs 0.017 af

SubcatchmentArea 69: Area 69 Runoff Area=0.913 ac 0.00% Impervious Runoff Depth=1.13"
Flow Length=86' Slope=0.2326 '/' Tc=3.5 min CN=46 Runoff=1.50 cfs 0.086 af

SubcatchmentArea 7: Area 7 Runoff Area=0.986 ac 0.00% Impervious Runoff Depth=3.18"
Flow Length=608' Tc=6.6 min CN=69 Runoff=4.85 cfs 0.261 af

SubcatchmentArea 70: Area 70 Runoff Area=1.671 ac 0.00% Impervious Runoff Depth=1.53"
Flow Length=126' Tc=4.0 min CN=51 Runoff=3.98 cfs 0.213 af

SubcatchmentArea 71: Area 71 Runoff Area=9.875 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=1,337' Tc=16.6 min CN=42 Runoff=5.65 cfs 0.684 af

SubcatchmentArea 8: Area 8 Runoff Area=35,545 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=348' Tc=3.6 min CN=69 Runoff=4.50 cfs 0.216 af

SubcatchmentArea 9: Area 9 Runoff Area=10,716 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=144' Tc=2.3 min CN=69 Runoff=1.44 cfs 0.065 af

Reach RD1: Roadside Ditch 1 Avg. Flow Depth=0.19' Max Vel=2.00 fps Inflow=1.99 cfs 0.304 af
n=0.030 L=440.6' S=0.0188 '/' Capacity=47.16 cfs Outflow=1.96 cfs 0.304 af

Reach RD2: Roadside Ditch 2 Avg. Flow Depth=0.52' Max Vel=3.14 fps Inflow=19.31 cfs 1.445 af
n=0.030 L=433.0' S=0.0162 '/' Capacity=72.77 cfs Outflow=17.96 cfs 1.445 af

Reach RD3: Roadside Ditch 3 Avg. Flow Depth=0.81' Max Vel=4.50 fps Inflow=13.48 cfs 0.663 af
n=0.030 L=821.0' S=0.0288 '/' Capacity=20.76 cfs Outflow=11.77 cfs 0.663 af

Reach RD4: Roadside Ditch 4 Avg. Flow Depth=0.24' Max Vel=1.52 fps Inflow=3.98 cfs 0.213 af
n=0.030 L=495.6' S=0.0090 '/' Capacity=54.26 cfs Outflow=2.99 cfs 0.213 af

Reach RD5: Roadside Ditch 5 Avg. Flow Depth=0.46' Max Vel=4.14 fps Inflow=3.67 cfs 0.179 af
n=0.030 L=288.0' S=0.0531 '/' Capacity=28.18 cfs Outflow=3.30 cfs 0.179 af

Reach S1.1: Swale S1.1 Avg. Flow Depth=0.21' Max Vel=2.87 fps Inflow=5.57 cfs 0.275 af
n=0.030 L=321.0' S=0.0319 '/' Capacity=338.34 cfs Outflow=4.95 cfs 0.275 af

Reach S1.2: Swale S1.2 Avg. Flow Depth=1.02' Max Vel=4.24 fps Inflow=52.19 cfs 2.880 af
n=0.030 L=202.8' S=0.0108 '/' Capacity=196.86 cfs Outflow=49.91 cfs 2.880 af

Reach S1.3: Swale S1.3 Avg. Flow Depth=1.03' Max Vel=4.92 fps Inflow=61.05 cfs 3.550 af
n=0.030 L=72.2' S=0.0144 '/' Capacity=227.36 cfs Outflow=60.33 cfs 3.550 af

Reach S1.4: Swale S1.4 Avg. Flow Depth=1.40' Max Vel=3.24 fps Inflow=62.44 cfs 3.671 af
n=0.030 L=148.0' S=0.0045 '/' Capacity=126.50 cfs Outflow=59.56 cfs 3.671 af

Reach S1.5: Swale S1.5 Avg. Flow Depth=0.27' Max Vel=1.35 fps Inflow=3.63 cfs 0.204 af
n=0.030 L=179.7' S=0.0050 '/' Capacity=134.06 cfs Outflow=3.33 cfs 0.204 af

Reach S1.6: Swale S1.6 Avg. Flow Depth=1.41' Max Vel=3.60 fps Inflow=69.21 cfs 4.277 af
n=0.030 L=252.0' S=0.0054 '/' Capacity=139.68 cfs Outflow=66.73 cfs 4.277 af

Reach S1.7: Swale S1.7 Avg. Flow Depth=0.41' Max Vel=2.20 fps Inflow=3.63 cfs 0.201 af
n=0.030 L=245.8' S=0.0099 '/' Capacity=90.14 cfs Outflow=3.32 cfs 0.201 af

Reach S1.8: Swale S1.8 Avg. Flow Depth=1.33' Max Vel=4.09 fps Inflow=74.10 cfs 4.838 af
n=0.030 L=422.0' S=0.0075 '/' Capacity=163.67 cfs Outflow=70.85 cfs 4.838 af

Reach S2.1: Swale S2.1 Avg. Flow Depth=1.73' Max Vel=3.72 fps Inflow=71.34 cfs 4.949 af
n=0.030 L=389.0' S=0.0054 '/' Capacity=97.05 cfs Outflow=68.62 cfs 4.949 af

Reach S2.2: Swale S2.2 Avg. Flow Depth=1.77' Max Vel=3.96 fps Inflow=120.78 cfs 9.518 af
n=0.030 L=411.0' S=0.0049 '/' Capacity=152.61 cfs Outflow=118.35 cfs 9.518 af

Reach S2.3: Swale S2.3 Avg. Flow Depth=1.38' Max Vel=5.64 fps Inflow=120.84 cfs 9.932 af
n=0.030 L=307.0' S=0.0130 '/' Capacity=249.72 cfs Outflow=119.37 cfs 9.932 af

Reach S3.1: Swale S3.1 Avg. Flow Depth=0.50' Max Vel=1.94 fps Inflow=11.02 cfs 0.542 af
n=0.030 L=357.0' S=0.0050 '/' Capacity=133.76 cfs Outflow=9.75 cfs 0.542 af

Reach S3.2: Swale S3.2 Avg. Flow Depth=1.06' Max Vel=2.93 fps Inflow=38.61 cfs 2.162 af
n=0.030 L=34.0' S=0.0050 '/' Capacity=133.95 cfs Outflow=37.80 cfs 2.162 af

Reach S3.3: Swale S3.3 Avg. Flow Depth=0.82' Max Vel=4.12 fps Inflow=37.80 cfs 2.162 af
n=0.030 L=200.0' S=0.0130 '/' Capacity=215.99 cfs Outflow=36.67 cfs 2.162 af

Reach S3.4: Swale S3.4 Avg. Flow Depth=0.45' Max Vel=1.95 fps Inflow=3.63 cfs 0.204 af
n=0.030 L=283.0' S=0.0071 '/' Capacity=76.21 cfs Outflow=3.29 cfs 0.204 af

Reach S3.5: Swale S3.5 Avg. Flow Depth=1.68' Max Vel=2.63 fps Inflow=68.29 cfs 4.234 af
n=0.030 L=318.5' S=0.0024 '/' Capacity=93.14 cfs Outflow=64.19 cfs 4.234 af

Reach S4.1: Swale S4.1 Avg. Flow Depth=0.22' Max Vel=2.07 fps Inflow=5.28 cfs 0.267 af
n=0.030 L=240.0' S=0.0153 '/' Capacity=70.22 cfs Outflow=4.68 cfs 0.267 af

Reach S4.2: Swale S4.2 Avg. Flow Depth=0.38' Max Vel=2.70 fps Inflow=11.92 cfs 0.667 af
n=0.030 L=259.3' S=0.0127 '/' Capacity=63.88 cfs Outflow=11.06 cfs 0.667 af

Reach S4.3: Swale S4.3 Avg. Flow Depth=1.08' Max Vel=2.26 fps Inflow=36.14 cfs 2.080 af
n=0.030 L=362.9' S=0.0027 '/' Capacity=108.12 cfs Outflow=33.37 cfs 2.080 af

Reach S4.4: Swale S4.4 Avg. Flow Depth=1.11' Max Vel=2.82 fps Inflow=45.34 cfs 3.104 af
n=0.030 L=495.6' S=0.0040 '/' Capacity=132.85 cfs Outflow=43.47 cfs 3.104 af

Reach S4.5: Swale S4.5 Avg. Flow Depth=0.89' Max Vel=3.87 fps Inflow=45.91 cfs 3.454 af
n=0.030 L=411.1' S=0.0097 '/' Capacity=465.89 cfs Outflow=44.58 cfs 3.454 af

Reach S4.6: Swale S4.6 Avg. Flow Depth=1.74' Max Vel=6.02 fps Inflow=168.73 cfs 14.356 af
n=0.030 L=537.0' S=0.0112 '/' Capacity=499.25 cfs Outflow=165.72 cfs 14.356 af

Reach S5.1: Swale S5.1 Avg. Flow Depth=0.29' Max Vel=2.49 fps Inflow=7.33 cfs 0.374 af
n=0.030 L=478.0' S=0.0154 '/' Capacity=235.22 cfs Outflow=6.57 cfs 0.374 af

Pond C8: Culvert C8 Peak Elev=811.38' Storage=0.000 af Inflow=1.60 cfs 0.073 af
12.0" Round Culvert n=0.012 L=85.6' S=0.0245 '/' Outflow=1.60 cfs 0.073 af

Pond N: North Infiltration Area Peak Elev=805.23' Storage=49,470 cf Inflow=26.07 cfs 2.341 af
Outflow=2.21 cfs 2.341 af

Pond Sed Pond: Sedimentation Basin Peak Elev=793.20' Storage=245,676 cf Inflow=169.96 cfs 15.500 af
3 af Primary=11.51 cfs 5.165 af Secondary=31.49 cfs 2.330 af Tertiary=34.88 cfs 0.772 af Outflow=83.78 cfs 15.500 af

Link C1: Culvert C1 Inflow=1.96 cfs 0.304 af
Primary=1.96 cfs 0.304 af

Link C10: Culvert C10 Inflow=4.95 cfs 0.275 af
Primary=4.95 cfs 0.275 af

Link C2: Culvert C2 Inflow=18.32 cfs 1.038 af
Primary=18.32 cfs 1.038 af

Link C3: Culvert C3 Inflow=49.91 cfs 2.880 af
Primary=49.91 cfs 2.880 af

Link C4: Culvert C4 Inflow=60.33 cfs 3.550 af
Primary=60.33 cfs 3.550 af

Link C5: Culvert C5 Inflow=66.73 cfs 4.277 af
Primary=66.73 cfs 4.277 af

Link C6: Culvert C6 Inflow=53.57 cfs 3.184 af
Primary=53.57 cfs 3.184 af

Link C7: Culvert C7 Inflow=123.92 cfs 10.752 af
Primary=123.92 cfs 10.752 af

Link C9: Culvert C9 Inflow=20.94 cfs 1.658 af
Primary=20.94 cfs 1.658 af

Link F10: Flume 10 Inflow=1.60 cfs 0.073 af
Primary=1.60 cfs 0.073 af

Link F1A: Flume 1A Inflow=9.08 cfs 0.491 af
Primary=9.08 cfs 0.491 af

Link F1B: Flume 1B Inflow=20.35 cfs 1.084 af
Primary=20.35 cfs 1.084 af

Link F2A: Flume 2A Inflow=3.34 cfs 0.169 af
Primary=3.34 cfs 0.169 af

Link F2B: Flume 2B Inflow=11.13 cfs 0.583 af
Primary=11.13 cfs 0.583 af

Link F3: Flume 3 Inflow=2.33 cfs 0.113 af
Primary=2.33 cfs 0.113 af

Link F4A: Flume 4A Inflow=5.87 cfs 0.320 af
Primary=5.87 cfs 0.320 af

Link F4B: Flume 4B Inflow=15.35 cfs 0.820 af
Primary=15.35 cfs 0.820 af

Link F5A: Flume 5A Inflow=1.28 cfs 0.063 af
Primary=1.28 cfs 0.063 af

Link F5B: Flume 5B Inflow=3.77 cfs 0.189 af
Primary=3.77 cfs 0.189 af

Link F6A: Flume 6A Inflow=7.42 cfs 0.382 af
Primary=7.42 cfs 0.382 af

Link F6B: Flume 6B Inflow=15.57 cfs 0.795 af
Primary=15.57 cfs 0.795 af

Link F7A: Flume 7A Inflow=5.92 cfs 0.281 af
Primary=5.92 cfs 0.281 af

Link F7B: Flume 7B Inflow=18.00 cfs 0.903 af
Primary=18.00 cfs 0.903 af

Link F7C: Flume 7C Inflow=29.56 cfs 1.495 af
Primary=29.56 cfs 1.495 af

Link F8A: Flume 8A Inflow=2.02 cfs 0.101 af
Primary=2.02 cfs 0.101 af

Link F8B: Flume 8B Inflow=7.88 cfs 0.397 af
Primary=7.88 cfs 0.397 af

Link F9A: Flume 9A Inflow=11.65 cfs 0.648 af
Primary=11.65 cfs 0.648 af

Link F9B: Flume 9B Inflow=26.78 cfs 1.468 af
Primary=26.78 cfs 1.468 af

Link F9C: Flume 9C Inflow=42.66 cfs 2.335 af
Primary=42.66 cfs 2.335 af

Link Wetland: Wetland Inflow=77.88 cfs 8.267 af
Primary=77.88 cfs 8.267 af

Summary for Subcatchment Area 1: Area 1

Runoff = 6.34 cfs @ 12.14 hrs, Volume= 0.344 af, Depth= 3.18"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.296	69	Pasture/grassland/range, Fair, HSG B
1.296		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	93	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	7	0.2500	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	151	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	113	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.7	364	Total			

Summary for Subcatchment Area 10: Area 10

Runoff = 2.83 cfs @ 12.14 hrs, Volume= 0.152 af, Depth= 3.18"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.573	69	Pasture/grassland/range, Fair, HSG B
0.573		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	79	0.1000	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.1	21	0.2500	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	53	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	168	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	321	Total			

Summary for Subcatchment Area 11: Area 11

Runoff = 8.84 cfs @ 12.15 hrs, Volume= 0.496 af, Depth= 3.18"
Routed to Link F9A : Flume 9A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.872	69	Pasture/grassland/range, Fair, HSG B
1.872		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	96	0.1000	0.30		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	4	0.2500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	90	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	606	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
7.6	796	Total			

Summary for Subcatchment Area 12: Area 12

Runoff = 8.11 cfs @ 12.12 hrs, Volume= 0.427 af, Depth= 3.18"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.610	69	Pasture/grassland/range, Fair, HSG B
1.610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	31	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.4	581	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	712	Total			

Summary for Subcatchment Area 13: Area 13

Runoff = 3.29 cfs @ 12.11 hrs, Volume= 0.166 af, Depth= 3.18"
Routed to Link F1B : Flume 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.626	69	Pasture/grassland/range, Fair, HSG B
0.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	183	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	333	Total			

Summary for Subcatchment Area 14: Area 14

Runoff = 3.27 cfs @ 12.11 hrs, Volume= 0.164 af, Depth= 3.18"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.620	69	Pasture/grassland/range, Fair, HSG B
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	331	Total			

Summary for Subcatchment Area 15: Area 15

Runoff = 4.72 cfs @ 12.13 hrs, Volume= 0.250 af, Depth= 3.18"
Routed to Link F2B : Flume 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.943	69	Pasture/grassland/range, Fair, HSG B
0.943		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	95	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	269	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.9	464	Total			

Summary for Subcatchment Area 16: Area 16

Runoff = 3.01 cfs @ 12.11 hrs, Volume= 0.151 af, Depth= 3.18"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.571	69	Pasture/grassland/range, Fair, HSG B
0.571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	44	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	171	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.4	315	Total			

Summary for Subcatchment Area 17: Area 17

Runoff = 5.14 cfs @ 12.11 hrs, Volume= 0.262 af, Depth= 3.18"
Routed to Link F6B : Flume 6B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.990	69	Pasture/grassland/range, Fair, HSG B
0.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	278	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	424	Total			

Summary for Subcatchment Area 18: Area 18

Runoff = 8.56 cfs @ 12.12 hrs, Volume= 0.439 af, Depth= 3.18"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.656	69	Pasture/grassland/range, Fair, HSG B
1.656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	88	0.2045	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	420	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	508	Total			

Summary for Subcatchment Area 19: Area 19

Runoff = 3.65 cfs @ 12.11 hrs, Volume= 0.183 af, Depth= 3.18"
Routed to Link F7B : Flume 7B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.689	69	Pasture/grassland/range, Fair, HSG B
0.689		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	136	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	286	Total			

Summary for Subcatchment Area 2: Area 2

Runoff = 2.89 cfs @ 12.11 hrs, Volume= 0.148 af, Depth= 3.18"
Routed to Link F1A : Flume 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.557	69	Pasture/grassland/range, Fair, HSG B
0.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	181	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	303	Total			

Summary for Subcatchment Area 20: Area 20

Runoff = 2.02 cfs @ 12.11 hrs, Volume= 0.101 af, Depth= 3.18"
Routed to Link F8A : Flume 8A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.381	69	Pasture/grassland/range, Fair, HSG B
0.381		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	306	Total			

Summary for Subcatchment Area 21: Area 21

Runoff = 2.74 cfs @ 12.11 hrs, Volume= 0.137 af, Depth= 3.18"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.516	69	Pasture/grassland/range, Fair, HSG B
0.516		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	205	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.3	312	Total			

Summary for Subcatchment Area 22: Area 22

Runoff = 12.74 cfs @ 12.14 hrs, Volume= 0.684 af, Depth= 3.18"
Routed to Link F9B : Flume 9B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.579	69	Pasture/grassland/range, Fair, HSG B
2.579		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	21	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	1,025	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.4	1,146	Total			

Summary for Subcatchment Area 23: Area 23

Runoff = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af, Depth= 3.18"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.427	69	Pasture/grassland/range, Fair, HSG B
0.427		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	70	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	227	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	65	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.8	362	Total			

Summary for Subcatchment Area 24: Area 24

Runoff = 6.11 cfs @ 12.11 hrs, Volume= 0.312 af, Depth= 3.18"
Routed to Link F7C : Flume 7C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.177	69	Pasture/grassland/range, Fair, HSG B
1.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	60	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	225	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	385	Total			

Summary for Subcatchment Area 25: Area 25

Runoff = 3.58 cfs @ 12.11 hrs, Volume= 0.181 af, Depth= 3.18"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.682	69	Pasture/grassland/range, Fair, HSG B
0.682		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	349	Total			

Summary for Subcatchment Area 26: Area 26

Runoff = 3.56 cfs @ 12.11 hrs, Volume= 0.179 af, Depth= 3.18"
Routed to Link F9C : Flume 9C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.677	69	Pasture/grassland/range, Fair, HSG B
0.677		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	50	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	191	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	341	Total			

Summary for Subcatchment Area 27: Area 27

Runoff = 12.62 cfs @ 12.14 hrs, Volume= 0.688 af, Depth= 3.18"
Routed to Link F9C : Flume 9C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.594	69	Pasture/grassland/range, Fair, HSG B
2.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	99	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
3.1	1,258	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
6.9	1,357	Total			

Summary for Subcatchment Area 28: Area 28

Runoff = 13.48 cfs @ 12.10 hrs, Volume= 0.663 af, Depth= 3.69"
Routed to Reach RD3 : Roadside Ditch 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.735	69	Pasture/grassland/range, Fair, HSG B
0.424	96	Gravel surface, HSG A
2.159	74	Weighted Average
2.159		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	25	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	125	Total			

Summary for Subcatchment Area 29: Area 29

Runoff = 3.67 cfs @ 12.10 hrs, Volume= 0.179 af, Depth= 3.48"
Routed to Reach RD5 : Roadside Ditch 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.543	69	Pasture/grassland/range, Fair, HSG B
0.073	96	Gravel surface, HSG A
0.616	72	Weighted Average
0.616		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.8	109	Total			

Summary for Subcatchment Area 3: Area 3

Runoff = 1.80 cfs @ 12.12 hrs, Volume= 0.092 af, Depth= 3.18"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.348	69	Pasture/grassland/range, Fair, HSG B
0.348		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	100	0.1950	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	36	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	162	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.8	298	Total			

Summary for Subcatchment Area 30: Area 30

Runoff = 0.86 cfs @ 12.07 hrs, Volume= 0.039 af, Depth= 3.18"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.149	69	Pasture/grassland/range, Fair, HSG B
0.149		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	12	0.2500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	199	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
1.2	211	Total			

Summary for Subcatchment Area 31: Area 31

Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.033 af, Depth= 3.18"
Routed to Link F10 : Flume 10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.126	69	Pasture/grassland/range, Fair, HSG B
0.126		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	59	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 32: Area 32

Runoff = 2.55 cfs @ 12.10 hrs, Volume= 0.125 af, Depth= 3.28"
Routed to Reach S3.2 : Swale S3.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.435	69	Pasture/grassland/range, Fair, HSG B
0.022	96	Gravel surface, HSG A
0.457	70	Weighted Average
0.457		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	22	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	122	Total			

Summary for Subcatchment Area 33: Area 33

Runoff = 5.48 cfs @ 12.11 hrs, Volume= 0.280 af, Depth= 3.18"
Routed to Link F7C : Flume 7C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.056	69	Pasture/grassland/range, Fair, HSG B
1.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	57	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	262	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.7	419	Total			

Summary for Subcatchment Area 34: Area 34

Runoff = 2.28 cfs @ 12.11 hrs, Volume= 0.115 af, Depth= 3.18"
Routed to Link F8B : Flume 8B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.434	69	Pasture/grassland/range, Fair, HSG B
0.434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	15	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	259	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.5	374	Total			

Summary for Subcatchment Area 35: Area 35

Runoff = 7.33 cfs @ 12.11 hrs, Volume= 0.374 af, Depth= 3.69"
Routed to Reach S5.1 : Swale S5.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.232	96	Gravel surface, HSG A
1.218	74	Weighted Average
1.218		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	70	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.7	10	0.1766	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	4	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	104	Total			

Summary for Subcatchment Area 36: Area 36

Runoff = 5.57 cfs @ 12.11 hrs, Volume= 0.275 af, Depth= 2.79"
Routed to Reach S1.1 : Swale S1.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.322	39	Pasture/grassland/range, Good, HSG A
0.696	69	Pasture/grassland/range, Fair, HSG B
0.167	96	Gravel surface, HSG A
1.185	65	Weighted Average
1.185		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	72	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	14	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	106	Total			

Summary for Subcatchment Area 37: Area 37

Runoff = 5.48 cfs @ 12.11 hrs, Volume= 0.269 af, Depth= 2.50"
Routed to Reach S1.2 : Swale S1.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.415	39	Pasture/grassland/range, Good, HSG A
0.743	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
1.291	62	Weighted Average
1.291		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	20	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	120	Total			

Summary for Subcatchment Area 38: Area 38

Runoff = 3.43 cfs @ 12.11 hrs, Volume= 0.172 af, Depth= 2.60"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.263	39	Pasture/grassland/range, Good, HSG A
0.409	69	Pasture/grassland/range, Fair, HSG B
0.123	96	Gravel surface, HSG A
0.795	63	Weighted Average
0.795		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	14	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	17	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	24	0.0833	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	155	Total			

Summary for Subcatchment Area 39: Area 39

Runoff = 1.57 cfs @ 12.18 hrs, Volume= 0.101 af, Depth= 1.96"
Routed to Reach S1.3 : Swale S1.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.317	39	Pasture/grassland/range, Good, HSG A
0.243	69	Pasture/grassland/range, Fair, HSG B
0.060	96	Gravel surface, HSG A
0.620	56	Weighted Average
0.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	81	0.0245	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.0	19	0.2500	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	29	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	20	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	19	0.1053	2.27		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	168	Total			

Summary for Subcatchment Area 4: Area 4

Runoff = 1.55 cfs @ 12.10 hrs, Volume= 0.076 af, Depth= 3.18"
Routed to Link F2A : Flume 2A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.288	69	Pasture/grassland/range, Fair, HSG B
0.288		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	49	0.0820	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	247	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
4.0	296	Total			

Summary for Subcatchment Area 40: Area 40

Runoff = 2.11 cfs @ 12.15 hrs, Volume= 0.120 af, Depth= 1.96"
Routed to Reach S1.4 : Swale S1.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.389	39	Pasture/grassland/range, Good, HSG A
0.270	69	Pasture/grassland/range, Fair, HSG B
0.080	96	Gravel surface, HSG A
0.739	56	Weighted Average
0.739		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	49	0.0408	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.1	47	0.2500	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	4	0.0050	0.39		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.2	19	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	22	0.1136	2.36		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.2	141	Total			

Summary for Subcatchment Area 41a: Area 41a

Runoff = 3.58 cfs @ 12.15 hrs, Volume= 0.202 af, Depth= 2.79"
Routed to Reach S1.6 : Swale S1.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.249	39	Pasture/grassland/range, Good, HSG A
0.489	69	Pasture/grassland/range, Fair, HSG B
0.133	96	Gravel surface, HSG A
0.871	65	Weighted Average
0.871		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	44	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.8	144	Total			

Summary for Subcatchment Area 41b: Area 41b

Runoff = 3.63 cfs @ 12.15 hrs, Volume= 0.201 af, Depth= 3.38"
Routed to Reach S1.7 : Swale S1.7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
0.712	71	Weighted Average
0.712		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	2	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	102	Total			

Summary for Subcatchment Area 42: Area 42

Runoff = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af, Depth= 3.18"
Routed to Reach S1.5 : Swale S1.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 43: Area 43

Runoff = 7.53 cfs @ 12.24 hrs, Volume= 0.561 af, Depth= 2.41"
Routed to Reach S1.8 : Swale S1.8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.797	39	Pasture/grassland/range, Good, HSG A
1.938	69	Pasture/grassland/range, Fair, HSG B
0.057	96	Gravel surface, HSG A
2.792	61	Weighted Average
2.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	119	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	22	0.1905	3.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	419	Total			

Summary for Subcatchment Area 44: Area 44

Runoff = 0.43 cfs @ 12.47 hrs, Volume= 0.074 af, Depth= 0.63"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.416	39	Pasture/grassland/range, Good, HSG A
1.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0260	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.9	194	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	647	0.0260	1.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.0	941	Total			

Summary for Subcatchment Area 45: Area 45

Runoff = 11.02 cfs @ 12.10 hrs, Volume= 0.542 af, Depth= 3.18"
Routed to Reach S3.1 : Swale S3.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.044	69	Pasture/grassland/range, Fair, HSG B
2.044		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	38	0.2632	3.59		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	138	Total			

Summary for Subcatchment Area 46: Area 46

Runoff = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af, Depth= 3.18"
Routed to Reach S3.4 : Swale S3.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.769	69	Pasture/grassland/range, Fair, HSG B
0.769		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.4	39	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.7	139	Total			

Summary for Subcatchment Area 47: Area 47

Runoff = 0.44 cfs @ 12.12 hrs, Volume= 0.023 af, Depth= 3.48"
Routed to Link C6 : Culvert C6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.070	69	Pasture/grassland/range, Fair, HSG B
0.009	96	Gravel surface, HSG A
0.079	72	Weighted Average
0.079		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.2	10	0.0500	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	10	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	18	0.1390	2.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.1	143	Total			

Summary for Subcatchment Area 48: Area 48

Runoff = 16.26 cfs @ 12.19 hrs, Volume= 1.050 af, Depth= 3.38"
Routed to Reach S3.5 : Swale S3.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
3.470	69	Pasture/grassland/range, Fair, HSG B
0.256	96	Gravel surface, HSG A
3.726	71	Weighted Average
3.726		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	83	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.9	208	0.0289	1.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	391	Total			

Summary for Subcatchment Area 49: Area 49

Runoff = 0.32 cfs @ 12.19 hrs, Volume= 0.036 af, Depth= 0.63"
Routed to Reach S2.1 : Swale S2.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.698	39	Pasture/grassland/range, Good, HSG A
0.698		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 5: Area 5

Runoff = 2.81 cfs @ 12.10 hrs, Volume= 0.134 af, Depth= 3.18"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.504	69	Pasture/grassland/range, Fair, HSG B
0.504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	72	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	186	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.4	258	Total			

Summary for Subcatchment Area 50: Area 50

Runoff = 1.22 cfs @ 12.10 hrs, Volume= 0.059 af, Depth= 3.18"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.223	69	Pasture/grassland/range, Fair, HSG B
0.223		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	157	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	62	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
3.7	296	Total			

Summary for Subcatchment Area 51: Area 51

Runoff = 3.35 cfs @ 12.12 hrs, Volume= 0.174 af, Depth= 3.18"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.655	69	Pasture/grassland/range, Fair, HSG B
0.655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	11	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	314	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
0.3	217	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
5.0	642	Total			

Summary for Subcatchment Area 52: Area 52

Runoff = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af, Depth= 3.18"
Routed to Link F5A : Flume 5A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.237	69	Pasture/grassland/range, Fair, HSG B
0.237		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	83	0.2500	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	138	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	127	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.0	348	Total			

Summary for Subcatchment Area 53: Area 53

Runoff = 2.50 cfs @ 12.11 hrs, Volume= 0.126 af, Depth= 3.18"
Routed to Link F5B : Flume 5B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.475	69	Pasture/grassland/range, Fair, HSG B
0.475		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	90	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	219	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.2	116	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
4.5	425	Total			

Summary for Subcatchment Area 54: Area 54

Runoff = 5.93 cfs @ 12.11 hrs, Volume= 0.300 af, Depth= 2.23"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.079	69	Pasture/grassland/range, Fair, HSG B
0.539	39	Pasture/grassland/range, Good, HSG A
1.618	59	Weighted Average
1.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	237	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.3	70	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.2	384	Total			

Summary for Subcatchment Area 55: Area 55

Runoff = 2.95 cfs @ 12.11 hrs, Volume= 0.147 af, Depth= 2.13"
Routed to Reach S2.2 : Swale S2.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.520	69	Pasture/grassland/range, Fair, HSG B
0.306	39	Pasture/grassland/range, Good, HSG A
0.826	58	Weighted Average
0.826		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	26	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	126	Total			

Summary for Subcatchment Area 56: Area 56

Runoff = 6.17 cfs @ 12.13 hrs, Volume= 0.325 af, Depth= 3.18"
Routed to Link F4B : Flume 4B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.228	69	Pasture/grassland/range, Fair, HSG B
1.228		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	6	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	541	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
5.7	647	Total			

Summary for Subcatchment Area 57: Area 57

Runoff = 3.79 cfs @ 12.11 hrs, Volume= 0.194 af, Depth= 2.13"
Routed to Reach S4.1 : Swale S4.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.526	39	Pasture/grassland/range, Good, HSG A
0.405	69	Pasture/grassland/range, Fair, HSG B
0.158	96	Gravel surface, HSG A
1.089	58	Weighted Average
1.089		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	80	0.2000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	20	0.0500	1.34		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	10	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	48	0.0625	1.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	158	Total			

Summary for Subcatchment Area 58: Area 58

Runoff = 4.33 cfs @ 12.11 hrs, Volume= 0.221 af, Depth= 2.23"
Routed to Reach S4.2 : Swale S4.2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.580	39	Pasture/grassland/range, Good, HSG A
0.433	69	Pasture/grassland/range, Fair, HSG B
0.181	96	Gravel surface, HSG B
1.194	59	Weighted Average
1.194		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	121	0.2314	3.37		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	221	Total			

Summary for Subcatchment Area 59: Area 59

Runoff = 6.17 cfs @ 12.12 hrs, Volume= 0.330 af, Depth= 1.78"
Routed to Reach S4.3 : Swale S4.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.134	39	Pasture/grassland/range, Good, HSG A
1.086	69	Pasture/grassland/range, Fair, HSG B
2.220	54	Weighted Average
2.220		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.8	140	0.1857	3.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	240	Total			

Summary for Subcatchment Area 6: Area 6

Runoff = 4.72 cfs @ 12.12 hrs, Volume= 0.248 af, Depth= 3.18"
Routed to Link F6A : Flume 6A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.936	69	Pasture/grassland/range, Fair, HSG B
0.936		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	100	0.2070	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.0	395	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
5.3	541	Total			

Summary for Subcatchment Area 60: Area 60

Runoff = 8.43 cfs @ 12.12 hrs, Volume= 0.441 af, Depth= 2.13"
Routed to Reach S4.4 : Swale S4.4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.939	39	Pasture/grassland/range, Good, HSG A
1.537	69	Pasture/grassland/range, Fair, HSG B
2.476	58	Weighted Average
2.476		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.9	163	0.1718	2.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	263	Total			

Summary for Subcatchment Area 61: Area 61

Runoff = 4.54 cfs @ 12.11 hrs, Volume= 0.238 af, Depth= 1.70"
Routed to Reach S4.5 : Swale S4.5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.898	39	Pasture/grassland/range, Good, HSG A
0.785	69	Pasture/grassland/range, Fair, HSG B
1.683	53	Weighted Average
1.683		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	100	0.2345	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	46	0.2345	3.39		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	146	Total			

Summary for Subcatchment Area 62: Area 62

Runoff = 1.18 cfs @ 12.39 hrs, Volume= 0.150 af, Depth= 0.90"
Routed to Reach S4.6 : Swale S4.6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.871	39	Pasture/grassland/range, Good, HSG A
0.000	96	Gravel surface, HSG A
0.130	96	Gravel surface, HSG A
2.001	43	Weighted Average
2.001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	100	0.0074	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
4.7	169	0.0074	0.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	49	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.8	318	Total			

Summary for Subcatchment Area 63: Area 63

Runoff = 0.97 cfs @ 12.21 hrs, Volume= 0.114 af, Depth= 0.63"
Routed to Reach S2.3 : Swale S2.3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.177	39	Pasture/grassland/range, Good, HSG A
2.177		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	66	0.0303	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.6	34	0.2500	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	49	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	149	Total			

Summary for Subcatchment Area 64: Area 64

Runoff = 1.14 cfs @ 12.16 hrs, Volume= 0.071 af, Depth= 1.44"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.479	39	Pasture/grassland/range, Good, HSG A
0.115	96	Gravel surface, HSG A
0.594	50	Weighted Average
0.594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0544	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.5	47	0.0544	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.6	147	Total			

Summary for Subcatchment Area 65: Area 65

Runoff = 14.43 cfs @ 12.04 hrs, Volume= 0.799 af, Depth= 6.35"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.509	98	Water Surface, HSG A
1.509		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment Area 66: Area 66

Runoff = 2.36 cfs @ 12.21 hrs, Volume= 0.273 af, Depth= 0.63"
Routed to Pond Sed Pond : Sedimentation Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
5.227	39	Pasture/grassland/range, Good, HSG A
5.227		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.0933	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	25	0.2500	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	10	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	381	0.0265	7.85	109.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.8	162	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	48	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.9	701	Total			

Summary for Subcatchment Area 67: Area 67

Runoff = 1.99 cfs @ 12.64 hrs, Volume= 0.304 af, Depth= 1.20"
Routed to Reach RD1 : Roadside Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
2.616	39	Pasture/grassland/range, Good, HSG A
0.039	69	Pasture/grassland/range, Fair, HSG B
0.380	96	Gravel surface, HSG A
3.035	47	Weighted Average
3.035		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0068	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
22.7	786	0.0068	0.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	886	Total			

Summary for Subcatchment Area 68: Area 68

Runoff = 0.26 cfs @ 12.11 hrs, Volume= 0.017 af, Depth= 0.83"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.227	39	Pasture/grassland/range, Good, HSG A
0.024	69	Pasture/grassland/range, Fair, HSG B
0.251	42	Weighted Average
0.251		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.1154	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 69: Area 69

Runoff = 1.50 cfs @ 12.11 hrs, Volume= 0.086 af, Depth= 1.13"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.695	39	Pasture/grassland/range, Good, HSG A
0.218	69	Pasture/grassland/range, Fair, HSG B
0.913	46	Weighted Average
0.913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	86	0.2326	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 7: Area 7

Runoff = 4.85 cfs @ 12.14 hrs, Volume= 0.261 af, Depth= 3.18"
Routed to Link F4A : Flume 4A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
0.986	69	Pasture/grassland/range, Fair, HSG B
0.986		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	31	0.1000	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.8	69	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	9	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	419	0.0200	4.80	23.38	**Trap/Vee/Rect Channel Flow, Existing Diversion Berm** Bot.W=0.00' D=1.18' Z= 4.0 & 3.0 '/' Top.W=8.26' n= 0.030 Earth, grassed & winding
0.1	80	0.2500	12.26	441.43	**Trap/Vee/Rect Channel Flow, Riprap Flume** Bot.W=12.00' D=2.00' Z= 3.0 '/' Top.W=24.00' n= 0.078 Riprap, 12-inch
6.6	608	Total			

Summary for Subcatchment Area 70: Area 70

Runoff = 3.98 cfs @ 12.11 hrs, Volume= 0.213 af, Depth= 1.53"
Routed to Reach RD4 : Roadside Ditch 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
1.016	39	Pasture/grassland/range, Good, HSG A
0.620	69	Pasture/grassland/range, Fair, HSG B
0.035	96	Gravel surface, HSG A
1.671	51	Weighted Average
1.671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	26	0.1538	2.75		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	126	Total			

Summary for Subcatchment Area 71: Area 71

Runoff = 5.65 cfs @ 12.32 hrs, Volume= 0.684 af, Depth= 0.83"
Routed to Pond N : North Infiltration Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (ac)	CN	Description
9.360	39	Pasture/grassland/range, Good, HSG A
0.515	96	Gravel surface, HSG A
9.875	42	Weighted Average
9.875		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	1,137	0.0193	4.31	32.30	**Trap/Vee/Rect Channel Flow, Roadside Ditch** Bot.W=0.00' D=1.00' Z= 5.0 & 10.0 '/' Top.W=15.00' n= 0.030
16.6	1,337	Total			

Summary for Subcatchment Area 8: Area 8

Runoff = 4.50 cfs @ 12.10 hrs, Volume= 0.216 af, Depth= 3.18"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
35,545	69	Pasture/grassland/range, Fair, HSG B
35,545		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	59	0.1695	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	289	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
3.6	348	Total			

Summary for Subcatchment Area 9: Area 9

Runoff = 1.44 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 3.18"
Routed to Link F7A : Flume 7A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
10,716	69	Pasture/grassland/range, Fair, HSG B
10,716		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	48	0.2500	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.2	96	0.0200	6.74	80.87	**Trap/Vee/Rect Channel Flow, Diversion Berm** Bot.W=0.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
2.3	144	Total			

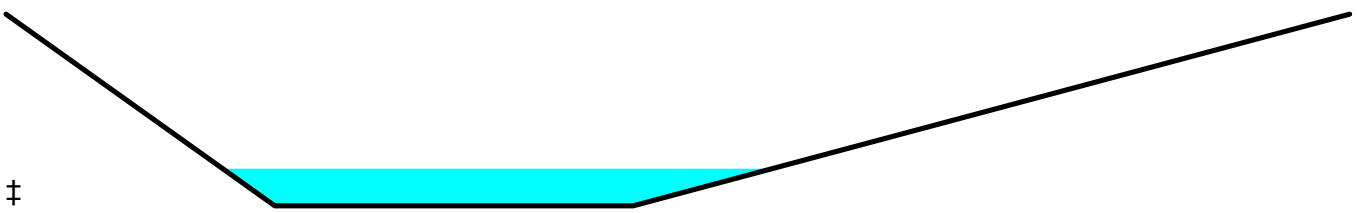
Summary for Reach RD1: Roadside Ditch 1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-yr, 24-hr event
Inflow = 1.99 cfs @ 12.64 hrs, Volume= 0.304 af
Outflow = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af, Atten= 1%, Lag= 6.5 min
Routed to Link C1 : Culvert C1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.00 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 9.2 min

Peak Storage= 434 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 6.14'
Bank-Full Depth= 1.00' Flow Area= 9.5 sf, Capacity= 47.16 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 8.0 '/' Top Width= 15.00'
Length= 440.6' Slope= 0.0188 '/'
Inlet Invert= 824.00', Outlet Invert= 815.70'



‡

Summary for Reach RD2: Roadside Ditch 2

Inflow Area = 7.576 ac, 0.00% Impervious, Inflow Depth = 2.29" for 100-yr, 24-hr event
Inflow = 19.31 cfs @ 12.19 hrs, Volume= 1.445 af
Outflow = 17.96 cfs @ 12.25 hrs, Volume= 1.445 af, Atten= 7%, Lag= 3.9 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.14 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 7.9 min

Peak Storage= 2,519 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.52' , Surface Width= 16.40'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 72.77 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 433.0' Slope= 0.0162 '/'
Inlet Invert= 814.55', Outlet Invert= 807.54'

‡

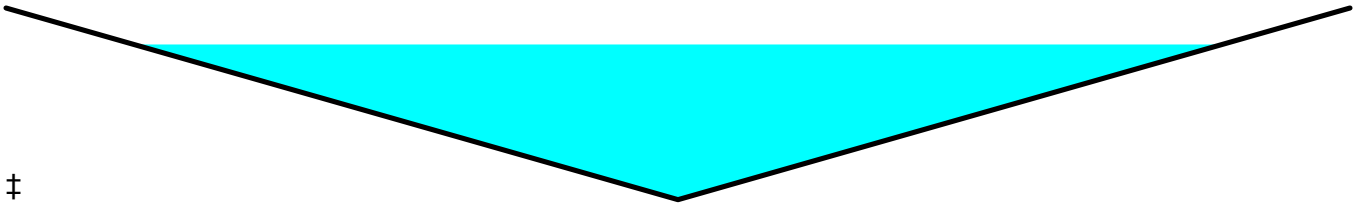
Summary for Reach RD3: Roadside Ditch 3

Inflow Area = 2.159 ac, 0.00% Impervious, Inflow Depth = 3.69" for 100-yr, 24-hr event
Inflow = 13.48 cfs @ 12.10 hrs, Volume= 0.663 af
Outflow = 11.77 cfs @ 12.19 hrs, Volume= 0.663 af, Atten= 13%, Lag= 5.2 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.50 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 1.47 fps, Avg. Travel Time= 9.3 min

Peak Storage= 2,151 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.81' , Surface Width= 6.48'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 20.76 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 821.0' Slope= 0.0288 '/'
Inlet Invert= 841.47', Outlet Invert= 817.83'



‡

Summary for Reach RD4: Roadside Ditch 4

Inflow Area = 1.671 ac, 0.00% Impervious, Inflow Depth = 1.53" for 100-yr, 24-hr event
Inflow = 3.98 cfs @ 12.11 hrs, Volume= 0.213 af
Outflow = 2.99 cfs @ 12.26 hrs, Volume= 0.213 af, Atten= 25%, Lag= 9.0 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 18.6 min

Peak Storage= 991 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 10.77'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 54.26 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 495.6' Slope= 0.0090 '/'
Inlet Invert= 812.00', Outlet Invert= 807.54'

‡

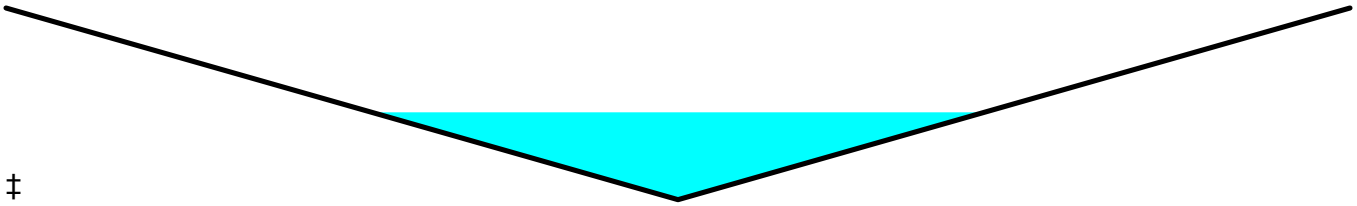
Summary for Reach RD5: Roadside Ditch 5

Inflow Area = 0.616 ac, 0.00% Impervious, Inflow Depth = 3.48" for 100-yr, 24-hr event
Inflow = 3.67 cfs @ 12.10 hrs, Volume= 0.179 af
Outflow = 3.30 cfs @ 12.14 hrs, Volume= 0.179 af, Atten= 10%, Lag= 2.2 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.14 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 3.2 min

Peak Storage= 238 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 3.64'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 28.18 cfs

0.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 288.0' Slope= 0.0531 '/'
Inlet Invert= 841.47', Outlet Invert= 826.18'



‡

Summary for Reach S1.1: Swale S1.1

Inflow Area = 1.185 ac, 0.00% Impervious, Inflow Depth = 2.79" for 100-yr, 24-hr event
Inflow = 5.57 cfs @ 12.11 hrs, Volume= 0.275 af
Outflow = 4.95 cfs @ 12.16 hrs, Volume= 0.275 af, Atten= 11%, Lag= 3.2 min
Routed to Link C10 : Culvert C10

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.87 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 6.7 min

Peak Storage= 581 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 9.64'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 338.34 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 321.0' Slope= 0.0319 '/'
Inlet Invert= 825.20', Outlet Invert= 814.96'

‡

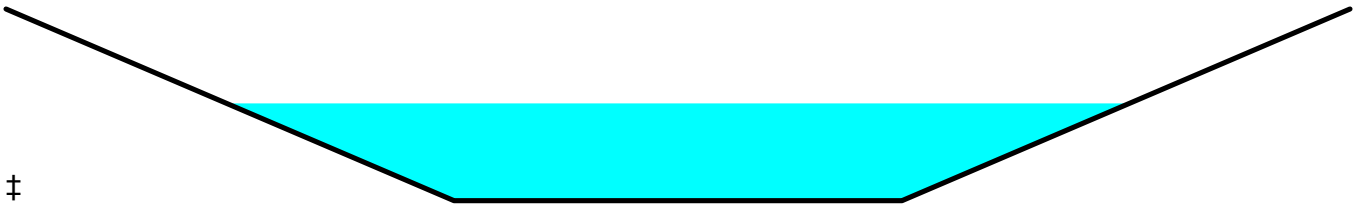
Summary for Reach S1.2: Swale S1.2

Inflow Area = 11.287 ac, 0.00% Impervious, Inflow Depth = 3.06" for 100-yr, 24-hr event
Inflow = 52.19 cfs @ 12.14 hrs, Volume= 2.880 af
Outflow = 49.91 cfs @ 12.16 hrs, Volume= 2.880 af, Atten= 4%, Lag= 1.2 min
Routed to Link C3 : Culvert C3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.24 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 2.9 min

Peak Storage= 2,484 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.02' , Surface Width= 16.13'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 196.86 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 202.8' Slope= 0.0108 '/'
Inlet Invert= 813.36', Outlet Invert= 811.17'



‡

Summary for Reach S1.3: Swale S1.3

Inflow Area = 14.199 ac, 0.00% Impervious, Inflow Depth = 3.00" for 100-yr, 24-hr event
Inflow = 61.05 cfs @ 12.15 hrs, Volume= 3.550 af
Outflow = 60.33 cfs @ 12.15 hrs, Volume= 3.550 af, Atten= 1%, Lag= 0.4 min
Routed to Link C4 : Culvert C4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.92 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 0.9 min

Peak Storage= 895 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.03' , Surface Width= 16.20'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 227.36 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 72.2' Slope= 0.0144 '/'
Inlet Invert= 810.90', Outlet Invert= 809.86'

‡

Summary for Reach S1.4: Swale S1.4

Inflow Area = 14.938 ac, 0.00% Impervious, Inflow Depth = 2.95" for 100-yr, 24-hr event
Inflow = 62.44 cfs @ 12.15 hrs, Volume= 3.671 af
Outflow = 59.56 cfs @ 12.18 hrs, Volume= 3.671 af, Atten= 5%, Lag= 1.4 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.24 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 2.7 min

Peak Storage= 2,814 cf @ 12.16 hrs
Average Depth at Peak Storage= 1.40' , Surface Width= 19.19'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 126.50 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 148.0' Slope= 0.0045 '/'
Inlet Invert= 809.60', Outlet Invert= 808.94'

‡

Summary for Reach S1.5: Swale S1.5

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af
Outflow = 3.33 cfs @ 12.21 hrs, Volume= 0.204 af, Atten= 8%, Lag= 3.8 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.35 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 8.2 min

Peak Storage= 448 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 10.19'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 134.06 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 179.7' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.95'

‡

Summary for Reach S1.6: Swale S1.6

Inflow Area = 17.290 ac, 0.00% Impervious, Inflow Depth = 2.97" for 100-yr, 24-hr event
Inflow = 69.21 cfs @ 12.18 hrs, Volume= 4.277 af
Outflow = 66.73 cfs @ 12.21 hrs, Volume= 4.277 af, Atten= 4%, Lag= 2.1 min
Routed to Link C5 : Culvert C5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.60 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 4.3 min

Peak Storage= 4,825 cf @ 12.20 hrs
Average Depth at Peak Storage= 1.41' , Surface Width= 19.25'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 139.68 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 252.0' Slope= 0.0054 '/'
Inlet Invert= 808.94', Outlet Invert= 807.57'

‡

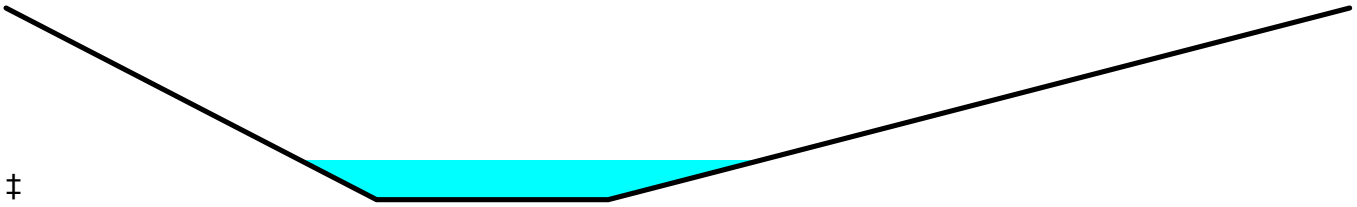
Summary for Reach S1.7: Swale S1.7

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 3.38" for 100-yr, 24-hr event
Inflow = 3.63 cfs @ 12.15 hrs, Volume= 0.201 af
Outflow = 3.32 cfs @ 12.20 hrs, Volume= 0.201 af, Atten= 9%, Lag= 3.3 min
Routed to Reach S1.6 : Swale S1.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.20 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 6.5 min

Peak Storage= 380 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 4.98'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 90.14 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 245.8' Slope= 0.0099 '/'
Inlet Invert= 810.00', Outlet Invert= 807.57'



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Summary for Reach S1.8: Swale S1.8

Inflow Area = 20.082 ac, 0.00% Impervious, Inflow Depth = 2.89" for 100-yr, 24-hr event
Inflow = 74.10 cfs @ 12.22 hrs, Volume= 4.838 af
Outflow = 70.85 cfs @ 12.27 hrs, Volume= 4.838 af, Atten= 4%, Lag= 3.2 min
Routed to Reach S2.1 : Swale S2.1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.09 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.09 fps, Avg. Travel Time= 6.5 min

Peak Storage= 7,485 cf @ 12.24 hrs
Average Depth at Peak Storage= 1.33' , Surface Width= 18.65'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 163.67 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 422.0' Slope= 0.0075 '/'
Inlet Invert= 807.15', Outlet Invert= 804.00'

‡

Summary for Reach S2.1: Swale S2.1

Inflow Area = 22.196 ac, 0.00% Impervious, Inflow Depth = 2.68" for 100-yr, 24-hr event
Inflow = 71.34 cfs @ 12.27 hrs, Volume= 4.949 af
Outflow = 68.62 cfs @ 12.32 hrs, Volume= 4.949 af, Atten= 4%, Lag= 3.2 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.72 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 5.9 min

Peak Storage= 7,331 cf @ 12.29 hrs
Average Depth at Peak Storage= 1.73' , Surface Width= 17.82'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 97.05 cfs

4.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 20.00'
Length= 389.0' Slope= 0.0054 '/'
Inlet Invert= 806.10', Outlet Invert= 804.00'

‡

Summary for Reach S2.2: Swale S2.2

Inflow Area = 39.450 ac, 0.00% Impervious, Inflow Depth = 2.90" for 100-yr, 24-hr event
Inflow = 120.78 cfs @ 12.27 hrs, Volume= 9.518 af
Outflow = 118.35 cfs @ 12.32 hrs, Volume= 9.518 af, Atten= 2%, Lag= 3.1 min
Routed to Reach S2.3 : Swale S2.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.96 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 6.7 min

Peak Storage= 12,407 cf @ 12.29 hrs
Average Depth at Peak Storage= 1.77' , Surface Width= 24.15'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 152.61 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 411.0' Slope= 0.0049 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S2.3: Swale S2.3

Inflow Area = 43.245 ac, 0.00% Impervious, Inflow Depth = 2.76" for 100-yr, 24-hr event
Inflow = 120.84 cfs @ 12.32 hrs, Volume= 9.932 af
Outflow = 119.37 cfs @ 12.35 hrs, Volume= 9.932 af, Atten= 1%, Lag= 1.7 min
Routed to Link C7 : Culvert C7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.64 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.45 fps, Avg. Travel Time= 3.5 min

Peak Storage= 6,544 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.38' , Surface Width= 21.00'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 249.72 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 307.0' Slope= 0.0130 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S3.1: Swale S3.1

Inflow Area = 2.044 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 11.02 cfs @ 12.10 hrs, Volume= 0.542 af
Outflow = 9.75 cfs @ 12.19 hrs, Volume= 0.542 af, Atten= 12%, Lag= 5.2 min
Routed to Reach S3.2 : Swale S3.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.94 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 12.5 min

Peak Storage= 1,797 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.50' , Surface Width= 12.02'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.76 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 357.0' Slope= 0.0050 '/'
Inlet Invert= 809.85', Outlet Invert= 808.07'

‡

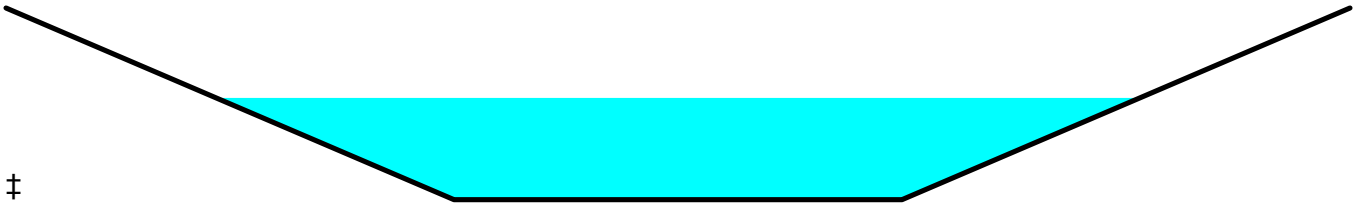
Summary for Reach S3.2: Swale S3.2

Inflow Area = 8.141 ac, 0.00% Impervious, Inflow Depth = 3.19" for 100-yr, 24-hr event
Inflow = 38.61 cfs @ 12.12 hrs, Volume= 2.162 af
Outflow = 37.80 cfs @ 12.13 hrs, Volume= 2.162 af, Atten= 2%, Lag= 0.5 min
Routed to Reach S3.3 : Swale S3.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.93 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 0.8 min

Peak Storage= 442 cf @ 12.12 hrs
Average Depth at Peak Storage= 1.06' , Surface Width= 16.50'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 133.95 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 34.0' Slope= 0.0050 '/'
Inlet Invert= 798.00', Outlet Invert= 797.83'



‡

Summary for Reach S3.3: Swale S3.3

Inflow Area = 8.141 ac, 0.00% Impervious, Inflow Depth = 3.19" for 100-yr, 24-hr event
Inflow = 37.80 cfs @ 12.13 hrs, Volume= 2.162 af
Outflow = 36.67 cfs @ 12.15 hrs, Volume= 2.162 af, Atten= 3%, Lag= 1.5 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.12 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 3.2 min

Peak Storage= 1,839 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.82' , Surface Width= 14.53'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 215.99 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 200.0' Slope= 0.0130 '/'
Inlet Invert= 808.00', Outlet Invert= 805.40'

‡

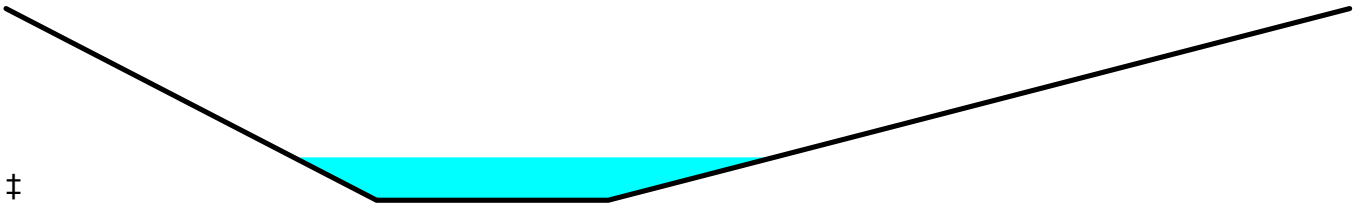
Summary for Reach S3.4: Swale S3.4

Inflow Area = 0.769 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.63 cfs @ 12.15 hrs, Volume= 0.204 af
Outflow = 3.29 cfs @ 12.22 hrs, Volume= 0.204 af, Atten= 9%, Lag= 4.3 min
Routed to Link C6 : Culvert C6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.95 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 8.3 min

Peak Storage= 487 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.45' , Surface Width= 5.19'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 76.21 cfs

2.50' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 4.0 '/' Top Width= 14.50'
Length= 283.0' Slope= 0.0071 '/'
Inlet Invert= 810.00', Outlet Invert= 808.00'



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Summary for Reach S3.5: Swale S3.5

Inflow Area = 15.716 ac, 0.00% Impervious, Inflow Depth = 3.23" for 100-yr, 24-hr event
Inflow = 68.29 cfs @ 12.15 hrs, Volume= 4.234 af
Outflow = 64.19 cfs @ 12.21 hrs, Volume= 4.234 af, Atten= 6%, Lag= 3.7 min
Routed to Reach S2.2 : Swale S2.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.63 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 7.8 min

Peak Storage= 7,904 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.68' , Surface Width= 21.48'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 93.14 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 318.5' Slope= 0.0024 '/'
Inlet Invert= 804.76', Outlet Invert= 803.99'

‡

Summary for Reach S4.1: Swale S4.1

Inflow Area = 1.364 ac, 0.00% Impervious, Inflow Depth = 2.35" for 100-yr, 24-hr event
Inflow = 5.28 cfs @ 12.10 hrs, Volume= 0.267 af
Outflow = 4.68 cfs @ 12.16 hrs, Volume= 0.267 af, Atten= 11%, Lag= 3.3 min
Routed to Reach S4.2 : Swale S4.2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.07 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 8.0 min

Peak Storage= 556 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 11.51'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 70.22 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 240.0' Slope= 0.0153 '/'
Inlet Invert= 811.94', Outlet Invert= 808.26'

‡

Summary for Reach S4.2: Swale S4.2

Inflow Area = 3.174 ac, 0.00% Impervious, Inflow Depth = 2.52" for 100-yr, 24-hr event
Inflow = 11.92 cfs @ 12.14 hrs, Volume= 0.667 af
Outflow = 11.06 cfs @ 12.18 hrs, Volume= 0.667 af, Atten= 7%, Lag= 2.8 min
Routed to Reach S4.3 : Swale S4.3

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.70 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 7.0 min

Peak Storage= 1,118 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 12.66'
Bank-Full Depth= 1.00' Flow Area= 13.5 sf, Capacity= 63.88 cfs

10.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 17.00'
Length= 259.3' Slope= 0.0127 '/'
Inlet Invert= 808.26', Outlet Invert= 804.97'

‡

Summary for Reach S4.3: Swale S4.3

Inflow Area = 9.483 ac, 0.00% Impervious, Inflow Depth = 2.63" for 100-yr, 24-hr event
Inflow = 36.14 cfs @ 12.14 hrs, Volume= 2.080 af
Outflow = 33.37 cfs @ 12.21 hrs, Volume= 2.080 af, Atten= 8%, Lag= 4.5 min
Routed to Reach S4.4 : Swale S4.4

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 11.3 min

Peak Storage= 5,406 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.08' , Surface Width= 17.57'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 108.12 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 362.9' Slope= 0.0027 '/'
Inlet Invert= 804.97', Outlet Invert= 804.00'

‡

Summary for Reach S4.4: Swale S4.4

Inflow Area = 14.158 ac, 0.00% Impervious, Inflow Depth = 2.63" for 100-yr, 24-hr event
Inflow = 45.34 cfs @ 12.17 hrs, Volume= 3.104 af
Outflow = 43.47 cfs @ 12.26 hrs, Volume= 3.104 af, Atten= 4%, Lag= 5.4 min
Routed to Reach S4.5 : Swale S4.5

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.82 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 12.3 min

Peak Storage= 7,633 cf @ 12.21 hrs
Average Depth at Peak Storage= 1.11' , Surface Width= 17.77'
Bank-Full Depth= 2.00' Flow Area= 34.0 sf, Capacity= 132.85 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 24.00'
Length= 495.6' Slope= 0.0040 '/'
Inlet Invert= 804.00', Outlet Invert= 802.00'

‡

Summary for Reach S4.5: Swale S4.5

Inflow Area = 16.268 ac, 0.00% Impervious, Inflow Depth = 2.55" for 100-yr, 24-hr event
Inflow = 45.91 cfs @ 12.26 hrs, Volume= 3.454 af
Outflow = 44.58 cfs @ 12.31 hrs, Volume= 3.454 af, Atten= 3%, Lag= 3.1 min
Routed to Reach S4.6 : Swale S4.6

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.87 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 7.0 min

Peak Storage= 4,792 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.89' , Surface Width= 16.22'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 465.89 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 411.1' Slope= 0.0097 '/'
Inlet Invert= 802.00', Outlet Invert= 798.00'

‡

Summary for Reach S4.6: Swale S4.6

Inflow Area = 64.606 ac, 0.00% Impervious, Inflow Depth = 2.67" for 100-yr, 24-hr event
Inflow = 168.73 cfs @ 12.33 hrs, Volume= 14.356 af
Outflow = 165.72 cfs @ 12.38 hrs, Volume= 14.356 af, Atten= 2%, Lag= 2.6 min
Routed to Pond Sed Pond : Sedimentation Basin

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.02 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.58 fps, Avg. Travel Time= 5.7 min

Peak Storage= 14,984 cf @ 12.35 hrs
Average Depth at Peak Storage= 1.74' , Surface Width= 22.15'
Bank-Full Depth= 3.00' Flow Area= 61.5 sf, Capacity= 499.25 cfs

10.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 3.0 '/' Top Width= 31.00'
Length= 537.0' Slope= 0.0112 '/'
Inlet Invert= 798.00', Outlet Invert= 792.00'

‡

Summary for Reach S5.1: Swale S5.1

Inflow Area = 1.218 ac, 0.00% Impervious, Inflow Depth = 3.69" for 100-yr, 24-hr event
Inflow = 7.33 cfs @ 12.11 hrs, Volume= 0.374 af
Outflow = 6.57 cfs @ 12.20 hrs, Volume= 0.374 af, Atten= 10%, Lag= 5.2 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.49 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 12.7 min

Peak Storage= 1,277 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 10.33'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 235.22 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 478.0' Slope= 0.0154 '/'
Inlet Invert= 825.20', Outlet Invert= 817.83'

‡

Summary for Pond C8: Culvert C8

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Outflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.1 min
Primary = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Routed to Reach S4.1 : Swale S4.1

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 811.38' @ 12.08 hrs Surf.Area= 0.000 ac Storage= 0.000 af
Flood Elev= 819.00' Surf.Area= 0.000 ac Storage= 0.001 af

Plug-Flow detention time= 0.2 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (817.4 - 817.3)

Volume	Invert	Avail.Storage	Storage Description
#1	810.70'	0.001 af	**3.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	810.70'	**12.0" Round Culvert** L= 85.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 810.70' / 808.60' S= 0.0245 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.49 cfs @ 12.08 hrs HW=811.35' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.49 cfs @ 2.75 fps)

Summary for Pond N: North Infiltration Area

Inflow Area = 19.122 ac, 0.00% Impervious, Inflow Depth = 1.47" for 100-yr, 24-hr event
Inflow = 26.07 cfs @ 12.26 hrs, Volume= 2.341 af
Outflow = 2.21 cfs @ 14.51 hrs, Volume= 2.341 af, Atten= 92%, Lag= 134.8 min
Primary = 2.21 cfs @ 14.51 hrs, Volume= 2.341 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 805.23' @ 14.51 hrs Surf.Area= 26,475 sf Storage= 49,470 cf

Plug-Flow detention time= 286.7 min calculated for 2.340 af (100% of inflow)
Center-of-Mass det. time= 286.7 min (1,155.0 - 868.3)

Volume	Invert	Avail.Storage	Storage Description
#1	802.00'	256,569 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
802.00	5,140	0	0
804.00	17,424	22,564	22,564
806.00	32,191	49,615	72,179
808.00	46,130	78,321	150,500
810.00	59,939	106,069	256,569

Device	Routing	Invert	Outlet Devices
#1	Primary	802.00'	**3.600 in/hr Exfiltration over Surface area**

Primary OutFlow Max=2.21 cfs @ 14.51 hrs HW=805.23' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 2.21 cfs)

Summary for Pond Sed Pond: Sedimentation Basin

Inflow Area = 71.936 ac, 2.10% Impervious, Inflow Depth = 2.59" for 100-yr, 24-hr event
Inflow = 169.96 cfs @ 12.38 hrs, Volume= 15.500 af
Outflow = 83.78 cfs @ 12.65 hrs, Volume= 15.500 af, Atten= 51%, Lag= 16.6 min
Discarded = 5.91 cfs @ 12.65 hrs, Volume= 7.233 af
Primary = 11.51 cfs @ 12.65 hrs, Volume= 5.165 af
Routed to Link Wetland : Wetland
Secondary = 31.49 cfs @ 12.65 hrs, Volume= 2.330 af
Routed to Link Wetland : Wetland
Tertiary = 34.88 cfs @ 12.65 hrs, Volume= 0.772 af
Routed to Link Wetland : Wetland

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 793.20' @ 12.65 hrs Surf.Area= 70,892 sf Storage= 245,676 cf
Flood Elev= 794.00' Surf.Area= 75,797 sf Storage= 304,443 cf

Plug-Flow detention time= 158.5 min calculated for 15.489 af (100% of inflow)
Center-of-Mass det. time= 158.5 min (1,005.3 - 846.8)

Volume	Invert	Avail.Storage	Storage Description
#1	789.00'	304,443 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
789.00	27,325	0	0
790.00	55,972	41,649	41,649
791.00	61,532	58,752	100,401
792.00	65,703	63,618	164,018
793.00	69,675	67,689	231,707
794.00	75,797	72,736	304,443

Device	Routing	Invert	Outlet Devices
#1	Primary	787.70'	**15.0" Round Culvert** L= 40.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 787.70' / 787.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	791.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	790.50'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#4	Device 1	790.00'	**0.8" Vert. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#5	Device 1	789.00'	**0.5" Vert. Orifice/Grate X 14.00 columns** X 6 rows with 6.0" cc spacing C= 0.600

			Limited to weir flow at low heads
#6	Secondary	792.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#7	Tertiary	793.00'	**158.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#8	Discarded	789.00'	**3.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=5.91 cfs @ 12.65 hrs HW=793.20' (Free Discharge)
└**8=Exfiltration** (Exfiltration Controls 5.91 cfs)

Primary OutFlow Max=11.51 cfs @ 12.65 hrs HW=793.20' (Free Discharge)
└**1=Culvert** (Inlet Controls 11.51 cfs @ 9.38 fps)
- **2=Orifice/Grate** (Passes < 35.04 cfs potential flow)
- **3=Orifice/Grate** (Passes < 0.11 cfs potential flow)
- **4=Orifice/Grate** (Passes < 0.12 cfs potential flow)
- **5=Orifice/Grate** (Passes < 0.93 cfs potential flow)

Secondary OutFlow Max=31.42 cfs @ 12.65 hrs HW=793.20' (Free Discharge)
└**6=Broad-Crested Rectangular Weir** (Weir Controls 31.42 cfs @ 2.25 fps)

Tertiary OutFlow Max=34.62 cfs @ 12.65 hrs HW=793.20' (Free Discharge)
└**7=Broad-Crested Rectangular Weir** (Weir Controls 34.62 cfs @ 1.11 fps)

Summary for Link C1: Culvert C1

Inflow Area = 3.035 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-yr, 24-hr event
Inflow = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af
Primary = 1.96 cfs @ 12.74 hrs, Volume= 0.304 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C10: Culvert C10

Inflow Area = 1.185 ac, 0.00% Impervious, Inflow Depth = 2.79" for 100-yr, 24-hr event
Inflow = 4.95 cfs @ 12.16 hrs, Volume= 0.275 af
Primary = 4.95 cfs @ 12.16 hrs, Volume= 0.275 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C2: Culvert C2

Inflow Area = 3.377 ac, 0.00% Impervious, Inflow Depth = 3.69" for 100-yr, 24-hr event
Inflow = 18.32 cfs @ 12.19 hrs, Volume= 1.038 af
Primary = 18.32 cfs @ 12.19 hrs, Volume= 1.038 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C3: Culvert C3

Inflow Area = 11.287 ac, 0.00% Impervious, Inflow Depth = 3.06" for 100-yr, 24-hr event
Inflow = 49.91 cfs @ 12.16 hrs, Volume= 2.880 af
Primary = 49.91 cfs @ 12.16 hrs, Volume= 2.880 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C4: Culvert C4

Inflow Area = 14.199 ac, 0.00% Impervious, Inflow Depth = 3.00" for 100-yr, 24-hr event
Inflow = 60.33 cfs @ 12.15 hrs, Volume= 3.550 af
Primary = 60.33 cfs @ 12.15 hrs, Volume= 3.550 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.4 : Swale S1.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C5: Culvert C5

Inflow Area = 17.290 ac, 0.00% Impervious, Inflow Depth = 2.97" for 100-yr, 24-hr event
Inflow = 66.73 cfs @ 12.21 hrs, Volume= 4.277 af
Primary = 66.73 cfs @ 12.21 hrs, Volume= 4.277 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.8 : Swale S1.8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C6: Culvert C6

Inflow Area = 11.990 ac, 0.00% Impervious, Inflow Depth = 3.19" for 100-yr, 24-hr event
Inflow = 53.57 cfs @ 12.14 hrs, Volume= 3.184 af
Primary = 53.57 cfs @ 12.14 hrs, Volume= 3.184 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.5 : Swale S3.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C7: Culvert C7

Inflow Area = 46.337 ac, 0.00% Impervious, Inflow Depth = 2.78" for 100-yr, 24-hr event
Inflow = 123.92 cfs @ 12.34 hrs, Volume= 10.752 af
Primary = 123.92 cfs @ 12.34 hrs, Volume= 10.752 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.6 : Swale S4.6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link C9: Culvert C9

Inflow Area = 9.247 ac, 0.00% Impervious, Inflow Depth = 2.15" for 100-yr, 24-hr event
Inflow = 20.94 cfs @ 12.26 hrs, Volume= 1.658 af
Primary = 20.94 cfs @ 12.26 hrs, Volume= 1.658 af, Atten= 0%, Lag= 0.0 min
Routed to Pond N : North Infiltration Area

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F10: Flume 10

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af
Primary = 1.60 cfs @ 12.08 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Routed to Pond C8 : Culvert C8

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1A: Flume 1A

Inflow Area = 1.853 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 9.08 cfs @ 12.13 hrs, Volume= 0.491 af
Primary = 9.08 cfs @ 12.13 hrs, Volume= 0.491 af, Atten= 0%, Lag= 0.0 min
Routed to Link F1B : Flume 1B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F1B: Flume 1B

Inflow Area = 4.089 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 20.35 cfs @ 12.13 hrs, Volume= 1.084 af
Primary = 20.35 cfs @ 12.13 hrs, Volume= 1.084 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.3 : Swale S4.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2A: Flume 2A

Inflow Area = 0.636 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.34 cfs @ 12.11 hrs, Volume= 0.169 af
Primary = 3.34 cfs @ 12.11 hrs, Volume= 0.169 af, Atten= 0%, Lag= 0.0 min
Routed to Link F2B : Flume 2B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F2B: Flume 2B

Inflow Area = 2.199 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 11.13 cfs @ 12.12 hrs, Volume= 0.583 af
Primary = 11.13 cfs @ 12.12 hrs, Volume= 0.583 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.4 : Swale S4.4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F3: Flume 3

Inflow Area = 0.427 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af
Primary = 2.33 cfs @ 12.10 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S4.5 : Swale S4.5

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4A: Flume 4A

Inflow Area = 1.209 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 5.87 cfs @ 12.13 hrs, Volume= 0.320 af
Primary = 5.87 cfs @ 12.13 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min
Routed to Link F4B : Flume 4B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F4B: Flume 4B

Inflow Area = 3.092 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 15.35 cfs @ 12.13 hrs, Volume= 0.820 af
Primary = 15.35 cfs @ 12.13 hrs, Volume= 0.820 af, Atten= 0%, Lag= 0.0 min
Routed to Link C7 : Culvert C7

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5A: Flume 5A

Inflow Area = 0.237 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af
Primary = 1.28 cfs @ 12.10 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min
Routed to Link F5B : Flume 5B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F5B: Flume 5B

Inflow Area = 0.712 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 3.77 cfs @ 12.11 hrs, Volume= 0.189 af
Primary = 3.77 cfs @ 12.11 hrs, Volume= 0.189 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S2.2 : Swale S2.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6A: Flume 6A

Inflow Area = 1.440 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 7.42 cfs @ 12.11 hrs, Volume= 0.382 af
Primary = 7.42 cfs @ 12.11 hrs, Volume= 0.382 af, Atten= 0%, Lag= 0.0 min
Routed to Link F6B : Flume 6B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F6B: Flume 6B

Inflow Area = 3.001 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 15.57 cfs @ 12.11 hrs, Volume= 0.795 af
Primary = 15.57 cfs @ 12.11 hrs, Volume= 0.795 af, Atten= 0%, Lag= 0.0 min
Routed to Link C6 : Culvert C6

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7A: Flume 7A

Inflow Area = 1.062 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 5.92 cfs @ 12.10 hrs, Volume= 0.281 af
Primary = 5.92 cfs @ 12.10 hrs, Volume= 0.281 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7B : Flume 7B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7B: Flume 7B

Inflow Area = 3.407 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 18.00 cfs @ 12.11 hrs, Volume= 0.903 af
Primary = 18.00 cfs @ 12.11 hrs, Volume= 0.903 af, Atten= 0%, Lag= 0.0 min
Routed to Link F7C : Flume 7C

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F7C: Flume 7C

Inflow Area = 5.640 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 29.56 cfs @ 12.11 hrs, Volume= 1.495 af
Primary = 29.56 cfs @ 12.11 hrs, Volume= 1.495 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S3.2 : Swale S3.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8A: Flume 8A

Inflow Area = 0.381 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 2.02 cfs @ 12.11 hrs, Volume= 0.101 af
Primary = 2.02 cfs @ 12.11 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min
Routed to Link F8B : Flume 8B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F8B: Flume 8B

Inflow Area = 1.497 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 7.88 cfs @ 12.11 hrs, Volume= 0.397 af
Primary = 7.88 cfs @ 12.11 hrs, Volume= 0.397 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.3 : Swale S1.3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9A: Flume 9A

Inflow Area = 2.445 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 11.65 cfs @ 12.15 hrs, Volume= 0.648 af
Primary = 11.65 cfs @ 12.15 hrs, Volume= 0.648 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9B : Flume 9B

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9B: Flume 9B

Inflow Area = 5.540 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 26.78 cfs @ 12.14 hrs, Volume= 1.468 af
Primary = 26.78 cfs @ 12.14 hrs, Volume= 1.468 af, Atten= 0%, Lag= 0.0 min
Routed to Link F9C : Flume 9C

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link F9C: Flume 9C

Inflow Area = 8.811 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 42.66 cfs @ 12.14 hrs, Volume= 2.335 af
Primary = 42.66 cfs @ 12.14 hrs, Volume= 2.335 af, Atten= 0%, Lag= 0.0 min
Routed to Reach S1.2 : Swale S1.2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link Wetland: Wetland

Inflow Area = 71.936 ac, 2.10% Impervious, Inflow Depth = 1.38" for 100-yr, 24-hr event
Inflow = 77.88 cfs @ 12.65 hrs, Volume= 8.267 af
Primary = 77.88 cfs @ 12.65 hrs, Volume= 8.267 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Swale Sizing

SCS ENGINEERS

		Sheet No:	1 of 3
		Calc. No.	
		Rev. No.	2
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Swale Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the proposed swales f to accommodate the 25-year, 24-hour storm event and determine required erosion matting.

References:

1. WisDOT Facilities Development Manual Chapter 13, Section 30-15 - Grass Lined Channels.
2. Design of Roadside Channels with Flexible Linings, HEC-15, USDOT FHWA.
3. HydroCAD Report: COL_Mod12-13_HydroCAD Report
4. Wisconsin Department of Natural Resources Conservation Practice Standard 1053 - Channel Erosion Mat.

Approach:

Use the HydroCAD Model results to obtain the peak flow during a 25-year, 24-hour storm event.

Use Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2 (from Reference #1) to size the swale for each design swale cross section. The WisDOT spreadsheet incorporates the design guidelines and equations described in "Design of Roadside Channels with Flexible Linings", HEC-15, USDOT FHWA (Reference #2).

Confirm the swale is stable and has enough capacity for the design flow rate.

Use Standard 1053 (see Reference #4) to select appropriate erosion control mat based on shear stress and application.

Assumptions:

1. Swales geometry shown on the drawing set.
2. Assume the following parameters per Section 15.2 - Grass Lining Properties from Reference #1:
   - Vegetation Retardance Class = C for Swales
   - Vegetation Condition = Good
   - Vegetation Growth Form = Turf
3. Assume cohesive soil type with ASTM Soil Class SC and a Plasticity Index (PI) of 16.

Calculations:

From the HydroCAD Report, the 25-year, 24-hour peak discharge rates in the swales are

Swales:	25-year		25-year		25-year
Swale S1.1 =	3.1 cfs	**Swale S2.1 =**	39.6 cfs	**Swale S3.5 =**	39.6 cfs
Swale S1.2 =	30.3 cfs	**Swale S2.2 =**	65.6 cfs	**Swale S4.1 =**	2.7 cfs
Swale S1.3 =	34.7 cfs	**Swale S2.3 =**	65.5 cfs	**Swale S4.2 =**	6.3 cfs
Swale S1.4 =	35.1 cfs	**Swale S3.1 =**	6.5 cfs	**Swale S4.3 =**	19.2 cfs
Swale S1.5 =	2.1 cfs	**Swale S3.2 =**	22.3 cfs	**Swale S4.4 =**	22.5 cfs
Swale S1.6 =	39.2 cfs	**Swale S3.3 =**	21.8 cfs	**Swale S4.5 =**	22.6 cfs
Swale S1.7 =	2.2 cfs	**Swale S3.4 =**	2.1 cfs	**Swale S4.6 =**	89.3 cfs
Swale S1.8 =	41.3 cfs			**Swale S5.1 =**	4.6 cfs
Roadside Ditch 1 =	0.6 cfs	**Roadside Ditch 2 =**	11.2 cfs	**Roadside Ditch 3 =**	8.4 cfs
Roadside Ditch 4 =	1.5 cfs	**Roadside Ditch 5 =**	2.3 cfs		

Use the WisDOT Grass Swale Design Spreadsheet (Page 2) to determine the flow depth, velocity and shear stress in the swales.

Results:

The swales are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

The swales are stable at the design flow rates.

Use Class I, Type B erosion mat for all swales except Roadside Ditch 3 and 5 should be Class II, Type B if regraded.

Channel/Ditch Geometry	Swale S1.1 =	Swale S1.2 =	Swale S1.3 =	Swale S1.4 =	Swale S1.5 =	Swale S1.6 =	Swale S1.7 =	Swale S1.8 =	Swale S2.1 =	Swale S2.2 =	Swale S2.3 =	Swale S3.1 =	Swale S3.2 =	Swale S3.3 =	Swale S3.4 =	Swale S3.5 =	Swale S4.1 =	Swale S4.2 =	Swale S4.3 =	Swale S4.4 =	Swale S4.5 =	Swale S4.6 =	Swale S5.1 =	Roadside Ditch 1 =	Roadside Ditch 2 =	Roadside Ditch 3 =	Roadside Ditch 4 =	Roadside Ditch 5 =
Channel Slope, S_c (ft/ft)	0.0319	0.0108	0.0144	0.0045	0.0054	0.005	0.005	0.005	0.0054	0.0049	0.0130	0.0050	0.0050	0.0130	0.0071	0.0090	0.0153	0.0127	0.0027	0.0040	0.0097	0.0112	0.0154	0.0188	0.0162	0.0288	0.0090	0.0531
Channel Bottom Width, B (ft)	8	8	8	8	8	8	2.5	8	4	10	10	8	8	8	2.5	8	10	10	10	10	10	10	8	4	6	0	6	0
Channel Side Slope, z_l	4	4	4	4	4	4	2	4	4	4	4	4	4	4	2	4	4	4	4	4	4	4	4	3	10	4	10	4
Channel Side Slope, z_r	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	4	8	10	4	10	4
Flow Depth, d (ft) Solve iteratively	0.25	1.14	1.08	1.73	0.45	1.73	0.75	1.77	2.00	2.02	1.37	0.78	1.36	0.91	0.65	1.38	0.29	0.47	1.52	1.38	0.97	1.70	0.41	0.20	0.63	0.90	0.33	0.49
Safety Factor, SF	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Vegetation/Soil Parameters																												
Vegetation Retardance Class	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Vegetation Condition	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good	good
Vegetation Growth Form	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf	turf
Soil Type	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive	cohesive
D_{75} (in) (Set at 0.00 for cohesive soils)																												
ASTM Soil Class	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
Plasticity Index, PI	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Results Summary																												
Design Q (ft^3/s)	3.1	30.3	34.7	35.1	2.1	39.2	2.2	41.3	39.6	65.6	65.5	6.5	22.3	21.8	2.1	39.6	2.7	6.3	19.2	22.5	22.6	89.3	4.6	0.6	11.2	8.4	1.5	2.3
1. Swales geometry shown on the drawing se	3.2	30.4	35.0	35.6	2.2	39.5	2.2	41.3	39.5	65.3	65.3	6.6	22.4	21.8	2.1	39.6	2.8	6.3	19.5	22.2	23.0	90.0	4.6	0.6	11.4	8.4	1.5	2.3
Difference Between Design & Calc. Flow (%)	1.0%	0.4%	0.8%	1.3%	1.4%	0.7%	-1.4%	0.2%	-0.3%	-0.6%	-0.3%	0.8%	0.9%	0.2%	-0.4%	0.0%	0.4%	0.4%	1.5%	-1.1%	1.8%	0.8%	-0.2%	-1.5%	1.2%	-0.2%	-1.7%	0.4%
Stable (Yes or No)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Channel Parameters																												
Vegetation Height, h (ft)	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Grass Roughness Coefficient, C_k	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238	0.238
Cover Factor, C_f	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Noncohesive Soil																												
Soil Grain Roughness, n_s	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Permissible Soil Shear Stress, τ_s (lb/ft^2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cohesive Soil																												
Porosity, e	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Soil Coefficient 1, c_1	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700	1.0700
Soil Coefficient 2, c_2	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30	14.30
Soil Coefficient 3, c_3	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700	47.700
Soil Coefficient 4, c_4	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Soil Coefficient 5, c_5	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61	-0.61
Soil Coefficient 6, c_6	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Permissible Soil Shear Stress, τ_s (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Total Permissible Shear Stress, τ_c (lb/ft^2)	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Cross Sectional Area, A (ft^2)	2.250	14.318	13.306	25.812	4.410	25.812	3.563	26.692	24.000	36.522	21.208	8.674	18.278	10.592	2.893	18.658	3.194	5.473	23.286	20.465	12.993	27.115	3.952	0.989	7.749	3.240	3.069	0.960
Wetted Perimeter, P (ft)	10.06	17.40	16.91	22.27	11.71	22.27	7.27	22.60	20.49	26.66	21.30	14.43	19.21	15.50	6.63	19.38	12.11	13.42	21.07	20.05	17.07	22.39	11.38	6.19	18.66	7.42	12.63	4.04
Hydraulic Radius, R (ft)	0.224	0.823	0.787	1.159	0.377	1.159	0.490	1.181	1.171	1.370	0.996	0.601	0.951	0.683	0.436	0.963	0.264	0.408	1.105	1.021	0.761	1.211	0.347	0.160	0.415	0.437	0.243	0.238
Top Width, T (ft)	10.00	17.12	16.64	21.84	11.60	21.84	7.00	22.16	20.00	26.16	20.96	14.24	18.88	15.28	6.40	19.04	12.03	13.29	20.64	19.66	16.79	21.90	11.28	6.15	18.60	7.20	12.60	3.92
Hydraulic Depth, D (ft)	0.225	0.836	0.800	1.182	0.380	1.182	0.509	1.204	1.200	1.396	1.012	0.609	0.968	0.693	0.452	0.980	0.266	0.412	1.128	1.041	0.774	1.238	0.350	0.161	0.417	0.450	0.244	0.245
Froude Number (Q design)	0.520	0.409	0.518	0.224	0.141	0.248	0.150	0.249	0.264	0.267	0.540	0.171	0.220	0.436	0.193	0.377	0.295	0.317	0.139	0.187	0.355	0.526	0.344	0.267	0.400	0.683	0.174	0.838
Channel Shear Stress, τ_d (lb/ft^2)	0.45	0.55	0.71	0.33	0.13	0.36	0.15	0.37	0.39	0.42	0.81	0.19	0.30	0.55	0.19	0.54	0.25	0.32	0.19	0.25	0.46	0.85	0.33	0.19	0.42	0.78	0.14	0.79
Actual Sheer Stress, τ_d (lb/ft^2)	0.50	0.77	0.97	0.49	0.15	0.54	0.23	0.55	0.67	0.62	1.11	0.24	0.42	0.74	0.29	0.78	0.28	0.37	0.26	0.34	0.59	1.19	0.39	0.23	0.64	1.62	0.19	1.62
Mannings n	0.070	0.064	0.058	0.080	0.116	0.076	0.108	0.076	0.074	0.072	0.055	0.099	0.083	0.064	0.098	0.065	0.088	0.080	0.099	0.088	0.069	0.054	0.079	0.099	0.072	0.056	0.113	0.056
Average Velocity, V (ft/s)	1.39	2.12	2.61	1.36	0.49	1.52	0.61	1.55	1.65	1.80	3.09	0.75	1.22	2.05	0.74	2.12	0.86	1.15	0.82	1.10	1.74	3.29	1.16	0.62	1.45	2.60	0.50	2.34
Calculated Flow, Q (ft^3/s)	3.2	30.4	35.0	35.6	2.2	39.5	2.2	41.3	39.5	65.3	65.3	6.6	22.4	21.8	2.1	39.6	2.8	6.3	19.5	22.2	23.0	90.0	4.6	0.6	11.4	8.4	1.5	2.3
Difference Between Design & Calc. Flow (%)	1.0%	0.4%	0.8%	1.3%	1.4%	0.7%	-1.4%	0.2%	-0.3%	-0.6%	-0.3%	0.8%	0.9%	0.2%	-0.4%	0.0%	0.4%	0.4%	1.5%	-1.1%	1.8%	0.8%	-0.2%	-1.5%	1.2%	-0.2%	-1.7%	0.4%
Effective Shear on Soil Surface, τ_s (lb/ft^2)	0.003	0.005	0.007	0.002	0.000	0.002	0.001	0.002	0.003	0.003	0.009	0.001	0.002	0.005	0.001	0.005	0.001	0.001	0.001	0.001	0.003	0.010	0.002	0.001	0.003	0.013	0.000	0.013
Total Permissible Shear on Veg., $\tau_{c,veg}$ (lb/ft^2)	15.34	12.82	10.53	20.03	42.11	18.08	36.51	18.08	17.14	16.22	9.47	30.67	21.56	12.82	30.06	13.22	24.24	20.03	30.67	24.24	14.90	9.13	19.53	30.67	16.22	9.81	39.96	9.81
Stable (Y or N)	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Source: Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2

Channel Erosion Mat

(1053)

Wisconsin Department of Natural Resources
Conservation Practice Standard

To differentiate applications WisDOT organizes erosion mats into three classes of mats, which are further broken down into various Types.

A. **Class I**: A short-term duration (minimum of 6 months), light duty, organic ECRM with plastic or biodegradable netting.

   1. **Type A** – Only suitable for slope applications, not channel applications.

   2. **Type B** – Double netted product for use in channels where the calculated (design) shear stress is 1.5 lbs/ft^2 or less.

B. **Class II**: A long-term duration (three years or greater), organic ECRM.

   1. **Type A** – Jute fiber only for use in channels to reinforce sod.

   2. **Type B** – For use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Made with plastic or biodegradable mat.

   3. **Type C** – A woven mat of 100% organic material for use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Applicable for use in environmentally sensitive areas where plastic netting is inappropriate.

C. **Class III**: A permanent 100% synthetic ECRM or TRM. Class I, Type B erosion mat or Class II, Type B or C erosion mat must be placed over a soil filled TRM.

   1. **Type A** – An ECRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

   2. **Type B** – A TRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

   3. **Type C** – A TRM for use in channels where the calculated (design) shear stress of 3.5 lbs/ft^2 or less.

   4. **Type D** – A TRM for use in channels where the calculated (design) shear stress of 5.0 lbs/ft^2 or less.

Culvert Sizing

SCS ENGINEERS

		Sheet No:	1 of 21
		Calc. No.	
		Rev. No.	1
Job No. 25222260.00	Job: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Culvert Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the post closure culverts to accommodate the 25-year, 24-hour storm event.

References:

1. HY-8 7.40 Computer Model
2. HydroCAD Report: COL_Mod12-13_HydroCAD Report
3. Figure 1 - Final Grades (Module 13)

Approach:

1. Create culvert crossing in HY-8 and input data from Reference #2 and #3.
2. Adjust diameter size and number of culverts in model until design flow does not over top berm/road crossing.

Assumptions:

1. Assume the tailwater channel data is a based on discharge swale or rock chute geometry (Reference #2).
2. Culverts are circular, PE Pipe with smooth interior, and with square edge with headwall.
3. Culvert elevatons,lengths, and slopes based on Figure 1 (Reference #3).
4. Roadway data for crossing based on Figure 1 (Reference #3).
5. Discharge flows from HydroCAD report (Refence #2).

Calculations:

See attached HY-8 Model output reports for C1 through C10.

Results:

The culverts are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

Culvert	Dia. (ft)	# of Barrels	Upstream Invert (ft)	Downstream Invert (ft)	Slope (%)	Length (ft)
C1	2	1	815.70	814.55	2.22	52
C2	2	2	817.83	814.00	5.14	75
C3	2.5	2	811.17	810.90	0.54	50
C4	2.5	2	809.86	809.60	0.52	50
C5	2.5	2	807.57	807.15	0.87	49
C6	2	2	805.40	804.76	0.61	105
C7	3.5	2	796.64	796.34	0.50	60
C8	1	1	810.70	808.60	2.45	86
C9	2	1	807.54	806.81	0.73	100
C10	2	2	814.96	813.36	3.20	50

Culvert Data: Culvert C1

Site Data - Culvert C1

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 815.70 ft
Outlet Station: 51.88 ft
Outlet Elevation: 814.55 ft
Number of Barrels: 1

Culvert Data Summary - Culvert C1

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 2 - Culvert Summary Table: Culvert C1

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)
0.60 cfs	0.60 cfs	816.05	0.35	0.0*	1-JS1t	0.18	0.27	1.06	0.29	0.36	1.23
0.74 cfs	0.74 cfs	816.09	0.39	0.0*	1-S2n	0.20	0.29	0.20	0.31	4.64	1.29
0.87 cfs	0.87 cfs	816.13	0.43	0.0*	1-JS1t	0.21	0.32	1.10	0.33	0.49	1.35
1.01 cfs	1.01 cfs	816.16	0.46	0.0*	1-JS1t	0.23	0.35	1.12	0.35	0.56	1.40
1.14 cfs	1.14 cfs	816.19	0.49	0.0*	1-JS1t	0.24	0.37	1.13	0.36	0.62	1.44
1.28 cfs	1.28 cfs	816.22	0.52	0.005	1-JS1t	0.26	0.39	1.15	0.38	0.69	1.48
1.42 cfs	1.42 cfs	816.25	0.55	0.021	1-JS1t	0.27	0.41	1.16	0.39	0.75	1.52
1.55 cfs	1.55 cfs	816.28	0.58	0.036	1-JS1t	0.28	0.43	1.18	0.41	0.81	1.55
1.69 cfs	1.69 cfs	816.30	0.60	0.050	1-JS1t	0.29	0.45	1.19	0.42	0.87	1.59
1.82 cfs	1.82 cfs	816.33	0.63	0.064	1-JS1t	0.30	0.47	1.20	0.43	0.92	1.62
1.96 cfs	1.96 cfs	816.35	0.65	0.078	1-JS1t	0.31	0.49	1.22	0.45	0.98	1.65

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 815.70 ft,
Outlet Elevation (invert): 814.55 ft
Culvert Length: 51.89 ft,
Culvert Slope: 0.0222

Tailwater Data for Crossing: Culvert C1

Table 3 - Downstream Channel Rating Curve (Crossing: Culvert C1)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.60	815.61	0.29	1.23	0.34	0.57
0.74	815.63	0.31	1.29	0.36	0.58
0.87	815.65	0.33	1.35	0.39	0.59

1.01	815.67	0.35	1.40	0.41	0.59
1.14	815.68	0.36	1.44	0.43	0.60
1.28	815.70	0.38	1.48	0.45	0.60
1.42	815.71	0.39	1.52	0.46	0.60
1.55	815.73	0.41	1.55	0.48	0.61
1.69	815.74	0.42	1.59	0.49	0.61
1.82	815.75	0.43	1.62	0.51	0.61
1.96	815.77	0.45	1.65	0.52	0.62

Tailwater Channel Data - Culvert C1

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 6.00 (_:1)
Channel Slope: 0.0188
Channel Manning's n: 0.0450
Channel Invert Elevation: 815.32 ft

Roadway Data for Crossing: Culvert C1

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 50.00 ft
Crest Elevation: 819.06 ft
Roadway Surface: Gravel
Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 0.60 cfs
Design Flow: 0.60 cfs
Maximum Flow: 1.96 cfs

Table 4 - Summary of Culvert Flows at Crossing: Culvert C1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert C1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
816.05	0.60	0.60	0.00	1
816.09	0.74	0.74	0.00	1
816.13	0.87	0.87	0.00	1
816.16	1.01	1.01	0.00	1
816.19	1.14	1.14	0.00	1
816.22	1.28	1.28	0.00	1
816.25	1.42	1.42	0.00	1
816.28	1.55	1.55	0.00	1
816.30	1.69	1.69	0.00	1
816.33	1.82	1.82	0.00	1
816.35	1.96	1.96	0.00	1
819.06	22.61	22.61	0.00	Overtopping

Culvert Data: C2

Site Data - C2

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 817.83 ft
Outlet Station: 74.54 ft
Outlet Elevation: 814.00 ft
Number of Barrels: 2

Culvert Data Summary - C2

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120

Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 3 - Culvert Summary Table: C2

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)
10.95 cfs	10.95 cfs	818.96	1.13	0.593	1-JS1f	0.42	0.83	2.00	0.49	1.74	2.24
11.69 cfs	11.62 cfs	819.00	1.17	0.625	1-JS1f	0.44	0.85	2.00	0.51	1.85	2.29
12.42 cfs	11.95 cfs	819.02	1.19	0.649	1-JS1f	0.44	0.86	2.00	0.53	1.90	2.34
13.16 cfs	12.19 cfs	819.04	1.21	0.672	1-JS1f	0.45	0.87	2.00	0.54	1.94	2.38
13.90 cfs	12.40 cfs	819.05	1.22	0.693	1-JS1f	0.45	0.88	2.00	0.56	1.97	2.42
14.63 cfs	12.59 cfs	819.06	1.23	0.714	1-JS1f	0.45	0.89	2.00	0.58	2.00	2.46
15.37 cfs	12.77 cfs	819.07	1.24	0.734	1-JS1f	0.46	0.89	2.00	0.59	2.03	2.50
16.11 cfs	12.94 cfs	819.09	1.26	0.754	1-JS1f	0.46	0.90	2.00	0.61	2.06	2.54
16.85 cfs	13.10 cfs	819.10	1.27	0.773	1-JS1f	0.46	0.91	2.00	0.62	2.09	2.57
17.58 cfs	13.26 cfs	819.10	1.27	0.791	1-JS1f	0.47	0.91	2.00	0.64	2.11	2.61
18.32 cfs	13.41 cfs	819.11	1.28	0.810	1-JS1f	0.47	0.92	2.00	0.65	2.13	2.64

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 817.83 ft,
Outlet Elevation (invert): 814.00 ft
Culvert Length: 74.64 ft,
Culvert Slope: 0.0514

Tailwater Data for Crossing: Culvert C2

Table 5 - Downstream Channel Rating Curve (Crossing: Culvert C2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
10.95	818.32	0.49	2.24	0.47	0.62
11.69	818.34	0.51	2.29	0.49	0.62
12.42	818.36	0.53	2.34	0.51	0.62

13.16	818.37	0.54	2.38	0.52	0.63
13.90	818.39	0.56	2.42	0.54	0.63
14.63	818.41	0.58	2.46	0.55	0.63
15.37	818.42	0.59	2.50	0.57	0.63
16.11	818.44	0.61	2.54	0.58	0.64
16.85	818.45	0.62	2.57	0.60	0.64
17.58	818.47	0.64	2.61	0.61	0.64
18.32	818.48	0.65	2.64	0.63	0.64

Tailwater Channel Data - Culvert C2

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 8.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0154
Channel Manning's n: 0.0450
Channel Invert Elevation: 817.83 ft

Roadway Data for Crossing: Culvert C2

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 50.00 ft
Crest Elevation: 819.00 ft
Roadway Surface: Gravel
Roadway Top Width: 20.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 10.95 cfs
Design Flow: 10.95 cfs
Maximum Flow: 18.32 cfs

Table 6 - Summary of Culvert Flows at Crossing: Culvert C2

Headwater Elevation (ft)	Total Discharge (cfs)	C2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
818.96	10.95	10.95	0.00	1
819.00	11.69	11.62	0.01	13
819.02	12.42	11.95	0.43	6
819.04	13.16	12.19	0.93	5
819.05	13.90	12.40	1.48	5
819.06	14.63	12.59	2.01	4
819.07	15.37	12.77	2.58	4
819.09	16.11	12.94	3.15	4
819.10	16.85	13.10	3.73	4
819.10	17.58	13.26	4.32	4
819.11	18.32	13.41	4.91	4
819.00	11.61	11.61	0.00	Overtopping

Culvert Data: C3

Site Data - C3

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 811.17 ft
Outlet Station: 50.00 ft
Outlet Elevation: 810.90 ft
Number of Barrels: 2

Culvert Data Summary - C3

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 4 - Culvert Summary Table: C3

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)
28.58 cfs	28.58 cfs	813.05	1.88	1.252	1-S2n	1.16	1.27	1.16	0.91	6.38	2.71
30.71 cfs	30.71 cfs	813.13	1.96	1.339	1-S2n	1.20	1.32	1.21	0.94	6.50	2.77
32.85 cfs	32.85 cfs	813.22	2.05	1.428	1-S2n	1.25	1.37	1.26	0.98	6.61	2.82
34.98 cfs	34.98 cfs	813.30	2.13	1.518	1-S2n	1.30	1.42	1.31	1.01	6.72	2.88
37.11 cfs	37.11 cfs	813.38	2.21	1.609	1-S2n	1.35	1.46	1.36	1.04	6.82	2.93
39.24 cfs	39.24 cfs	813.46	2.29	1.702	1-S2n	1.40	1.50	1.40	1.07	6.92	2.98
41.38 cfs	41.38 cfs	813.54	2.37	1.796	1-S2n	1.44	1.54	1.45	1.10	7.01	3.02
43.51 cfs	43.51 cfs	813.62	2.45	1.892	1-S2n	1.49	1.59	1.50	1.13	7.10	3.07
45.64 cfs	45.64 cfs	813.71	2.54	1.990	5-S2n	1.54	1.63	1.54	1.16	7.17	3.11
47.78 cfs	47.78 cfs	813.79	2.62	2.089	5-S2n	1.59	1.66	1.59	1.19	7.25	3.15
49.91 cfs	49.09 cfs	813.85	2.68	2.152	5-S2n	1.62	1.69	1.62	1.22	7.29	3.19

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 811.17 ft,
Outlet Elevation (invert): 810.90 ft
Culvert Length: 50.00 ft,
Culvert Slope: 0.0054

Tailwater Data for Crossing: Culvert C3

Table 7 - Downstream Channel Rating Curve (Crossing: Culvert C3)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
28.58	812.08	0.91	2.71	0.28	0.57
30.71	812.12	0.94	2.77	0.29	0.58
32.85	812.15	0.98	2.82	0.30	0.58

34.98	812.18	1.01	2.88	0.32	0.58
37.11	812.22	1.04	2.93	0.33	0.59
39.24	812.25	1.07	2.98	0.33	0.59
41.38	812.28	1.10	3.02	0.34	0.59
43.51	812.31	1.13	3.07	0.35	0.59
45.64	812.34	1.16	3.11	0.36	0.59
47.78	812.36	1.19	3.15	0.37	0.60
49.91	812.39	1.22	3.19	0.38	0.60

Tailwater Channel Data - Culvert C3

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 8.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0050
Channel Manning's n: 0.0300
Channel Invert Elevation: 811.17 ft

Roadway Data for Crossing: Culvert C3

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 29.00 ft
Crest Elevation: 813.80 ft
Roadway Surface: Gravel
Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 28.58 cfs
Design Flow: 28.58 cfs
Maximum Flow: 49.91 cfs

Table 8 - Summary of Culvert Flows at Crossing: Culvert C3

Headwater Elevation (ft)	Total Discharge (cfs)	C3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
813.05	28.58	28.58	0.00	1
813.13	30.71	30.71	0.00	1
813.22	32.85	32.85	0.00	1
813.30	34.98	34.98	0.00	1
813.38	37.11	37.11	0.00	1
813.46	39.24	39.24	0.00	1
813.54	41.38	41.38	0.00	1
813.62	43.51	43.51	0.00	1
813.71	45.64	45.64	0.00	1
813.79	47.78	47.78	0.00	1
813.85	49.91	49.09	0.77	7
813.80	47.90	47.90	0.00	Overtopping

Culvert Data: C4

Site Data - C4

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 809.86 ft
Outlet Station: 50.00 ft
Outlet Elevation: 809.60 ft
Number of Barrels: 2

Culvert Data Summary - C4

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 7 - Culvert Summary Table: C4

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)
34.14 cfs	34.14 cfs	811.96	2.10	1.492	1-S2n	1.30	1.40	1.30	0.91	6.60	3.22
36.76 cfs	36.76 cfs	812.06	2.20	1.604	1-S2n	1.36	1.45	1.36	0.95	6.72	3.29
39.38 cfs	39.38 cfs	812.16	2.30	1.718	1-S2n	1.41	1.51	1.42	0.98	6.84	3.36
42.00 cfs	42.00 cfs	812.26	2.40	1.834	1-S2n	1.47	1.56	1.48	1.02	6.94	3.42
44.62 cfs	44.62 cfs	812.36	2.50	1.953	1-S2n	1.53	1.61	1.54	1.05	7.04	3.48
47.23 cfs	47.23 cfs	812.46	2.60	2.074	5-S2n	1.59	1.65	1.60	1.08	7.13	3.54
49.85 cfs	49.85 cfs	812.57	2.71	2.198	5-S2n	1.66	1.70	1.66	1.11	7.23	3.59
52.47 cfs	52.47 cfs	812.68	2.82	2.325	5-S2n	1.72	1.75	1.72	1.14	7.28	3.65
55.09 cfs	55.09 cfs	812.79	2.93	2.454	5-S2n	1.78	1.79	1.78	1.17	7.35	3.70
57.71 cfs	57.71 cfs	812.99	3.05	3.129	7-M2c	1.85	1.83	1.83	1.20	7.49	3.75
60.33 cfs	60.33 cfs	813.07	3.18	3.214	7-M2c	1.93	1.87	1.87	1.23	7.65	3.79

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 809.86 ft,
Outlet Elevation (invert): 809.60 ft
Culvert Length: 50.00 ft,
Culvert Slope: 0.0052

Tailwater Data for Crossing: Culvert C4

Table 13 - Downstream Channel Rating Curve (Crossing: Culvert C4)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
34.14	810.78	0.91	3.22	0.40	0.68
36.76	810.82	0.95	3.29	0.41	0.68
39.38	810.85	0.98	3.36	0.43	0.69

42.00	810.88	1.02	3.42	0.44	0.69
44.62	810.92	1.05	3.48	0.46	0.69
47.23	810.95	1.08	3.54	0.47	0.70
49.85	810.98	1.11	3.59	0.49	0.70
52.47	811.01	1.14	3.65	0.50	0.70
55.09	811.04	1.17	3.70	0.51	0.70
57.71	811.07	1.20	3.75	0.53	0.71
60.33	811.10	1.23	3.79	0.54	0.71

Tailwater Channel Data - Culvert C4

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 8.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0070
Channel Manning's n: 0.0300
Channel Invert Elevation: 809.87 ft

Roadway Data for Crossing: Culvert C4

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 29.00 ft
Crest Elevation: 813.14 ft
Roadway Surface: Gravel
Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 34.14 cfs
Design Flow: 34.14 cfs
Maximum Flow: 60.33 cfs

Table 14 - Summary of Culvert Flows at Crossing: Culvert C4

Headwater Elevation (ft)	Total Discharge (cfs)	C4 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
811.96	34.14	34.14	0.00	1
812.06	36.76	36.76	0.00	1
812.16	39.38	39.38	0.00	1
812.26	42.00	42.00	0.00	1
812.36	44.62	44.62	0.00	1
812.46	47.23	47.23	0.00	1
812.57	49.85	49.85	0.00	1
812.68	52.47	52.47	0.00	1
812.79	55.09	55.09	0.00	1
812.99	57.71	57.71	0.00	1
813.07	60.33	60.33	0.00	1
813.14	62.28	62.28	0.00	Overtopping

Culvert Data: C5

Site Data - C5

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 807.57 ft
Outlet Station: 48.50 ft
Outlet Elevation: 807.15 ft
Number of Barrels: 2

Culvert Data Summary - C5

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 8 - Culvert Summary Table: C5

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)
37.41 cfs	37.41 cfs	809.79	2.22	1.490	1-S2n	1.18	1.47	1.23	1.05	7.81	2.93
40.34 cfs	40.34 cfs	809.90	2.33	1.601	1-S2n	1.23	1.52	1.28	1.09	7.96	3.00
43.27 cfs	43.27 cfs	810.01	2.44	1.728	1-S2n	1.28	1.58	1.34	1.13	8.10	3.06
46.21 cfs	46.21 cfs	810.13	2.56	1.862	5-S2n	1.33	1.64	1.39	1.17	8.24	3.12
49.14 cfs	49.14 cfs	810.25	2.68	1.999	5-S2n	1.39	1.69	1.44	1.21	8.37	3.17
52.07 cfs	52.07 cfs	810.37	2.80	2.140	5-S2n	1.44	1.74	1.50	1.24	8.50	3.23
55.00 cfs	55.00 cfs	810.50	2.93	2.284	5-S2n	1.49	1.79	1.55	1.28	8.62	3.28
57.93 cfs	57.93 cfs	810.63	3.06	2.431	5-S2n	1.54	1.83	1.60	1.31	8.74	3.32
60.87 cfs	60.87 cfs	810.77	3.20	2.892	5-S2n	1.59	1.88	1.65	1.35	8.86	3.37
63.80 cfs	63.26 cfs	810.89	3.32	2.999	5-S2n	1.64	1.92	1.69	1.38	8.95	3.42
66.73 cfs	64.47 cfs	810.95	3.38	3.055	5-S2n	1.66	1.93	1.71	1.41	8.99	3.46

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 807.57 ft,
Outlet Elevation (invert): 807.15 ft
Culvert Length: 48.50 ft,
Culvert Slope: 0.0087

Tailwater Data for Crossing: Culvert C5

Table 15 - Downstream Channel Rating Curve (Crossing: Culvert C5)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
37.41	808.64	1.05	2.93	0.33	0.59
40.34	808.68	1.09	3.00	0.34	0.59
43.27	808.72	1.13	3.06	0.35	0.59

46.21	808.76	1.17	3.12	0.36	0.59
49.14	808.80	1.21	3.17	0.38	0.60
52.07	808.83	1.24	3.23	0.39	0.60
55.00	808.87	1.28	3.28	0.40	0.60
57.93	808.90	1.31	3.32	0.41	0.60
60.87	808.94	1.35	3.37	0.42	0.61
63.80	808.97	1.38	3.42	0.43	0.61
66.73	809.00	1.41	3.46	0.44	0.61

Tailwater Channel Data - Culvert C5

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 8.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0050
Channel Manning's n: 0.0300
Channel Invert Elevation: 807.59 ft

Roadway Data for Crossing: Culvert C5

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 28.00 ft
Crest Elevation: 810.85 ft
Roadway Surface: Gravel
Roadway Top Width: 20.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 37.41 cfs
Design Flow: 37.41 cfs
Maximum Flow: 66.73 cfs

Table 16 - Summary of Culvert Flows at Crossing: Culvert C5

Headwater Elevation (ft)	Total Discharge (cfs)	C5 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
809.79	37.41	37.41	0.00	1
809.90	40.34	40.34	0.00	1
810.01	43.27	43.27	0.00	1
810.13	46.21	46.21	0.00	1
810.25	49.14	49.14	0.00	1
810.37	52.07	52.07	0.00	1
810.50	55.00	55.00	0.00	1
810.63	57.93	57.93	0.00	1
810.77	60.87	60.87	0.00	1
810.89	63.80	63.26	0.50	11
810.95	66.73	64.47	2.22	7
810.85	62.53	62.53	0.00	Overtopping

Culvert Data: C6

Site Data - C6

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 805.40 ft
Outlet Station: 104.56 ft
Outlet Elevation: 804.76 ft
Number of Barrels: 2

Culvert Data Summary - C6

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Mitered to Conform to Slope
Inlet Depression: None

Table 1 - Culvert Summary Table: C6

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)
30.67 cfs	30.67 cfs	807.82	2.42	1.808	5-S2n	1.35	1.41	1.35	0.81	6.79	3.25
32.96 cfs	32.96 cfs	808.01	2.61	2.020	5-S2n	1.43	1.46	1.43	0.85	6.87	3.33
35.25 cfs	35.25 cfs	808.21	2.81	2.485	5-S2n	1.51	1.51	1.51	0.88	6.94	3.40
37.54 cfs	37.54 cfs	808.43	3.03	2.882	7-M2c	1.60	1.56	1.56	0.91	7.14	3.47
39.83 cfs	39.00 cfs	808.58	3.18	2.950	7-M2c	1.67	1.59	1.59	0.95	7.29	3.54
42.12 cfs	39.76 cfs	808.65	3.25	2.987	7-M2c	1.71	1.60	1.60	0.98	7.37	3.61
44.41 cfs	40.38 cfs	808.72	3.32	3.019	7-M2c	1.75	1.61	1.61	1.01	7.44	3.67
46.70 cfs	40.94 cfs	808.78	3.38	3.049	7-M2c	2.00	1.62	1.62	1.04	7.50	3.73
48.99 cfs	41.44 cfs	808.83	3.43	3.079	7-M2c	2.00	1.63	1.63	1.07	7.55	3.79
51.28 cfs	41.89 cfs	808.88	3.48	3.107	7-M2c	2.00	1.64	1.64	1.09	7.60	3.85
53.57 cfs	42.33 cfs	808.93	3.53	3.135	7-M2c	2.00	1.65	1.65	1.12	7.65	3.90

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 805.40 ft,
Outlet Elevation (invert): 804.76 ft
Culvert Length: 104.56 ft,
Culvert Slope: 0.0061

Tailwater Data for Crossing: Culvert C6

Table 1 - Downstream Channel Rating Curve (Crossing: Culvert C6)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
30.67	805.37	0.81	3.25	0.36	0.68
32.96	805.41	0.85	3.33	0.37	0.68
35.25	805.44	0.88	3.40	0.38	0.68

37.54	805.47	0.91	3.47	0.40	0.69
39.83	805.51	0.95	3.54	0.41	0.69
42.12	805.54	0.98	3.61	0.43	0.69
44.41	805.57	1.01	3.67	0.44	0.70
46.70	805.60	1.04	3.73	0.45	0.70
48.99	805.63	1.07	3.79	0.47	0.70
51.28	805.65	1.09	3.85	0.48	0.70
53.57	805.68	1.12	3.90	0.49	0.71

Tailwater Channel Data - Culvert C6

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 10.00 ft
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.0070
Channel Manning's n: 0.0300
Channel Invert Elevation: 804.56 ft

Roadway Data for Crossing: Culvert C6

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 15.00 ft
Crest Elevation: 808.50 ft
Roadway Surface: Gravel
Roadway Top Width: 100.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 30.67 cfs
Design Flow: 30.67 cfs
Maximum Flow: 53.57 cfs

Table 2 - Summary of Culvert Flows at Crossing: Culvert C6

Headwater Elevation (ft)	Total Discharge (cfs)	C6 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
807.82	30.67	30.67	0.00	1
808.01	32.96	32.96	0.00	1
808.21	35.25	35.25	0.00	1
808.43	37.54	37.54	0.00	1
808.58	39.83	39.00	0.81	10
808.65	42.12	39.76	2.34	7
808.72	44.41	40.38	4.01	6
808.78	46.70	40.94	5.75	6
808.83	48.99	41.44	7.55	6
808.88	51.28	41.89	9.37	5
808.93	53.57	42.33	11.23	5
808.50	38.24	38.24	0.00	Overtopping

Culvert Data: C7

Site Data - C7

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 796.64 ft
Outlet Station: 60.20 ft
Outlet Elevation: 796.34 ft
Number of Barrels: 2

Culvert Data Summary - C7

Barrel Shape: Circular
Barrel Diameter: 3.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 5 - Culvert Summary Table: C7

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)
67.17 cfs	67.17 cfs	799.52	2.60	2.880	2-M2c	2.53	1.79	1.79	1.08	6.76	4.34
72.84 cfs	72.84 cfs	799.66	2.73	3.024	2-M2c	2.71	1.87	1.87	1.13	6.95	4.44
78.52 cfs	78.52 cfs	799.81	2.86	3.167	2-M2c	2.93	1.95	1.95	1.18	7.14	4.54
84.19 cfs	84.19 cfs	799.95	3.00	3.310	2-M2c	3.50	2.02	2.02	1.22	7.32	4.64
89.87 cfs	89.87 cfs	800.09	3.13	3.452	2-M2c	3.50	2.09	2.09	1.26	7.50	4.72
95.55 cfs	95.55 cfs	800.23	3.26	3.595	7-M2c	3.50	2.16	2.16	1.31	7.67	4.81
101.22 cfs	101.22 cfs	800.38	3.40	3.739	7-M2c	3.50	2.22	2.22	1.35	7.85	4.89
106.90 cfs	106.90 cfs	800.53	3.54	3.886	7-M2c	3.50	2.29	2.29	1.38	8.02	4.97
112.57 cfs	112.57 cfs	800.68	3.68	4.037	7-M2c	3.50	2.35	2.35	1.42	8.20	5.04
118.25 cfs	118.25 cfs	800.83	3.83	4.194	7-M2c	3.50	2.41	2.41	1.46	8.37	5.11
123.92 cfs	123.92 cfs	801.00	3.98	4.360	7-M2c	3.50	2.47	2.47	1.50	8.55	5.18

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 796.64 ft,
Outlet Elevation (invert): 796.34 ft
Culvert Length: 60.20 ft,
Culvert Slope: 0.0050

Tailwater Data for Crossing: Culvert C7

Table 9 - Downstream Channel Rating Curve (Crossing: Culvert C7)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
67.17	796.68	1.08	4.34	0.67	0.84

72.84	796.73	1.13	4.44	0.70	0.84
78.52	796.78	1.18	4.54	0.73	0.85
84.19	796.82	1.22	4.64	0.76	0.85
89.87	796.86	1.26	4.72	0.79	0.86
95.55	796.91	1.31	4.81	0.81	0.86
101.22	796.95	1.35	4.89	0.84	0.86
106.90	796.98	1.38	4.97	0.86	0.87
112.57	797.02	1.42	5.04	0.89	0.87
118.25	797.06	1.46	5.11	0.91	0.87
123.92	797.10	1.50	5.18	0.93	0.88

Tailwater Channel Data - Culvert C7

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 10.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0100
Channel Manning's n: 0.0300
Channel Invert Elevation: 795.60 ft

Roadway Data for Crossing: Culvert C7

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 50.00 ft
Crest Elevation: 802.50 ft
Roadway Surface: Gravel
Roadway Top Width: 60.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 67.17 cfs
Design Flow: 67.17 cfs
Maximum Flow: 123.92 cfs

Table 10 - Summary of Culvert Flows at Crossing: Culvert C7

Headwater Elevation (ft)	Total Discharge (cfs)	C7 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
799.52	67.17	67.17	0.00	1
799.66	72.84	72.84	0.00	1
799.81	78.52	78.52	0.00	1
799.95	84.19	84.19	0.00	1
800.09	89.87	89.87	0.00	1
800.23	95.55	95.55	0.00	1
800.38	101.22	101.22	0.00	1
800.53	106.90	106.90	0.00	1
800.68	112.57	112.57	0.00	1
800.83	118.25	118.25	0.00	1
801.00	123.92	123.92	0.00	1
802.50	162.83	162.83	0.00	Overtopping

Culvert Data: C8

Site Data - C8

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 810.70 ft
Outlet Station: 85.60 ft
Outlet Elevation: 808.60 ft
Number of Barrels: 1

Culvert Data Summary - C8

Barrel Shape: Circular
Barrel Diameter: 1.00 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 9 - Culvert Summary Table: C8

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)
0.96 cfs	0.96 cfs	811.27	0.57	0.534	1-JS1f	0.27	0.41	1.00	0.45	1.22	2.40
1.02 cfs	1.02 cfs	811.30	0.60	0.557	1-S2n	0.28	0.43	0.28	0.46	5.74	2.44
1.09 cfs	1.09 cfs	811.32	0.62	0.581	1-JS1f	0.29	0.44	1.00	0.47	1.39	2.47
1.15 cfs	1.15 cfs	811.34	0.64	0.605	1-JS1f	0.30	0.45	1.00	0.48	1.47	2.51
1.22 cfs	1.22 cfs	811.37	0.67	0.629	1-JS1f	0.30	0.47	1.00	0.49	1.55	2.54
1.28 cfs	1.28 cfs	811.39	0.69	0.653	1-JS1f	0.31	0.48	1.00	0.50	1.63	2.58
1.34 cfs	1.34 cfs	811.41	0.71	0.679	1-JS1f	0.32	0.49	1.00	0.51	1.71	2.61
1.41 cfs	1.41 cfs	811.43	0.73	0.704	1-JS1f	0.33	0.50	1.00	0.52	1.79	2.64
1.47 cfs	1.47 cfs	811.45	0.75	0.730	1-JS1f	0.34	0.51	1.00	0.53	1.87	2.67
1.54 cfs	1.54 cfs	811.54	0.77	0.840	1-S1f	0.34	0.53	1.00	0.53	1.96	2.70
1.60 cfs	1.60 cfs	811.55	0.79	0.849	1-S1f	0.35	0.54	1.00	0.54	2.04	2.72

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 810.70 ft,
Outlet Elevation (invert): 808.60 ft
Culvert Length: 85.63 ft,
Culvert Slope: 0.0245

Tailwater Data for Crossing: Culvert C8

Table 17 - Downstream Channel Rating Curve (Crossing: Culvert C8)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.96	811.15	0.45	2.40	0.56	0.89
1.02	811.16	0.46	2.44	0.57	0.90

1.09	811.17	0.47	2.47	0.59	0.90
1.15	811.18	0.48	2.51	0.60	0.90
1.22	811.19	0.49	2.54	0.61	0.91
1.28	811.20	0.50	2.58	0.62	0.91
1.34	811.21	0.51	2.61	0.63	0.91
1.41	811.22	0.52	2.64	0.64	0.91
1.47	811.23	0.53	2.67	0.66	0.92
1.54	811.23	0.53	2.70	0.67	0.92
1.60	811.24	0.54	2.72	0.68	0.92

Tailwater Channel Data - Culvert C8

Tailwater Channel Option: Triangular Channel
Side Slope (H:V): 2.00 (_:1)
Channel Slope: 0.0200
Channel Manning's n: 0.0300
Channel Invert Elevation: 822.00 ft

Roadway Data for Crossing: Culvert C8

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 10.00 ft
Crest Elevation: 822.00 ft
Roadway Surface: Gravel
Roadway Top Width: 25.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 0.96 cfs
Design Flow: 0.96 cfs
Maximum Flow: 1.60 cfs

Table 18 - Summary of Culvert Flows at Crossing: Culvert C8b

Headwater Elevation (ft)	Total Discharge (cfs)	C8 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
811.27	0.96	0.96	0.00	1
811.30	1.02	1.02	0.00	1
811.32	1.09	1.09	0.00	1
811.34	1.15	1.15	0.00	1
811.37	1.22	1.22	0.00	1
811.39	1.28	1.28	0.00	1
811.41	1.34	1.34	0.00	1
811.43	1.41	1.41	0.00	1
811.45	1.47	1.47	0.00	1
811.54	1.54	1.54	0.00	1
811.55	1.60	1.60	0.00	1
822.00	10.37	10.37	0.00	Overtopping

Culvert Data: C9

Site Data - C9

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 807.54 ft
Outlet Station: 99.86 ft
Outlet Elevation: 806.81 ft
Number of Barrels: 1

Culvert Data Summary - C9

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

Table 6 - Culvert Summary Table: C9

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)
11.16 cfs	11.16 cfs	809.67	1.98	2.134	7-M2c	1.79	1.20	1.20	0.27	5.68	3.11
12.14 cfs	12.14 cfs	809.83	2.11	2.287	7-M2c	2.00	1.25	1.25	0.29	5.87	3.21
13.12 cfs	13.12 cfs	810.01	2.24	2.473	7-M2c	2.00	1.30	1.30	0.30	6.05	3.30
14.09 cfs	14.09 cfs	810.31	2.39	2.772	7-M2c	2.00	1.35	1.35	0.31	6.24	3.39
15.07 cfs	15.07 cfs	810.63	2.54	3.090	7-M2c	2.00	1.40	1.40	0.33	6.42	3.47
16.05 cfs	16.05 cfs	810.97	2.70	3.425	7-M2c	2.00	1.44	1.44	0.34	6.61	3.55
17.03 cfs	17.03 cfs	811.32	2.87	3.777	7-M2c	2.00	1.49	1.49	0.35	6.80	3.62
18.01 cfs	18.01 cfs	811.69	3.05	4.147	7-M2c	2.00	1.53	1.53	0.36	6.99	3.69
18.98 cfs	18.98 cfs	812.04	3.24	4.503	7-M2c	2.00	1.57	1.57	0.37	7.19	3.76
19.96 cfs	19.96 cfs	812.44	3.44	4.896	7-M2c	2.00	1.60	1.60	0.38	7.39	3.83
20.94 cfs	20.94 cfs	812.85	3.65	5.310	7-M2c	2.00	1.64	1.64	0.40	7.60	3.90

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 807.54 ft,
Outlet Elevation (invert): 806.81 ft
Culvert Length: 99.86 ft,
Culvert Slope: 0.0073

Tailwater Data for Crossing: Culvert C9

Table 11 - Downstream Channel Rating Curve (Crossing: Culvert C9)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
11.16	807.71	0.27	3.11	0.96	1.09
12.14	807.73	0.29	3.21	1.01	1.10
13.12	807.74	0.30	3.30	1.05	1.11
14.09	807.75	0.31	3.39	1.10	1.11

15.07	807.77	0.33	3.47	1.14	1.12
16.05	807.78	0.34	3.55	1.18	1.13
17.03	807.79	0.35	3.62	1.23	1.13
18.01	807.80	0.36	3.69	1.27	1.14
18.98	807.81	0.37	3.76	1.31	1.14
19.96	807.82	0.38	3.83	1.34	1.15
20.94	807.84	0.40	3.90	1.38	1.15

Tailwater Channel Data - Culvert C9

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 12.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0560
Channel Manning's n: 0.0450
Channel Invert Elevation: 807.44 ft

Roadway Data for Crossing: Culvert C9

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 50.00 ft
Crest Elevation: 812.87 ft
Roadway Surface: Paved
Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 11.16 cfs
Design Flow: 11.16 cfs
Maximum Flow: 20.94 cfs

Table 12 - Summary of Culvert Flows at Crossing: Culvert C9

Headwater Elevation (ft)	Total Discharge (cfs)	C9 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
809.67	11.16	11.16	0.00	1
809.83	12.14	12.14	0.00	1
810.01	13.12	13.12	0.00	1
810.31	14.09	14.09	0.00	1
810.63	15.07	15.07	0.00	1
810.97	16.05	16.05	0.00	1
811.32	17.03	17.03	0.00	1
811.69	18.01	18.01	0.00	1
812.04	18.98	18.98	0.00	1
812.44	19.96	19.96	0.00	1
812.85	20.94	20.94	0.00	1
812.87	21.00	21.00	0.00	Overtopping

Culvert Data: C10

Site Data - C10

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 814.96 ft
Outlet Station: 50.00 ft
Outlet Elevation: 813.36 ft
Number of Barrels: 2

Culvert Data Summary - C10

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 10 - Culvert Summary Table: C10

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)
2.76 cfs	2.76 cfs	815.50	0.54	0.147	1-JS1t	0.24	0.41	1.74	0.14	0.48	2.29
2.98 cfs	2.98 cfs	815.52	0.56	0.154	1-JS1t	0.25	0.42	1.75	0.15	0.51	2.36
3.20 cfs	3.20 cfs	815.54	0.58	0.162	1-JS1t	0.26	0.44	1.75	0.15	0.55	2.42
3.42 cfs	3.42 cfs	815.56	0.60	0.169	1-JS1t	0.27	0.45	1.76	0.16	0.58	2.48
3.64 cfs	3.64 cfs	815.58	0.62	0.176	1-JS1t	0.28	0.47	1.77	0.17	0.62	2.54
3.85 cfs	3.85 cfs	815.60	0.64	0.183	1-JS1t	0.28	0.48	1.77	0.17	0.66	2.59
4.07 cfs	4.07 cfs	815.62	0.66	0.190	1-JS1t	0.29	0.50	1.78	0.18	0.69	2.64
4.29 cfs	4.29 cfs	815.64	0.68	0.197	1-JS1t	0.30	0.51	1.78	0.18	0.73	2.69
4.51 cfs	4.51 cfs	815.66	0.70	0.204	1-JS1t	0.31	0.52	1.79	0.19	0.76	2.74
4.73 cfs	4.73 cfs	815.68	0.72	0.211	1-JS1t	0.31	0.53	1.79	0.19	0.80	2.79
4.95 cfs	4.95 cfs	815.69	0.73	0.218	1-JS1t	0.32	0.55	1.80	0.20	0.83	2.84

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 814.96 ft,
Outlet Elevation (invert): 813.36 ft
Culvert Length: 50.03 ft,
Culvert Slope: 0.0320

Tailwater Data for Crossing: Culvert C10

Table 19 - Downstream Channel Rating Curve (Crossing: Culvert C10)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
2.76	815.10	0.14	2.29	0.28	1.11
2.98	815.11	0.15	2.36	0.29	1.12
3.20	815.11	0.15	2.42	0.31	1.13

3.42	815.12	0.16	2.48	0.32	1.13
3.64	815.13	0.17	2.54	0.33	1.14
3.85	815.13	0.17	2.59	0.34	1.15
4.07	815.14	0.18	2.64	0.35	1.15
4.29	815.14	0.18	2.69	0.36	1.16
4.51	815.15	0.19	2.74	0.38	1.16
4.73	815.15	0.19	2.79	0.39	1.17
4.95	815.16	0.20	2.84	0.40	1.17

Tailwater Channel Data - Culvert C10

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 8.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0320
Channel Manning's n: 0.0300
Channel Invert Elevation: 814.96 ft

Roadway Data for Crossing: Culvert C10

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 10.00 ft
Crest Elevation: 818.00 ft
Roadway Surface: Gravel
Roadway Top Width: 25.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 2.76 cfs
Design Flow: 2.76 cfs
Maximum Flow: 4.95 cfs

Table 20 - Summary of Culvert Flows at Crossing: Culvert C10

Headwater Elevation (ft)	Total Discharge (cfs)	C10 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
815.50	2.76	2.76	0.00	1
815.52	2.98	2.98	0.00	1
815.54	3.20	3.20	0.00	1
815.56	3.42	3.42	0.00	1
815.58	3.64	3.64	0.00	1
815.60	3.85	3.85	0.00	1
815.62	4.07	4.07	0.00	1
815.64	4.29	4.29	0.00	1
815.66	4.51	4.51	0.00	1
815.68	4.73	4.73	0.00	1
815.69	4.95	4.95	0.00	1
818.00	41.60	41.60	0.00	Overtopping

Diversion Berm Sizing

SCS ENGINEERS

		Sheet No:	1 of 3
		Calc. No.	
		Rev. No.	1
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: RJG	Date: 8/11/23
Client: WPL	Subject: Diversion Berm Sizing	Chk'd: SJL	Date: 8/24/23

Purpose:

To size the post closure diversion berms on the final cover to accommodate the 25-year, 24-hour storm event.

References:

1. WisDOT Facilities Development Manual Chapter 13, Section 30-15 - Grass Lined Channels.
2. Design of Roadside Channels with Flexible Linings, HEC-15, USDOT FHWA.
3. HydroCAD Report: COL_Mod12-13_HydroCAD Report
4. Wisconsin Department of Natural Resources Conservation Practice Standard 1053 - Channel Erosion Mat.

Approach:

Use the Post Closure HydroCAD Model results to obtain the peak flow during a 25-year, 24-hour storm event along the diversion berms.

Use Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2 (from Reference #1) to size the swale for each design swale cross section. The WisDOT spreadsheet incorporates the design guidelines and equations described in "Design of Roadside Channels with Flexible Linings", HEC-15, USDOT FHWA (Reference #2).

Confirm the swale is stable and has enough capacity for the design flow rate.

Assumptions:

1. Assume the channel geometry is a v-notch swale with one sideslope at 4:1 and one sideslope at 2:1 and a depth of 2.0 ft.
2. Assume 2.0% slope along the flowpath of the diversion swale.
3. Assume the following parameters per Section 15.2 - Grass Lining Properties from Reference #1:
   Vegetation Retardance Class = C for Swales
   Vegetation Condition = Good
   Vegetation Growth Form = Turf
4. Assume cohesive soil type with ASTM Soil Class SC and a Plasticity Index (PI) of 16.

Calculations:

From the HydroCAD Report, the peak flow rate along the diversion berms are as follows:

Areas		Areas		Areas		Areas	
1	3.75 cfs	10	1.68 cfs	18	5.06 cfs	26	2.10 cfs
2	1.71 cfs	11	5.22 cfs	19	2.16 cfs	27	7.46 cfs
3	1.06 cfs	12	4.83 cfs	20	1.19 cfs	30	1.34 cfs
4	0.92 cfs	13	1.94 cfs	21	1.62 cfs	33	3.24 cfs
5	1.66 cfs	14	1.93 cfs	22	7.54 cfs	34	1.35 cfs
6	2.81 cfs	15	2.80 cfs	23	1.38 cfs		
8	2.66 cfs	16	1.78 cfs	24	3.61 cfs		
9	0.86 cfs	17	3.04 cfs	25	2.12 cfs		

Use highest flow to confirm diversion berm functions.

Use the Grass Swale Design Spreadsheet (Page 2) to determine the flow depth, velocity and shear stress in the swales.

Results:

The diversion berms are adequately designed to accommodate the flows from the 25-year, 24-hour storm event. The diversion berms are stable at the design flow rates. The design flow depth of 2.0 feet maintains at least 0.5 ft of freeboard during the 25-year, 24-hour storm event. Based on shear stress, use erosion mat Class I, Type B along the flow path of the diversion berms.

Channel/Ditch Geometry	*Area 22*
Channel Slope, S_o (ft/ft)	**0.02**
Channel Bottom Width, B (ft)	**0**
Channel Side Slope, z_1	**4**
Channel Side Slope, z_2	**2**
Flow Depth, d (ft) Solve iteratively	**1.07**
Safety Factor, SF	**1.0**
Vegetation/Soil Parameters	
Vegetation Retardance Class	**C**
Vegetation Condition	**good**
Vegetation Growth Form	**turf**
Soil Type	**cohesive**
D_{75} (in) (Set at 0.00 for cohesive soils)	
ASTM Soil Class	**SC**
Plasticity Index, PI	**16**
Results Summary	
Design Q (ft^3/s)	**7.5**
Calculated Q (ft^3/s)	7.5
Difference Between Design & Calc. Flow (%)	-0.2%
Stable (Yes or No)	**YES**
Channel Parameters	
Vegetation Height, h (ft)	0.67
Grass Roughness Coefficient, C_n	0.238
Cover Factor, C_f	0.90
Noncohesive Soil	
Soil Grain Roughness, n_s	0.016
Permissible Soil Shear Stress, τ_p (lb/ft^2)	N/A
Cohesive Soil	
Porosity, e	0.35
Soil Coefficient 1, c_1	1.0700
Soil Coefficient 2, c_2	14.30
Soil Coefficient 3, c_3	47.700
Soil Coefficient 4, c_4	1.42
Soil Coefficient 5, c_5	-0.61
Soil Coefficient 6, c_6	0.00010
Permissible Soil Shear Stress, τ_p (lb/ft^2)	0.080
Total Permissible Shear Stress, τ_p (lb/ft^2)	0.080
Cross Sectional Area, A (ft^2)	3.435
Wetted Perimeter, P (ft)	6.80
Hydraulic Radius, R (ft)	0.505
Top Width, T (ft)	6.42
Hydraulic Depth, D (ft)	0.535
Froude Number (Q design)	0.528
Channel Shear Stress, τ_o (lb/ft^2)	0.63
Actual Sheer Stress, τ_d (lb/ft^2)	1.34
Mannings n	0.061
Average Velocity, V (ft/s)	2.20
Calculated Flow, Q (ft^3/s)	7.5
Difference Between Design & Calc. Flow (%)	-0.2%
Effective Shear on Soil Surface, τ_e (lb/ft^2)	0.009
Total Permissible Shear on Veg., $\tau_{p,veg}$ (lb/ft^2)	11.65
Stable (Y or N)	YES

Source: Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2

Channel Erosion Mat

(1053)

Wisconsin Department of Natural Resources
Conservation Practice Standard

To differentiate applications WisDOT organizes erosion mats into three classes of mats, which are further broken down into various Types.

A. **Class I**: A short-term duration (minimum of 6 months), light duty, organic ECRM with plastic or biodegradable netting.

   1. **Type A** – Only suitable for slope applications, not channel applications.

   2. **Type B** – Double netted product for use in channels where the calculated (design) shear stress is 1.5 lbs/ft^2 or less.

B. **Class II**: A long-term duration (three years or greater), organic ECRM.

   1. **Type A** – Jute fiber only for use in channels to reinforce sod.

   2. **Type B** – For use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Made with plastic or biodegradable mat.

   3. **Type C** – A woven mat of 100% organic material for use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Applicable for use in environmentally sensitive areas where plastic netting is inappropriate.

C. **Class III**: A permanent 100% synthetic ECRM or TRM. Class I, Type B erosion mat or Class II, Type B or C erosion mat must be placed over a soil filled TRM.

   1. **Type A** – An ECRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

   2. **Type B** – A TRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

   3. **Type C** – A TRM for use in channels where the calculated (design) shear stress of 3.5 lbs/ft^2 or less.

   4. **Type D** – A TRM for use in channels where the calculated (design) shear stress of 5.0 lbs/ft^2 or less.

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Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: RJG	Date: 8/11/23
Client: WPL	Subject: Diversion Berm Spacing Calculation	Chk'd: SJL	Date: 8/18/23

Purpose:

Determine the spacing between diversion berms on the landfill final cover, with the goal of maintaining ≤ 3 ton/acre of soil loss along the final cover.

References

1. "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978. (Figure 1 on Sheet 2 and Tables 10 and 13 on Sheet 4).
2. Erosion and Sediment Control Handbook," Goldman, Jackson, & Bursztynsky, 1986. (Table 5.5 on Sheet 5).
3. Rainfed retention probabilities computed for different cropping tillage systems. Agricultural Water Management, A.W. Mills & G.W. Thomas, 1985. Table 5.10 on Sheet 3)
4. Colombia Energy Center POO Update Drawings

Approach:

Use the Universal Soil Loss Equation (USLE) to determine diversion berm spacing. Longest flow length is 555 feet.

USLE Equation: $A = R * K * LS * C * P$

where: A = Average annual soil loss, tons/acre
R = Rainfall and runoff erosivity index
K = Soil erodibility factor, tons/acre
LS = Slope length and steepness factor
C = Cover management factor
P = Practice factor

or $LS = \frac{A}{R \times K \times C \times P}$

Assumptions:

A =	3	tons/acre
R =	145	see Figure 1 on Sheet 2 (Reference #1)
K =	0.38	see Table 5.10 on Sheet 3 for Loamy Very Fine Sand (Reference #3)
C =	0.0064	see Table 10 on Sheet 4, assuming 90% cover (Reference #1)
P =	1.0	assume no support practice used

Calculation:

$$LS = \frac{A}{R \times K \times C \times P} = \frac{3}{145 \times 0.38 \times 0.0064 \times 1.0} = 8.51$$

From the LS Values Table (Sheet 5), based on the 4:1 final cover slope, the slope distance is between 200 and 250 feet.
Use linear interpolation between the LS values for 200 and 250 feet to determine the slope length value for the 4:1 slope.

Slope Length @ 200 ft LS= 8.33
Slope Length @ 250 ft LS= 9.31

Slope length for the calculate LS factor = 209 ft

Results:

The maximum distance between diversion berms along the final cover to maintain less than 3 tons/acre soil loss is 209 ft.

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Calc. No.			
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Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: RJG	Date: 8/11/23
Client: WPL	Subject: Diversion Berm Spacing Calculation	Chk'd: SJL	Date: 8/18/23

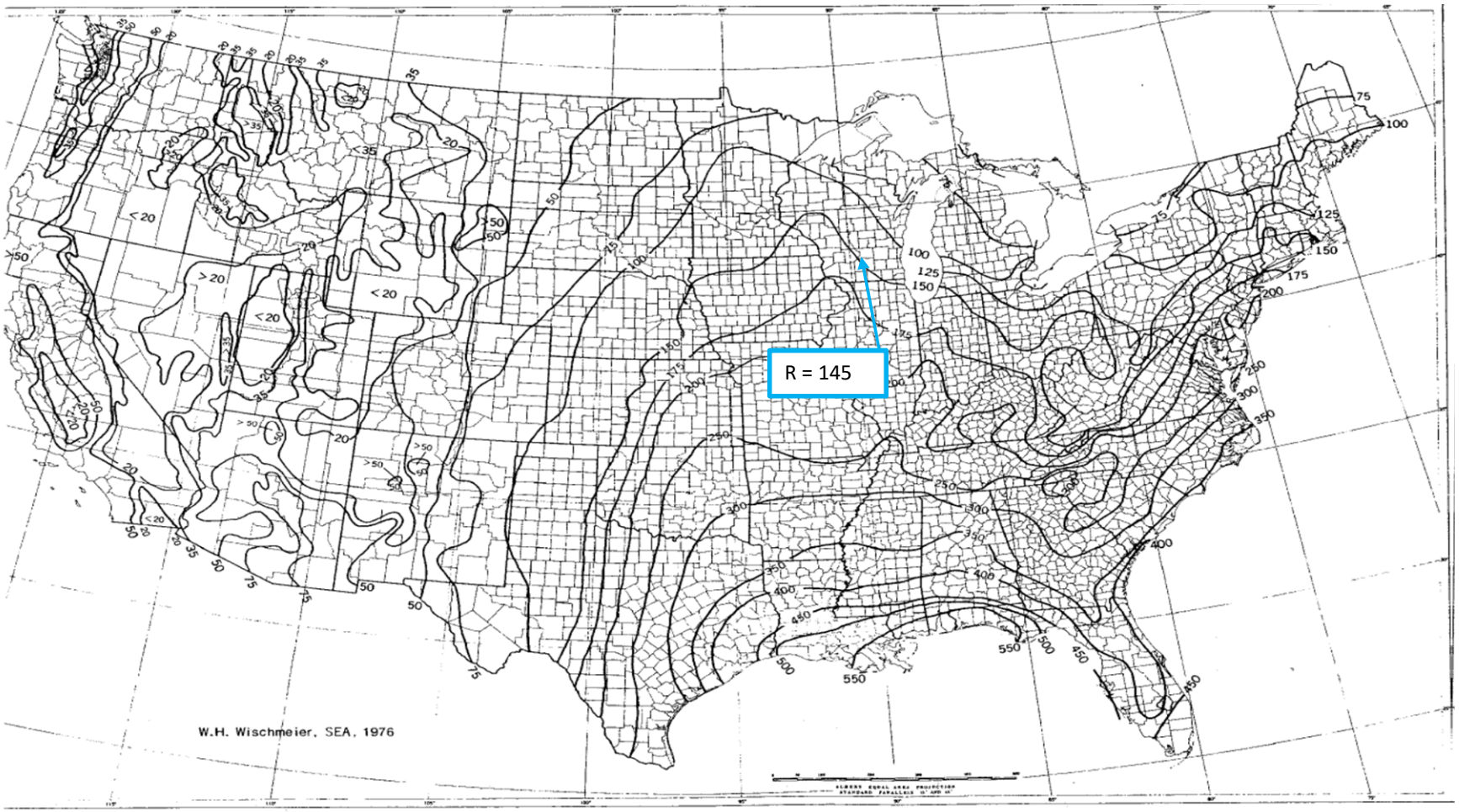


FIGURE 1.—Average annual values of the rainfall erosion index.

Source: "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978.

Table 5.10. Soil Erodibility Factor K_{fact} (after Stewart et al. 1975)[a]

	P_{om}(%)		
Textural Class	<0.5	2	4
Sand	0.05	0.03	0.02
Fine sand	0.16	0.14	0.10
Very finesand	0.42	0.36	0.28
Loamy sand	0.12	0.10	0.08
Loamy finesand	0.24	0.20	0.16
Loamy veryfine sand	0.44	0.38	0.30
Sandy loam	0.27	0.24	0.19
Fine sandyloam	0.35	0.30	0.24
Very fine sandy loam	0.47	0.41	0.33
Loam	0.38	0.34	0.29
Silt loam	0.48	0.42	0.33
Silt	0.60	0.52	0.42
Sandy clayloam	0.27	0.25	0.21
Clay loam	0.28	0.25	0.21
Silty clayloam	0.37	0.32	0.26
Sandy clay	0.14	0.13	0.12
Silty clay	0.25	0.23	0.19
Clay		0.13-0.2	

(a) The values shown are estimated averages of broad ranges of specific soil values. When a texture is near the border line of two texture classes, use the average of the two K_{fact} values. In addition, the values shown are commensurate with the English units used in the cited reference (and as used in the source-term module input files). To obtain analagous values in the metric units used in this report, the above values should be multiplied by 1.292.

TABLE 10.—*Factor* **C** *for permanent pasture, range, and idle land*[1]

Vegetative canopy		Cover that contacts the soil surface						
Type and height[2]	Percent cover[3]	Type[4]	Percent ground cover 0	20	40	60	80	95
No appreciable canopy		G	0.45	0.20	0.10	0.042	0.013	0.003
		W	.45	.24	.15	.091	.043	.011
Tall weeds or short brush with average drop fall height of 20 in	25	G	.36	.17	.09	.038	.013	.003
		W	.36	.20	.13	.083	.041	.011
	50	G	.26	.13	.07	.035	.012	.003
		W	.26	.16	.11	.076	.039	.011
	75	G	.17	.10	.06	.032	.011	.003
		W	.17	.12	.09	.068	.038	.011
Appreciable brush or bushes, with average drop fall height of 6½ ft	25	G	.40	.18	.09	.040	.013	.003
		W	.40	.22	.14	.087	.042	.011
	50	G	.34	.16	.08	.038	.012	.003
		W	.34	.19	.13	.082	.041	.011
	75	G	.28	.14	.08	.036	.012	.003
		W	.28	.17	.12	.078	.040	.011
Trees, but no appreciable low brush. Average drop fall height of 13 ft	25	G	.42	.19	.10	.041	.013	.003
		W	.42	.23	.14	.089	.042	.011
	50	G	.39	.18	.09	.040	.013	.003
		W	.39	.21	.14	.087	.042	.011
	75	G	.36	.17	.09	.039	.012	.003
		W	.36	.20	.13	.084	.041	.011

[1] The listed **C** values assume that the vegetation and mulch are randomly distributed over the entire area.

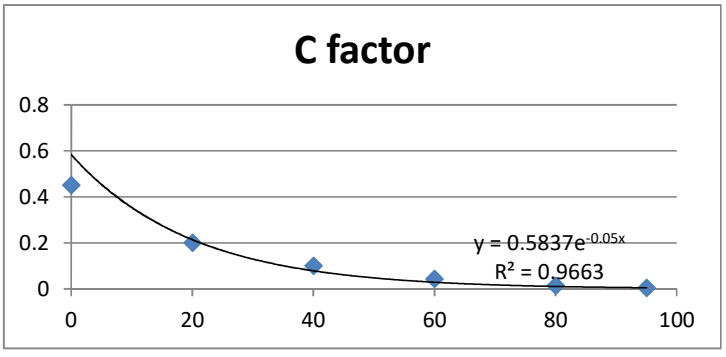
[2] Canopy height is measured as the average fall height of water drops falling from the canopy to the ground. Canopy effect is inversely proportional to drop fall height and is negligible if fall height exceeds 33 ft.

[3] Portion of total-area surface that would be hidden from view by canopy in a vertical projection (a bird's-eye view).

[4] G: cover at surface is grass, grasslike plants, decaying compacted duff, or litter at least 2 in deep.
W: cover at surface is mostly broadleaf herbaceous plants (as weeds with little lateral-root network near the surface) or undecayed residues or both.

Interpolated value
C = 0.0064

Source: "Predicting Rainfall Erosion Losses," USDA Agriculture Handbook Number 537, 1978.



= 90 % cover 0.0064

TABLE 5.5 LS Values* (10)

Slope ratio	Slope gradient s, %	LS values for following slope lengths l, ft (m)									
		10 (3.0)	20 (6.1)	30 (9.1)	40 (12.2)	50 (15.2)	60 (18.3)	70 (21.3)	80 (24.4)	90 (27.4)	100 (30.5)
	0.5	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.09	0.10
100:1	1	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.12	0.12
	2	0.10	0.12	0.14	0.15	0.16	0.17	0.18	0.19	0.19	0.20
	3	0.14	0.18	0.20	0.22	0.23	0.25	0.26	0.27	0.28	0.29
	4	0.16	0.21	0.25	0.28	0.30	0.33	0.35	0.37	0.38	0.40
20:1	5	0.17	0.24	0.29	0.34	0.38	0.41	0.45	0.48	0.51	0.53
	6	0.21	0.30	0.37	0.43	0.48	0.52	0.56	0.60	0.64	0.67
	7	0.26	0.37	0.45	0.52	0.58	0.64	0.69	0.74	0.78	0.82
12½:1	8	0.31	0.44	0.54	0.63	0.70	0.77	0.83	0.89	0.94	0.99
	9	0.37	0.52	0.64	0.74	0.83	0.91	0.98	1.05	1.11	1.17
10:1	10	0.43	0.61	0.75	0.87	0.97	1.06	1.15	1.22	1.30	1.37
	11	0.50	0.71	0.86	1.00	1.12	1.22	1.32	1.41	1.50	1.58
8:1	12.5	0.61	0.86	1.05	1.22	1.36	1.49	1.61	1.72	1.82	1.92
	15	0.81	1.14	1.40	1.62	1.81	1.98	2.14	2.29	2.43	2.56
6:1	16.7	0.96	1.36	1.67	1.92	2.15	2.36	2.54	2.72	2.88	3.04
5:1	20	1.29	1.82	2.23	2.58	2.88	3.16	3.41	3.65	3.87	4.08
4½:1	22	1.51	2.13	2.61	3.02	3.37	3.69	3.99	4.27	4.53	4.77
4:1	25	1.86	2.63	3.23	3.73	4.16	4.56	4.93	5.27	5.59	5.89
	30	2.51	3.56	4.36	5.03	5.62	6.16	6.65	7.11	7.54	7.95
3:1	33.3	2.98	4.22	5.17	5.96	6.67	7.30	7.89	8.43	8.95	9.43
	35	3.23	4.57	5.60	6.46	7.23	7.92	8.55	9.14	9.70	10.22
2½:1	40	4.00	5.66	6.93	8.00	8.95	9.80	10.59	11.32	12.00	12.65
	45	4.81	6.80	8.33	9.61	10.75	11.77	12.72	13.60	14.42	15.20
2:1	50	5.64	7.97	9.76	11.27	12.60	13.81	14.91	15.94	16.91	17.82
	55	6.48	9.16	11.22	12.96	14.48	15.87	17.14	18.32	19.43	20.48
1¾:1	57	6.82	9.64	11.80	13.63	15.24	16.69	18.03	19.28	20.45	21.55
	60	7.32	10.35	12.68	14.64	16.37	17.93	19.37	20.71	21.96	23.15
1½:1	66.7	8.44	11.93	14.61	16.88	18.87	20.67	22.32	23.87	25.31	26.68
	70	8.98	12.70	15.55	17.96	20.08	21.99	23.75	25.39	26.93	28.39
	75	9.78	13.83	16.94	19.56	21.87	23.95	25.87	27.66	29.34	30.92
1¼:1	80	10.55	14.93	18.28	21.11	23.60	25.85	27.93	29.85	31.66	33.38
	85	11.30	15.98	19.58	22.61	25.27	27.69	29.90	31.97	33.91	35.74
	90	12.02	17.00	20.82	24.04	26.88	29.44	31.80	34.00	36.06	38.01
	95	12.71	17.97	22.01	25.41	28.41	31.12	33.62	35.94	38.12	40.18
1:1	100	13.36	18.89	23.14	26.72	29.87	32.72	35.34	37.78	40.08	42.24

Slope ratio	Slope gradient s, %	LS values for following slope lengths l, ft (m)												
		150 (46)	200 (61)	250 (76)	300 (91)	350 (107)	400 (122)	450 (137)	500 (152)	600 (183)	700 (213)	800 (244)	900 (274)	1000 (305)
	0.5	0.10	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15
100:1	1	0.14	0.14	0.15	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20
	2	0.23	0.25	0.26	0.28	0.29	0.30	0.32	0.33	0.34	0.36	0.37	0.39	0.40
	3	0.32	0.35	0.38	0.40	0.42	0.43	0.45	0.46	0.49	0.51	0.54	0.55	0.57
	4	0.47	0.53	0.58	0.62	0.66	0.70	0.73	0.76	0.82	0.87	0.92	0.96	1.00
20:1	5	0.66	0.76	0.85	0.93	1.00	1.07	1.13	1.20	1.31	1.42	1.51	1.60	1.69
	6	0.82	0.95	1.06	1.16	1.26	1.34	1.43	1.50	1.65	1.78	1.90	2.02	2.13
	7	1.01	1.17	1.30	1.43	1.54	1.65	1.75	1.84	2.02	2.18	2.33	2.47	2.61
12½:1	8	1.21	1.40	1.57	1.72	1.85	1.98	2.10	2.22	2.43	2.62	2.80	2.97	3.13
	9	1.44	1.66	1.85	2.03	2.19	2.35	2.49	2.62	2.87	3.10	3.32	3.52	3.71
10:1	10	1.68	1.94	2.16	2.37	2.56	2.74	2.90	3.06	3.35	3.62	3.87	4.11	4.33
	11	1.93	2.23	2.50	2.74	2.95	3.16	3.35	3.53	3.87	4.18	4.47	4.74	4.99
8:1	12.5	2.35	2.72	3.04	3.33	3.59	3.84	4.08	4.30	4.71	5.08	5.43	5.76	6.08
	15	3.13	3.62	4.05	4.43	4.79	5.12	5.43	5.72	6.27	6.77	7.24	7.68	8.09
6:1	16.7	3.72	4.30	4.81	5.27	5.69	6.08	6.45	6.80	7.45	8.04	8.60	9.12	9.62
5:1	20	5.00	5.77	6.45	7.06	7.63	8.16	8.65	9.12	9.99	10.79	11.54	12.24	12.90
4½:1	22	5.84	6.75	7.54	8.26	8.92	9.54	10.12	10.67	11.68	12.62	13.49	14.31	15.08
4:1	25	7.21	8.33	9.31	10.20	11.02	11.78	12.49	13.17	14.43	15.58	16.66	17.67	18.63
	30	9.74	11.25	12.57	13.77	14.88	15.91	16.87	17.78	19.48	21.04	22.49	23.86	25.15
3:1	33.3	11.55	13.34	14.91	16.33	17.64	18.86	20.00	21.09	23.10	24.95	26.67	28.29	29.82
	35	12.52	14.46	16.16	17.70	19.12	20.44	21.68	22.86	25.04	27.04	28.91	30.67	32.32
2½:1	40	15.50	17.89	20.01	21.91	23.67	25.30	26.84	28.29	30.99	33.48	35.79	37.96	40.01
	45	18.62	21.50	24.03	26.33	28.44	30.40	32.24	33.99	37.23	40.22	42.99	45.60	48.07
2:1	50	21.83	25.21	28.18	30.87	33.34	35.65	37.81	39.85	43.66	47.16	50.41	53.47	56.36
	55	25.09	28.97	32.39	35.48	38.32	40.97	43.45	45.80	50.18	54.20	57.94	61.45	64.78
1¾:1	57	26.40	30.48	34.08	37.33	40.32	43.10	45.72	48.19	52.79	57.02	60.96	64.66	68.15
	60	28.35	32.74	36.60	40.10	43.31	46.30	49.11	51.77	56.71	61.25	65.48	69.45	73.21
1½:1	66.7	32.68	37.74	42.19	46.22	49.92	53.37	56.60	59.66	65.36	70.60	75.47	80.05	84.38
	70	34.77	40.15	44.89	49.17	53.11	56.78	60.23	63.48	69.54	75.12	80.30	85.17	89.78
	75	37.87	43.73	48.89	53.56	57.85	61.85	65.60	69.15	75.75	81.82	87.46	92.77	97.79
1¼:1	80	40.88	47.20	52.77	57.81	62.44	66.75	70.80	74.63	81.76	88.31	94.41	100.13	105.55
	85	43.78	50.55	56.51	61.91	66.87	71.48	75.82	79.92	87.55	94.57	101.09	107.23	113.03
	90	46.55	53.76	60.10	65.84	71.11	76.02	80.63	84.99	93.11	100.57	107.51	114.03	120.20
	95	49.21	56.82	63.53	69.59	75.17	80.36	85.23	89.84	98.42	106.30	113.64	120.54	127.06
1:1	100	51.74	59.74	66.79	73.17	79.03	84.49	89.61	94.46	103.48	111.77	119.48	126.73	133.59

*Calculated from

$$LS = \left(\frac{65.41 \times s^2}{s^2 + 10{,}000} + \frac{4.56 \times s}{\sqrt{s^2 + 10{,}000}} + 0.065\right)\left(\frac{l}{72.5}\right)^m$$

LS = topographic factor
l = slope length, ft (m × 0.3048)
s = slope steepness,
m = exponent dependent upon slope steep
(0.2 for slopes < 1%, 0.3 for slopes 1 t
0.4 for slopes 3.5 to 4.5%, and
0.5 for slopes > 5%)

FROM "EROSION & SEDIMENT CONTROL HANDBOOK", Goldman, Jackson, + Bursztynsky, 1986

Source: Erosion and Sediment Control Handbook," Goldman, Jackson, & Bursztynsky, 1986.

Downslope Flume & Energy Dissipator Sizing

SCS ENGINEERS

		Sheet No:	1 of 4
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Downslope Pipe and Inlet Sizing	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the downslope pipe and inlet to accommodate the 25-year, 24-hour storm event.

References:

1. HydroCAD Report: COL_Mod12-13_HydroCAD Report

Approach:

Use the orifice equation to size the downslope pipe inlet. Size the inlet for the largest diversion berm flow rate and apply that inlet size to all downslope pipe inlets. Confirm the head (h) acting on the orifice will not overtop the diversion berm depth of 2.0 ft.

Use Manning's equation to size the downslope pipe based on the largest diversion berm flow rate. Confirm the pipe has capacity for the design flow under open channel flow conditions.

Assumptions:

1. Orifice coefficient = 0.63
2. Assume the orifice head (h) acts on the centerline of the inlet pipe.
3. Manning's n = 0.012 (For smooth walled HDPE pipe: http://www.engineeringtoolbox.com/mannings-roughness-d_799.html)
4. Size flumes under the vegetated cover condition.

From the HydroCAD Report (Reference 1) , the peak discharge to each downslope flume resulting from a 25-year, 24-hour storm is as follows*:

Flume 1		**Flume 2**		**Flume 3 Existing)**		**Flume 4 (Existing)**		**Flume 5 (Existing)**	
Area 1	3.75	Area 3	1.06						
Area 2	1.71	Area 4	0.92						
Area 12	4.83	Area 14	1.93						
Area 13	1.94	Area 15	2.80						
Total =	12.23		6.71		0		0		0

Flume 6		**Flume 7**		**Flume 8**		**Flume 9**		**Flume 10**	
Area 5	1.66	Area 8	2.66	Area 20	1.19	Area 10	1.68	Area 27	0.52
Area 6	2.81	Area 9	0.86	Area 25	2.12	Area 11	5.22	Area 28	0.44
Area 16	1.78	Area 18	5.06	Area 34	1.35	Area 21	1.62		
Area 17	3.04	Area 19	2.16			Area 22	7.54		
		Area 24	3.61			Area 26	2.10		
		Area 33	3.24			Area 27	7.46		
Total =	9.29	Total =	17.59	Total =	4.66	Total =	25.62	Total =	0.96

** Please note that the total flow rate at each flume calculated above may not reflect the flow rate shown in the HydroCAD Model due to the inflow to the flume occuring at different times during the storm event. The calculation above reflects the peak flow rate.*

Results:

Based on the inlet sizing calculation, an 18" diameter inlet will convey the stormwater runoff from the largest flow rate to a inlet (Area 22).

Based on the Manning's calculation for flow within the pipe, the 12" diameter downslope pipe will accommodate the design flow for Flumes 1 through 8 and Flume 10 under open channel flow conditions. Although the flow for the downslope pipes can be handled by 12" dia. pipes, for ease of construction, all downslope pipes will be 18" dia with the exception of Flume 10. Flume 10 will be constructed with a 12" dia pipe based on the drainage area and anticipated flow rate.

Calculations:

Size the downslope pipe inlet:

From the HydroCAD report (Reference #1), the maximum 25-year, 24-hour flow along a diversion berm is 7.54 cfs
in HydroCAD model). Area 27 Inlet

Orifice Equation: $Q = C * A * (2 * g * h)^{0.5}$

where: Q = flow rate (cfs) = 7.5 (From above)
C = orifice coefficient = 0.63 (See assumption #1)
A = orifice area (sf) = 1.77 (area of 18" diameter pipe) Actual Pipe Diameter = 18 inches
g = gravity (ft/sec^2)= 32
h = orifice head acting on centerline (ft)
$h = (Q/(C * A))^2/(2 * g)$ = 0.7 ft
Given Assumption #2, depth of flow along diversion berm = h + D/2/12 = 1.46 ft

The diversion swale depth of 2 ft is sufficient to prevent overtopping at the downslope pipe inlet locations. The depth of the diversion berm increases at the entrance of the down slope pipes due to mounding of the soil over the pipe.

Size the downslope flume pipe:

Use Manning's equation to size the downslope pipe.

Manning's Equation: Q = (1.49/n) x A x R^(2/3) x S^(1/2)
where: Q = Flow Rate, cfs
n = Manning's Roughness Coefficient
A = Flow Area, sf
R = Hydraulic Radius, ft (= A/P)
S = Channel Slope, ft/ft

For flow rates < 20 cfs, assume a 12" diameter downslope flume:

Use 17.59 cfs to Flume 7 to check sizing (max flow to a flume that is < 20 cfs)
Design Criteria
Pipe Diameter (in) = D = 12
Pipe Slope (ft/ft) = S = 0.25
Manning's Roughness Coefficient = n = 0.012
See Downslope Flume 7 pipe flow calculator on Sheet 3

For flow rates >20 cfs, try 18" diameter downslope flume:

Use 25.62 cfs to Flume 9 to check sizing (max flow to a flume that is < 20 cfs)
Design Criteria
Pipe Diameter (in) = D = 18
Pipe Slope (ft/ft) = S = 0.25
Manning's Roughness Coefficient = n = 0.012
See Downslope Flume 9 pipe flow calculator on Sheet 3

Calculations (Continued): **Flume 7** **17.59** 0

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	12.00	in
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.7500	fraction

Results:

Flow, Q	17.5969	ft^3/s
Velocity, v	27.8498	ft/s
Velocity head, hv	12.0541	ft
Flow Area, A	0.6319	ft^2
Wetted Perimeter, P	2.0944	ft
Hydraulic Radius	0.3017	ft
Top Width, T	0.8660	ft
Froude Number, F	5.84	
Shear Stress (tractive force), τ	11.7045	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

Calculations (Continued): **Flume 9** **25.62**

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	18.00	in
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.4705	fraction

Results:

Flow, Q	25.6240	ft^3/s
Velocity, v	31.3544	ft/s
Velocity head, hv	15.2789	ft
Flow Area, A	0.8172	ft^2
Wetted Perimeter, P	2.2676	ft
Hydraulic Radius	0.3604	ft
Top Width, T	1.4974	ft
Froude Number, F	7.60	
Shear Stress (tractive force), τ	11.0139	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

SCS ENGINEERS

Sheet No. 1 of 7			
Calc. No.			
Rev. No.			
Job No. 25222260.00	Project: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Energy Dissipator Sizing	Chk'd: RJG	Date: 8/30/23

Purpose:

To size an energy dissipator structure and riprap apron at the outlet of the downslope flume pipes.

References:

1. "Hydraulic Design of Energy Dissipators for Culverts and Channels," HEC-14, Third Edition, July 2006, USDOT FHWA.
2. Downslope Pipe and Inlet Sizing calculation (for pipe size, flow rate, and pipe velocity).
3. HydroCAD Report: COL_Mod12-13_HydroCAD Report
4. Facilities Development Manual Chapter 13, Section 13-30 - Rock Riprap Lined Chutes.
5. WisDOT FDM Table 25.1

Approach:

Use the downslope pipe outlet velocity to size an energy dissipator structure (USBR Type VI Impact Basin) following the design approach outlined in Section 9.4 of Reference #1.

Use Rock Chute Data Spreadsheet, FDM 13-30-30 Attachment 30.1 (from Reference #5) to design the rock chute.

For construction purposes use the maximum flow to size all dissipators and riprap apron.

Assumptions:

1. Riprap specific gravity = 2.65
2. From the HydroCAD Report, the 25-year, 24-hour peak discharge to each downslope flume is as follows*:

Flume 1		**Flume 2**		**Flume 3 Existing)**		**Flume 4 (Existing)**		**Flume 5 (Existing)**	
Area 1	3.75	Area 3	1.06						
Area 2	1.71	Area 4	0.92						
Area 12	4.83	Area 14	1.93						
Area 13	1.94	Area 15	2.80						
Total =	12.23		6.71		0		0		0

Flume 6		**Flume 7**		**Flume 8**		**Flume 9**		**Flume 10**
Area 5	1.66	Area 8	2.66	Area 20	1.19	Area 10	1.68	This flume discharges directly into a concrete catch basin at the toe of slope, therefore, no energy dissipator is needed.
Area 6	2.81	Area 9	0.86	Area 25	2.12	Area 11	5.22	
Area 16	1.78	Area 18	5.06	Area 34	1.35	Area 21	1.62	
Area 17	3.04	Area 19	2.16			Area 22	7.54	
		Area 24	3.61			Area 26	2.10	
		Area 33	3.24			Area 27	7.46	
Total =	9.29	Total =	17.59	Total =	4.66	Total =	25.62	

** Please note that the total flow rate at each flume calculated above may not reflect the flow rate shown in the HydroCAD Model due to the inflow to the flume occuring at different times during the storm event. The calculation above reflects the peak flow rate.*

Using Figure 9.14 (See Sheet 4), enter the Froude Number and the Energy from Step 2 to determine the
from the downslope flume pipe and inlet sizing calculation.

Results:

The energy dissipator structures for the 18" dia. downslope flume pipes will consist of dissipator structures with widths (W_B) of 6 feet, with the remaining dimensions from Table 9.2 on Sheets 5 and 6.

Riprap at the Flume energy dissipator outlets will consist of WisDOT Select Crush Material (D50= 2.2 inches) (See Page 3).

The riprap apron footprint will be based on the energy dissipator width, the rock chute, and/or the outlet swale geometry (See Plan Set).

Calculations:

For 18" dia. downslope flume pipes

From Reference #2:

Flow rate (Q) = 25.6 cfs

Pipe velocity (V) = 31.4 ft/s

Flow area (A) = Q/V = 0.82 sf

Design procedure from pg. 9-40 of Reference #1:

Step 1: Compute the Equivalent Depth of Flow Entering Dissipator:

$Y_e = (A/2)^{1/2}$ where: Ye = Equivalent depth

A = Area (from above)

Y_e = 0.64 ft

Step 2: Compute the Froude Number and the energy at the end of the pipe:

$Fr = V/[(g*Y_e)^{1/2}]$ where: Fr = Froude Number

V = Velocity (from above)

g = Gravity constant (32.2 ft/sec^2)

Fr = 6.9 Y_e = Equivalent depth (from Step 1 above)

$H_o = Y_e+V^2/2g$ where: H_o = Energy at the end of the pipe

Y_e = Equivalent depth (from above)

V = Velocity (from above)

Ho = 15.9 ft g = Gravity constant (32.2 ft/sec^2)

Step 3: Determine H_o/W_B and calculate the required width of the energy dissipator:

Using Figure 9.14 (See Sheet 4), enter the Froude Number and the Energy from Step 2 to determine the width of the energy dissipator.

From Figure 9.14, H_o/W_B = 2.70

$W_B = H_o/(H_o/W_B)$ W_B = 5.9 ft.

Use W_B = 6.0 ft.

Step 4: Obtain the remaining energy dissipator dimensions from Table 9.2 from Reference #1 (see Sheets 5 and 6)

Calculations:

Step 5: Determine the exit velocity from the energy dissiaptor structure and size the riprap apron at the structure outlet.

Use the relationship:

$H_B = Q/(W_B \times V_B) + V_B^2 / 2g = H_o \times (1-H_L/H_o)$

Where:

Q = 25.6 cfs, flowrate
W_B = 6.0 ft, width of energy dissipator
g = 32.2 ft/s^2, gravity
H_O 15.9 Energy at end of pipe
H_L/H_O 76 %, Energy loss (From Figure 9.15 from Reference #1, see Sheet 3)
V_B = Velocity at exit of dissipator (ft/s)
HB = Energy at exit of dissipator (ft)

Calculate HB using the second part of the equation:

$H_B = H_o \times (1-H_L/H_o)$

H_B = 3.82 ft

Using trial and error, select values for V_B and use the first part of the equation to calculate H_B:

Try V_B = 1.105 ft/s H_B = 3.87 ft

Based on the energy dissipator structure exit velocity, calculate the riprap size at the dissipator outlet.

From Equation 10.6 from Reference #1:

$D_{50} = (0.692 / (S-1)) \times (V^2/2g)$

Where:

S = 2.65 Specific gravity (See Assumption #1)
V = 1.11 Velocity = V_B from above.
D_{50} = riprap size

$D_{50\ Calc'd}$ = 0.008 feet

Round the calculated D_{50} up to the nearest IDOT standard riprap size:

$D_{50\ Design}$ = 0.18 feet Use = Select Crushed Material with geotextile Type R

Riprap Type	D_{50} (inches)	D_{50} (feet)	Riprap Thickness (in)	Geotextile Type
Select Crushed Material	2.2	0.18	5	Type R
Light Riprap	10	0.83	12	Type R
Medium Riprap	12.5	1.04	18	Type HR
Heavy Riprap	16	1.33	24	Type HR
Extra-Heavy Riprap	20	1.67	30	Type HR

from Reference 5

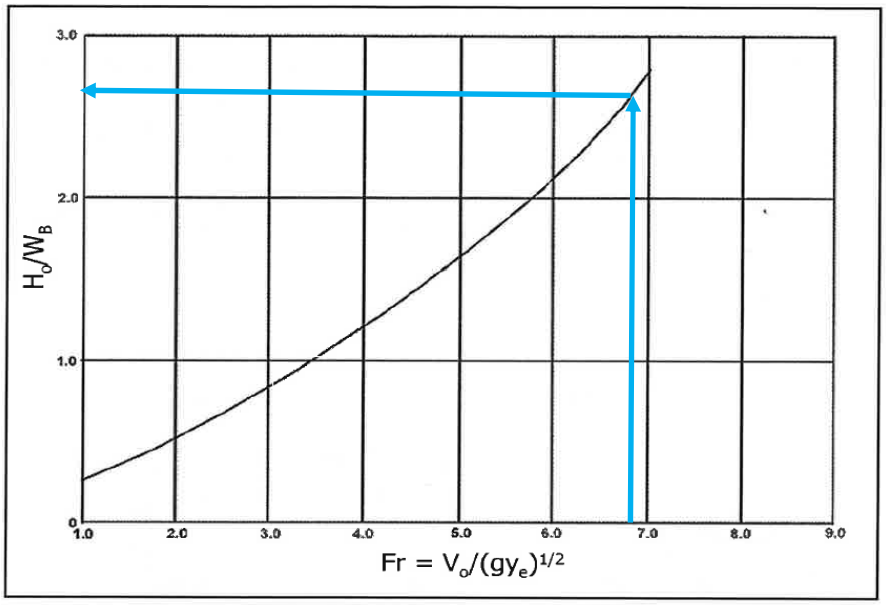


Figure 9.14. Design Curve for USBR Type VI Impact Basin

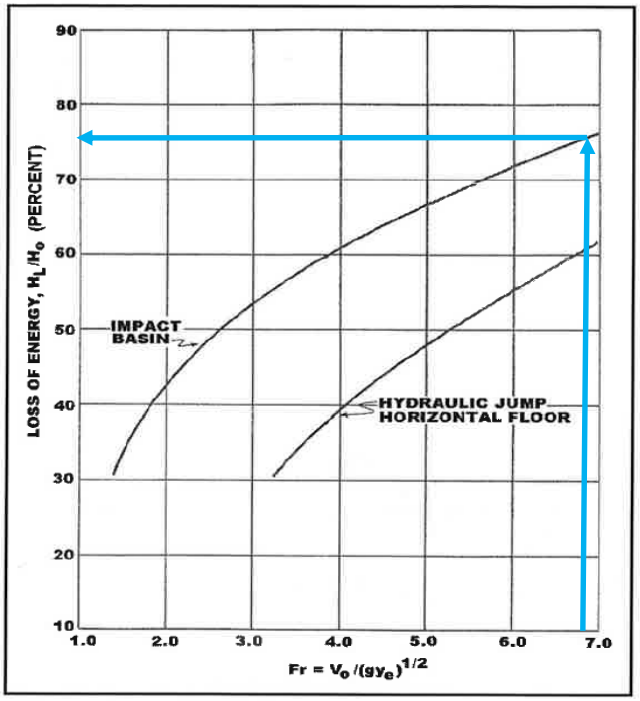


Figure 9.15. Energy Loss of USBR Type VI Impact Basin versus Hydraulic Jump

Table 9.2 (CU). USBR Type VI Impact Basin Dimensions (ft) (AASHTO, 2005)

W_B	h_1	h_2	h_3	h_4	L	L_1	L_2
4.	3.08	1.50	0.67	1.67	5.42	2.33	3.08
5.	3.83	1.92	0.83	2.08	6.67	2.92	3.83
6.	4.58	2.25	1.00	2.50	8.00	3.42	4.58
7.	5.42	2.58	1.17	2.92	9.42	4.00	5.42
8.	6.17	3.00	1.33	3.33	10.67	4.58	6.17
9.	6.92	3.42	1.50	3.75	12.00	5.17	6.92
10.	7.58	3.75	1.67	4.17	13.42	5.75	7.67
11.	8.42	4.17	1.83	4.58	14.58	6.33	8.42
12.	9.17	4.50	2.00	5.00	16.00	6.83	9.17
13.	10.17	4.92	2.17	5.42	17.33	7.42	10.00
14.	10.75	5.25	2.33	5.83	18.67	8.00	10.75
15.	11.50	5.58	2.50	6.25	20.00	8.50	11.50
16.	12.25	6.00	2.67	6.67	21.33	9.08	12.25
17.	13.00	6.33	2.83	7.08	21.50	9.67	13.00
18.	13.75	6.67	3.00	7.50	23.92	10.25	13.75
19.	14.58	7.08	3.17	7.92	25.33	10.83	14.58
20.	15.33	7.50	3.33	8.33	26.58	11.42	15.33

W_B	W_1	W_2	t_1	t_2	t_3	t_4	t_5
4.	0.33	1.08	0.50	0.50	0.50	0.50	0.25
5.	0.42	1.42	0.50	0.50	0.50	0.50	0.25
6.	0.50	1.67	0.50	0.50	0.50	0.50	0.25
7.	0.50	1.92	0.50	0.50	0.50	0.50	0.25
8.	0.58	2.17	0.50	0.58	0.58	0.50	0.25
9.	0.67	2.50	0.58	0.58	0.67	0.58	0.25
10.	0.75	2.75	0.67	0.67	0.75	0.67	0.25
11.	0.83	3.00	0.67	0.75	0.75	0.67	0.33
12.	0.92	3.00	0.67	0.83	0.83	0.75	0.33
13.	1.00	3.00	0.67	0.92	0.83	0.83	0.33
14.	1.08	3.00	0.67	1.00	0.92	0.92	0.42
15.	1.17	3.00	0.67	1.00	1.00	1.00	0.42
16.	1.25	3.00	0.75	1.00	1.00	1.00	0.50
17.	1.33	3.00	0.75	1.08	1.00	1.00	0.50
18.	1.33	3.00	0.75	1.08	1.08	1.08	0.58
19.	1.42	3.00	0.83	1.17	1.08	1.08	0.58
20.	1.50	3.00	0.83	1.17	1.17	1.17	0.67

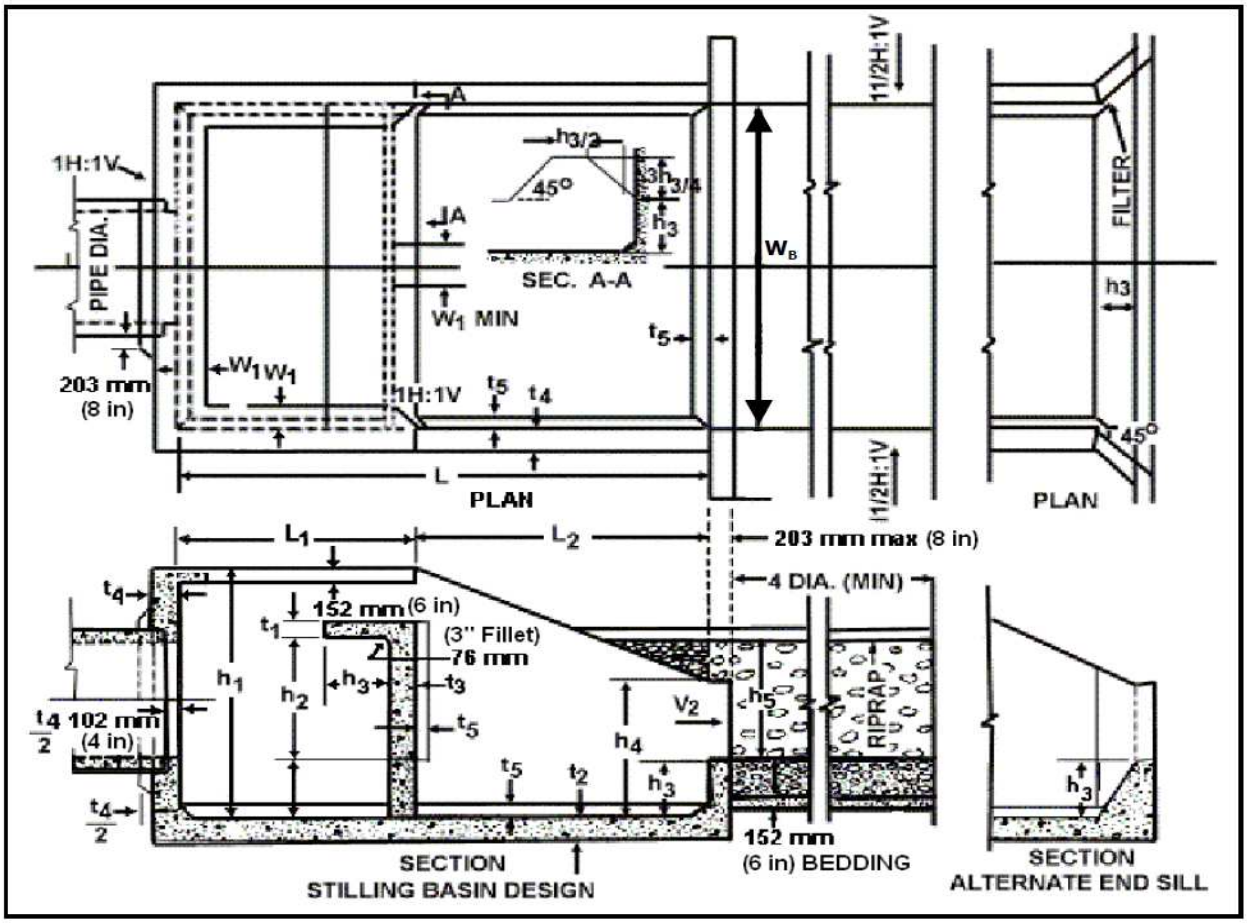


Figure 9.13. USBR Type VI Impact Basin

Calculations (Continued):

Downslope Flume 9 - Velocity Calculator (Q = 25.62 cfs)

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Inputs:

Pipe Diameter, d_o	18	in
Manning Roughness, n	0.0120	
Pressure slope	0.2500	slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	0.4705	fraction

Results:

Flow, Q	25.6240	ft^3/s
Velocity, v	31.3544	ft/s
Velocity head, hv	183.3465	in
Flow Area, A	0.8172	ft^2
Wetted Perimeter, P	2.2676	ft
Hydraulic Radius	0.3604	ft
Top Width, T	1.4974	ft
Froude Number, F	7.60	
Shear Stress (tractive force), τ	11.0139	psf

Version 2.0 (20 June 2017)

HawsEDC Calculators

Rock Chute Sizing

SCS ENGINEERS

		Sheet No:	1 of 5
		Calc. No.	
		Rev. No.	
Job No. 25222260.00	Job: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Rock Chute Sizing & Riprap Size	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the rock chutes to accommodate the 25-year, 24-hour storm event.

References:

1. Rock Chute Design Data spreadsheet Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998.
2. HydroCAD Report: COL_Mod12-13_HydroCAD Report
3. Figure 1 - Final Grades (Module 13)
4. Stable 25.1 Typical Particle Sizes of Native Sands at 75 Percent Passing (D75) from WisDOT Facilities. Development Manual (FDM).

Approach:

1. Enter Inlet Channel data based on culvert apron or swale geometry Reference #2 and #3.
2. Enter Chute data based on slope from Reference #3, start the width, Bw equal to inlet channel Bw.
3. Enter Outlet Channel data based on Reference #3, start the width, Bw equal to inlet channel Bw.
4. Enter drainage area, apron elevations, flow (Q), and rainfall.
5. Adjust Bw for Chute and Outlet Channel until spreadsheet shows the rock chute "will" function adequately.
6. Determine rip rap classification based on D50 weight per Reference #4.

Assumptions:

1. Assume side slopes of chute and outlet channel are 2:1.
2. Assume Factor of Safey is 1.2.
3. n-value is based on proposed conditions at the channel.
4. Assume Outlet apron depth, d is 1.0 ft.
5. Freeboard is 1.0 ft.
6. Use 25-year, 24-hour storm event flow (Reference #2) for Q_{high} and Q_{low}.
7. Classification of riprap is based on weight (Reference #4).

Calculations:

See attached spreadsheet calcs for each rock chute.

Results:

The rock chutes are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

Rock Chute	Width (ft)	Thickness (in)	Apron Width (ft)	Apron Length (ft)	D_{50} (in)	WisDOT Rip Rap Classification
RC1	8	4	8	2	2	Select Crushed Material, Type R
RC2	6	12	6	7	5.9	Light Riprap Type R
RC3	6	8	6	5	3.8	Light Riprap Type R
RC4	6	9	6	6	3.8	Light Riprap, Type R

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12-13 RC1 **County:** Columbia
Designer: SJL **Checked by:** RJG
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	0.0 ft.	Bottom Width =	8.0 ft.		Bottom Width =	8.0 ft.
Side slopes =	4.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.030	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0600 ft./ft.	Bed slope =	0.1769 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 829.0 ft. ---- Outlet 806.0 ft. --- (H_{drop} = 22 ft.)

Degree of angularity = 1

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

1 --> 50% angular, 50% rounded
2 --> 100 % rounded

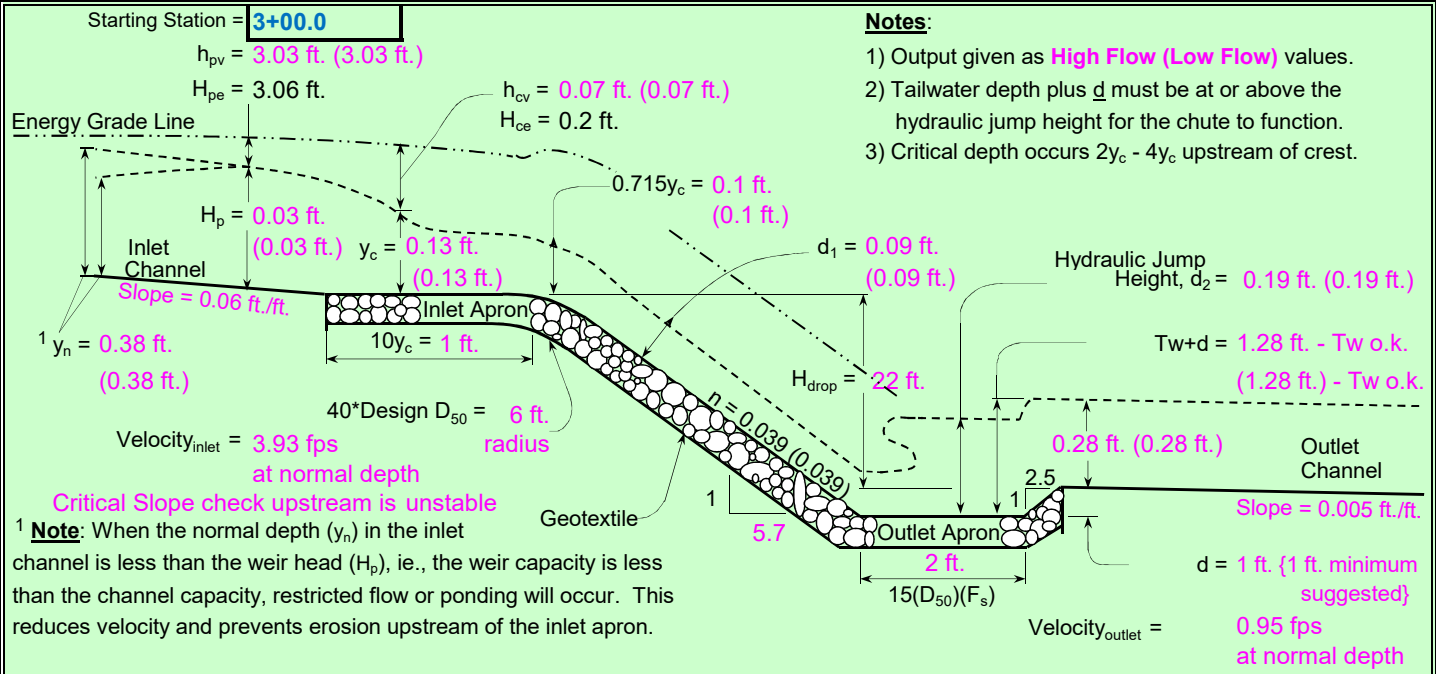
Q_{high} = 2.3 cfs High flow storm through chute → Tw (ft.) = Program
Q_{low} = 2.3 cfs Low flow storm through chute → Tw (ft.) = Program

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.18 1.20

Profile and Cross Section (Output):

Starting Station = 3+00.0

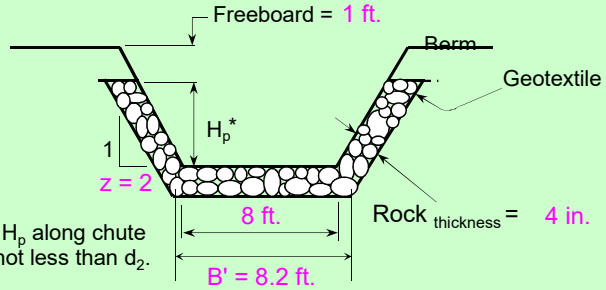


Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs 2y_c - 4y_c upstream of crest.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	0.28 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.09 ft.	Normal depth in chute
n-value =	0.039	Manning's roughness coefficient
D_{50}(SF) =	2 in.	Minimum Design D_{50}*
2(D_{50})(SF) =	4 in.	Rock chute thickness
Tw + d =	1.28 ft.	Tailwater above outlet apron
d_2 =	0.19 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12-13 RC2 **County:** Columbia
Designer: SJL **Checked by:** RJG
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	1.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.012	Side slopes =	2.0 (z:1) →	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0001 ft./ft.	Bed slope =	0.2319 ft./ft →	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n		Freeboard =	1.0 ft. →			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 820.0 ft. ------ Outlet 804.0 ft. --- (H_{drop} = 15 ft.)

Degree of angularity = 1

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

1 --> 50% angular, 50% rounded
2 --> 100 % rounded

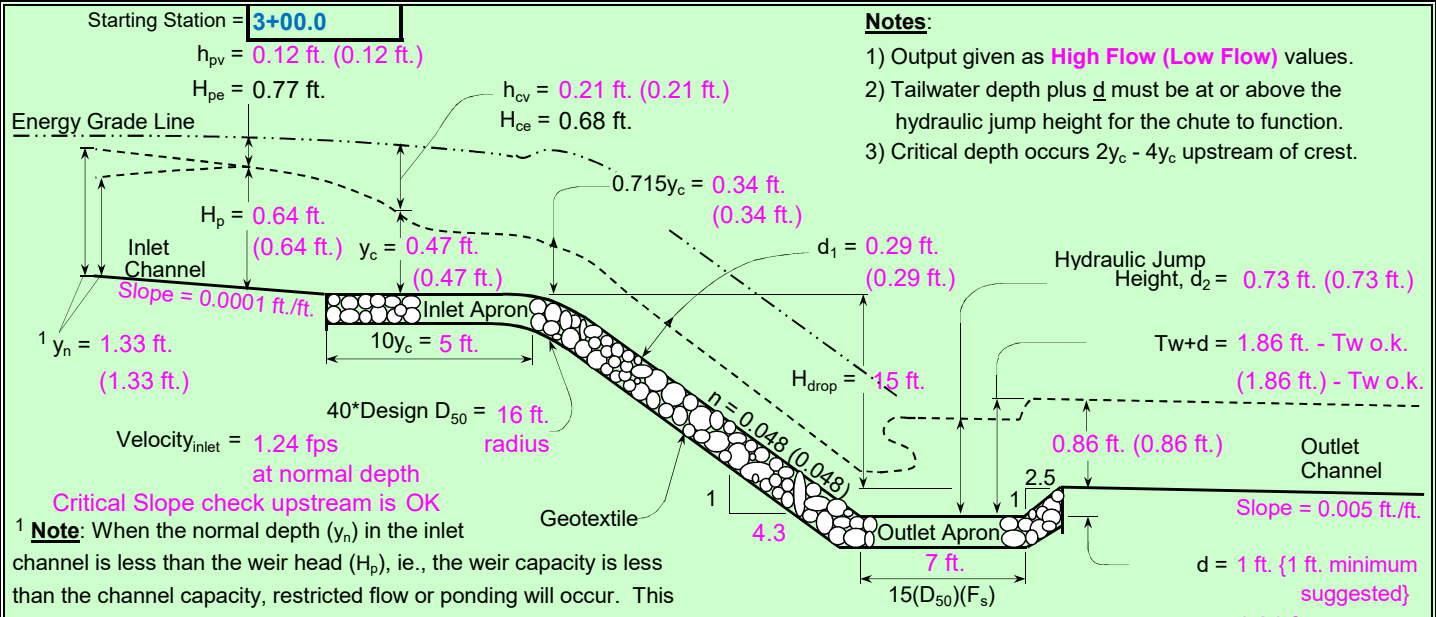
Q_{high} = 12.1 cfs High flow storm through chute → Tw (ft.) = Program
Q_{low} = 12.1 cfs Low flow storm through chute → Tw (ft.) = Program

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.23 1.20

Profile and Cross Section (Output):

Starting Station = 3+00.0

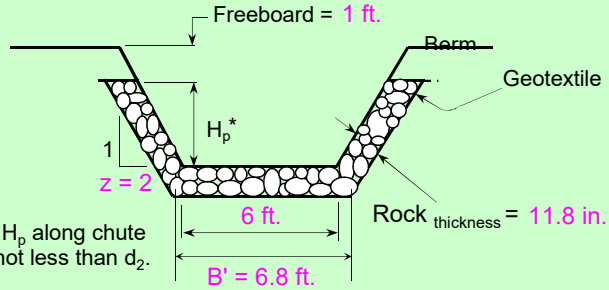


Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs 2y_c - 4y_c upstream of crest.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.85 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.29 ft.	Normal depth in chute
n-value =	0.048	Manning's roughness coefficient
D_{50}(SF) =	5.9 in.	Minimum Design D_{50}*
2(D_{50})(SF) =	11.8 in.	Rock chute thickness
Tw + d =	1.86 ft.	Tailwater above outlet apron
d_2 =	0.73 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12-13 RC3 **County:** Columbia
Designer: SJL **Checked by:** RJG
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	1.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.012	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0001 ft./ft.	Bed slope =	0.1545 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 821.0 ft. ---- Outlet 804.0 ft. --- (H_{drop} = 16 ft.)

Degree of angularity = 1

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

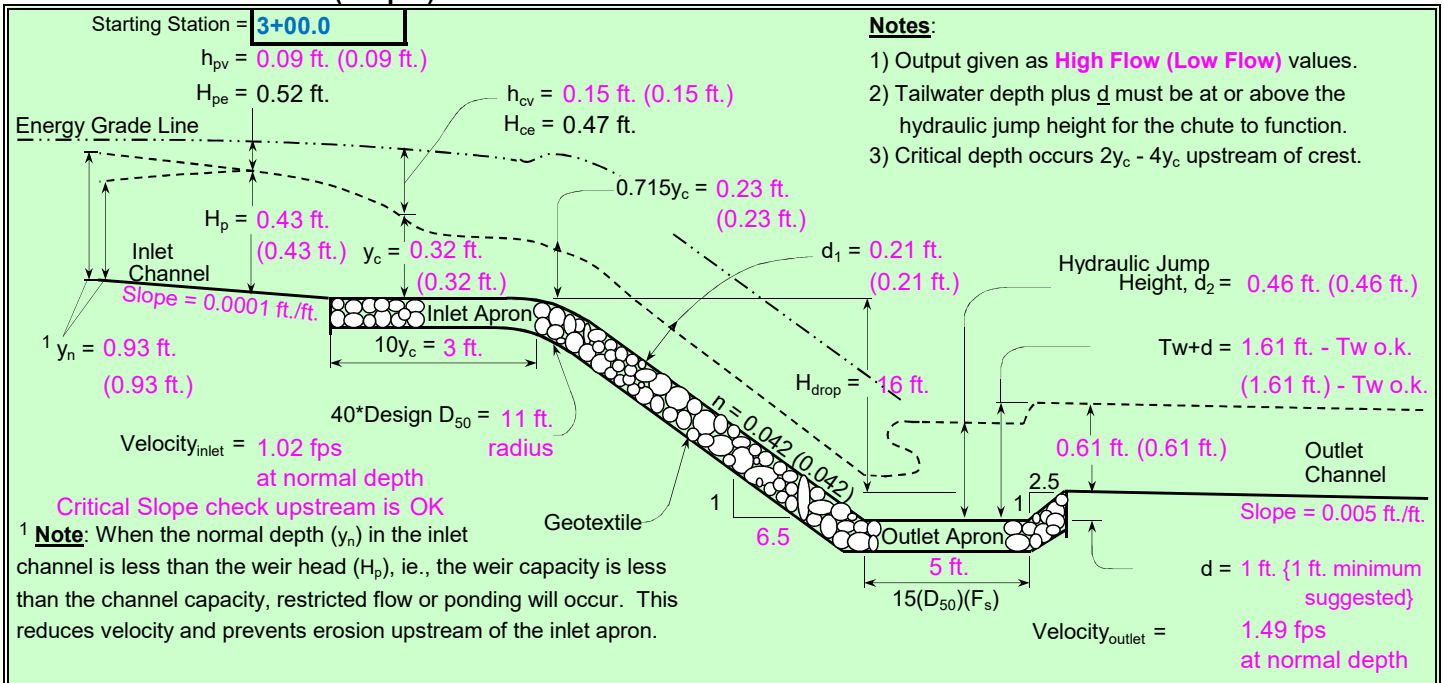
1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Q_{high} = 6.6 cfs High flow storm through chute → Tw (ft.) = Program
Q_{low} = 6.6 cfs Low flow storm through chute → Tw (ft.) = Program

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.15 1.20

Profile and Cross Section (Output):

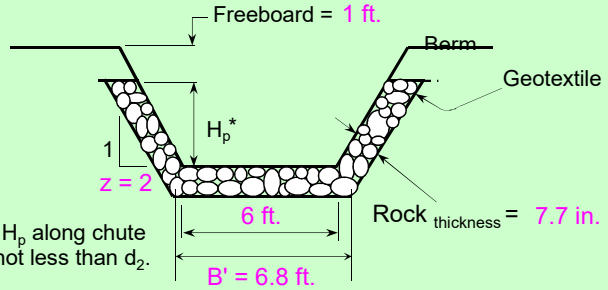


Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs 2y_c - 4y_c upstream of crest.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.04 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.21 ft.	Normal depth in chute
n-value =	0.042	Manning's roughness coefficient
D_{50}(SF) =	3.8 in.	Minimum Design D_{50}*
2(D_{50})(SF) =	7.7 in.	Rock chute thickness
Tw + d =	1.61 ft.	Tailwater above outlet apron
d_2 =	0.46 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Mod 12-13 RC4 **County:** Columbia
Designer: RJG **Checked by:** SJL
Date: August 28, 2023 **Date:** 08/28/23

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	4.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	4.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.045	Side slopes =	2.0 (z:1) →	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0288 ft./ft.	Bed slope =	0.2212 ft./ft →	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n		Freeboard =	1.0 ft. →			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 824.9 ft. ---- Outlet 817.6 ft. --- (H_{drop} = 6.3 ft.)

Degree of angularity = 1

Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

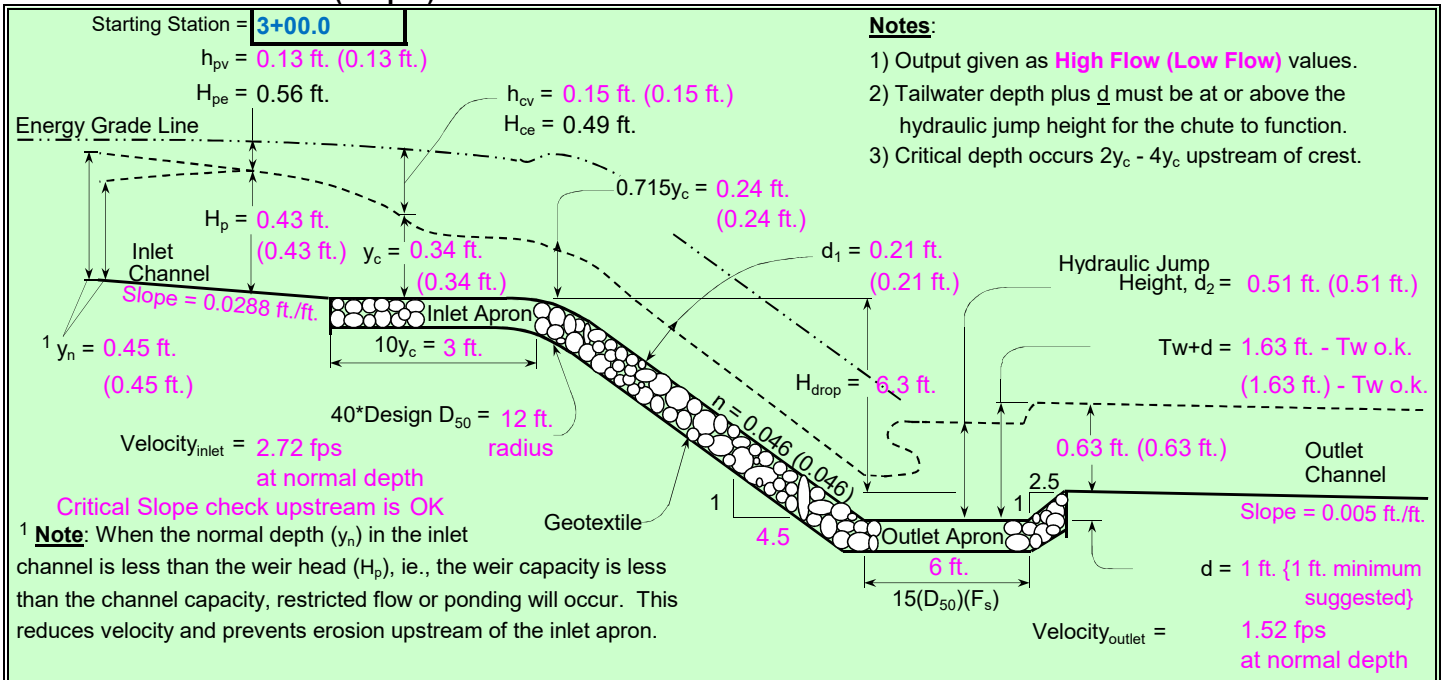
1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.22 1.20

Q_{high} = 7.0 cfs High flow storm through chute → Tw (ft.) = **Program**
Q_{low} = 7.0 cfs Low flow storm through chute → Tw (ft.) = **Program**

Profile and Cross Section (Output):

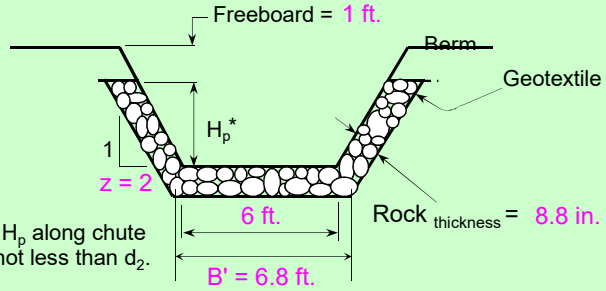


Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs 2y_c - 4y_c upstream of crest.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.1 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.21 ft.	Normal depth in chute
n-value =	0.046	Manning's roughness coefficient
D_{50}(SF) =	4.4 in.	Minimum Design D_{50}*
2(D_{50})(SF) =	8.8 in.	Rock chute thickness
Tw + d =	1.63 ft.	Tailwater above outlet apron
d_2 =	0.51 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Riprap Apron Sizing

SCS ENGINEERS

		Sheet No.	1 of 2
		Calc. No.	
		Rev. No.	2
Job No. 25222260.00	Job: Columbia Energy Center MOD 12-13	By: SJL	Date: 8/28/23
Client: WPL	Subject: Riprap Sizing at Culvert Outlet	Chk'd: RJG	Date: 8/28/23

Purpose:

To size the riprap apron dimensions at culvert C2, C3, C4, C5, C8, and C10 based on a 25-year, 24 hour storm event:

References:

1. "Energy Dissipators," Wisconsin Department of Transportation (WisDOT), Facilities Development Manual (FDM) 13-35-5.
2. HydroCAD Report: COL_Mod12-13_HydroCAD Report
3. "Rock Riprap Lined Channels," WisDOT FDM 13-30-25.
4. Culvert Sizing Calculation.
5. WisDOT FDM Chapter 13, Section 30 - Rock Riprap Lined Chutes

Approach:

Use the equations in Section 5.2 - Riprap Blanket of WisDOT FDM 13-35-5 (Energy Dissipators) to determine the average size of stone (d_{50}) and riprap apron length. Round up the calculated d_{50} to the nearest WisDOT standard riprap size.

Use WisDOT FDM 13-35 Attachment 5.2 to determine the width of the riprap apron for discharges to a flat area. For discharges to channels, extend riprap across the channel bottom and up the sides.

Assumptions:

Assume riprap apron thickness (T) is 2 * d_{50} to protect against washout and undercutting of the riprap.

Assume tailwater depth, TW = 0.40 * D_o

Assume max TW conditions for the riprap apron width.

Assume that when there are multiple culverts, the total discharge to the culverts is distributed evenly through each barrel.

Calculation:

From WisDOT Section 5.2 - Riprap Blanket:

$$d_{50}/D_o = 0.020\ (D_o/TW)\ (Q/D_o^{5/2})^{4/3}$$

$$L_{sp}/D_o = 1.7\ (Q/D_o^{5/2}) + 8$$

Or:

$$d_{50} = 0.02 \times (D_o/TW) \times (Q/D_o^{5/2})^{4/3} \times D_o$$

$$L_{sp} = (1.7\ (Q/D_o^{5/2}) + 8) \times D_o$$

where: D_o = Diameter or width of culvert (ft)

Q = Flow rate (cfs) (discharge rate through culvert, from Worst Case Condition HydroCAD Model (Reference #2))

TW = Tail water depth (ft)

d_{50} = Average size of stone (ft)

L_{sp} = Length of stone protection (Apron Length) (ft)

Location	Total Flow (Q, cfs)	Number of Pipes	D_o (ft)	Q (cfs)	TW (ft)	$d_{50\ calculated}$	$d_{50\ Design}$	L_{sp}
Culvert C2	10.95	2	2	5.5	0.80	0.10	0.18	19
Culvert C3	28.58	2	2.5	14.3	1.00	0.20	0.83	26
Culvert C4	34.14	2	2.5	17.1	1.00	0.26	0.83	27
Culvert C5	37.41	2	2.5	18.7	1.00	0.29	0.83	28
Culvert C8	0.96	1	1	1.0	0.40	0.05	0.18	10
Culvert 10	2.76	1	2	2.8	0.80	0.04	0.18	18

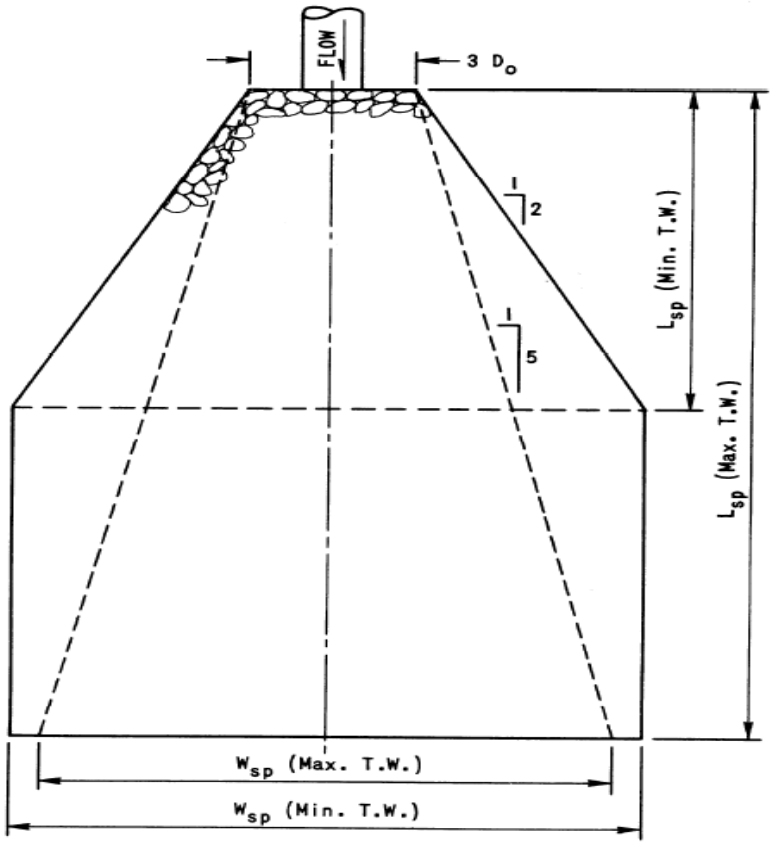
Results:

Below is a summary of the d_{50} , thickness (T), and configuration of the riprap apron. Also refer to WisDOT FDM Attachment 5.2 (Sheet 2) for details on apron layout. Use WisDOT Light Riprap at culvert discharge.

Location	d_{50} (in)*	T (in)	L_{sp} (ft)	W_{sp} (ft)	WisDOT Riprap sizes
Culvert C2	2.2	6	19	See Note 1	Select Crushed Material
Culvert C3	10.0	20	26	See Note 1	Light Riprap
Culvert C4	10.0	20	27	See Note 1	Light Riprap
Culvert C5	10.0	20	28	See Note 1	Light Riprap
Culvert C8	2.2	6	10	See Note 1	Select Crushed Material
Culvert 10	2.2	6	18	See Note 1	Select Crushed Material

1. For discharges to channels, place riprap along channel bottom and up side of channel.

FDM 13-35 Attachment 5.2 Recommended Configuration of Riprap Blanket Subject to Maximum and Minimum Tail Waters



RECOMMENDED CONFIGURATION OF RIPRAP BLANKET SUBJECT TO MAXIMUM AND MINIMUM TAILWATERS

Source: Miscellaneous paper H-72-5, "Practical Guidance for Estimating and Controlling Erosion at Culvert Outlets", U.S. Army Engineer Waterways Experiment Station, May, 1972.

Table 25.1 Typical Particle Sizes of Native Sands at 75 Percent Passing (D_{75})

Riprap Type	D50 (inches)	D50 (feet)	Riprap Thickness (in)	Geotextile Type
Select Crushed Material	2.2	0.18	5	Type R
Light Riprap	10	0.83	12	Type R
Medium Riprap	12.5	1.04	18	Type HR
Heavy Riprap	16	1.33	24	Type HR
Extra-Heavy Riprap	20	1.67	30	Type HR

Source: Table 25.1 from WisDOT FDM.

Appendix A2

Module 12/13 – Leachate/Surface Water Pond Evaluation

SCS ENGINEERS					
		SHEET NO.	1		
Job No.	25222260.00	CALC. NO.			
Job:	Columbia Energy Center	REV. NO.	2		
Client	WPL	BY	SJL	DATE	8/28/23
Subject	Module 12/13 - Leachate/Surface Water Pond Evaluation	CHK'D.	RJG	DATE	8/30/23

Purpose:

The purpose of the leachate/surface water pond evaluation is to determine the following based on the as-built leachate/surface water pond top of liner elevation of 796.97 (see Background section below):

- The maximum amount of open area during each filling phase in order to maintain the peak water elevation resulting from the 25-year, 24-hour storm event at the maximum allowable 796.97.
- Based on the amount of allowable open area determined from the above, determine the maximum starting water elevations in the leachate/surface water pond to accommodate 1, 2, 5, and 10-year, 24-hour storm events without overtopping.

Background:

- During construction of Module 2, the top of the leachate/surface water pond liner was determined to be at elevation 796.97.
- Previous calculations submitted to the WDNR on January 30, 2018 and March 10, 2021, evaluated the leachate/surface water pond capacity based on the as-built pond liner elevation.
- A similar evaluation was performed for Module 3 and 4 construction and then Module 5 and 6 construction that produced a chart of maximum leachate/surface water pond starting elevations vs. rainfall storage capacity.
- Module 10 and 11 were constructed in 2002 and CCR placement began in 2023.
- Module 12 and 13 will be constructed if additional airspace is required before the plant is closed.
- The Filling Phases 0 - 4 were previously submitted and approved by WDNR in 2022 as part of the Plan Modification Request - Plan of Operations Update that covered modules up to Module 10-11.

Approach:

- Use the previously developed HydroCAD storm water model to model the below four filling scenarios.
    1. Filling Phase 5 – Assumes portions of Module 11 and 12 are contributing to the leachate/surface water pond while material is placed from the pond closure and the plant. See **Figure 1** for filling grades and contributing area.
    2. Filling Phase 6 – Assumes portions of Module 12 and 13 are contributing to the leachate/surface water pond while material is placed from the pond closure and the plant. See **Figure 2** for filling grades and contributing area.

Assumptions:

- CCR surfaces and intermediate cover areas were assumed to be impermeable (CN=98).
- The top of pond liner elevation is 796.97 (see Background section).
- Time of Concentration is 20 minutes for open areas.

Results:

1. Maximum allowable open area and contact water sump area during filling of Module 12 and 13 is 8.51 acres.

2. Filling Phase 5:
    - The contributing area of landfill to the leachate/surface water pond is 6.24 acres for the leachate/surface water pond to accommodate the runoff from a 25-year, 24-hour storm without overtopping. This acreage includes the open landfill area plus the contact water sump area.
    - The remainder of landfill would need to be closed/covered with final or intermediate cover and routed away from the pond.
    - **Figure 1** shows a proposed filling sequence, and **Figure 1a** shows the various operating levels of the leachate/surface water pond to accommodate the various storm events with the additional cover in place.

3. Filling Phase 6:
    - The contributing area of landfill to the leachate/surface water pond is 8.475 acres for the leachate/surface water pond to accommodate the runoff from a 25-year, 24-hour storm without overtopping. This acreage includes the open landfill area plus the contact water sump area.
    - The remainder of landfill would need to be closed/covered with final or intermediate cover and routed away from the pond.
    - **Figure 2** shows a proposed filling sequence, and **Figure 2a** shows the various operating levels of the leachate/surface water pond to accommodate the various storm events with the additional cover in place.

The HydroCAD reports for the maximum open contributing area, each scenario modeled are attached.

I:\25222260.00\Data and Calculations\Leachate\230728_Leachate_Surface Water Pond Evaluation_POO Calc writeup.docx

540,500 N | 541,000 N | 541,500 N | 542,000 N | 542,500 N | 543,000 N | 543,500 N

2,123,500 E | 2,124,000 E | 2,124,500 E | 2,125,000 E

COAL PILE

SOUTH SEDIMENTATION BASIN

WPDES POND

LEACHATE/ SURFACE WATER POND

EXISTING FINAL COVER

ESTIMATED INTERMEDIATE COVER

ACTIVE AREA
(ESTIMATED OPEN AREA 5.5 ACRES)

MODULE 12 LINER
(ESTIMATED 0.5 ACRES)

C. M. ST. P. & P. RR.

MURRAY ROAD

MW-311 | MW-83 | SG-4 | MW-33AR | MW-33B | MW-34A | MW-34B | MW-88B | MW-88A | MW-85 | MW-85B | MW-302 | MW-5R | MW-310 | MW-309 | MW-92B | MW-92A | LS1 | MW-91AR | MW-91B | LP-1 | MW-37B | MW-37A | MW-301 | MW-17 | MW-84A | MW-84B | MW-86 | MW-93B | MW-93A | MW-312

LH-10A | LH-10B | LH-11A | LH-11B

LEGEND

- DRY ASH DISPOSAL FACILITY LIMITS
- LIMITS OF WASTE
- FINAL COVER LIMITS
- PAVED ROAD
- UNPAVED ROAD
- VEGETATION
- FENCE
- EXISTING GRADE (10' INTERVAL)
- EXISTING GRADE (2' INTERVAL)
- SWALE
- EDGE OF WATER
- WETLAND
- PROPOSED GRADE (10' INTERVAL)
- PROPOSED GRADE (2' INTERVAL)
- PROPOSED PERIMETER ROAD
- PROPOSED SWALE
- PROPOSED CULVERT
- EXISTING FINAL COVER
- ESTIMATED INTERMEDIATE COVER
- ACTIVE FILLING AREA
- UNFILLED MODULE 12 LINER AREA FOR CONTACT WATER PUMPING

NOTES:

1. PROPOSED GRADES ARE CONCEPTUAL. ACTUAL GRADES WILL BE BASED ON PLANT OPERATIONS.

100 0 100

SCALE: 1" = 100'

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DRAWN BY: KP
CHECKED BY: RR/MRH
APPROVED BY: MRH 08/30/2023

PROJECT NO. 25222260.01
DRAWN: 07/24/2023
REVISED: 08/15/2023

Wisconsin Power and Light Company

WISCONSIN POWER AND LIGHT COLUMBIA ENERGY CENTER W8375 MURRAY ROAD PARDEEVILLE, WISCONSIN 53954

CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

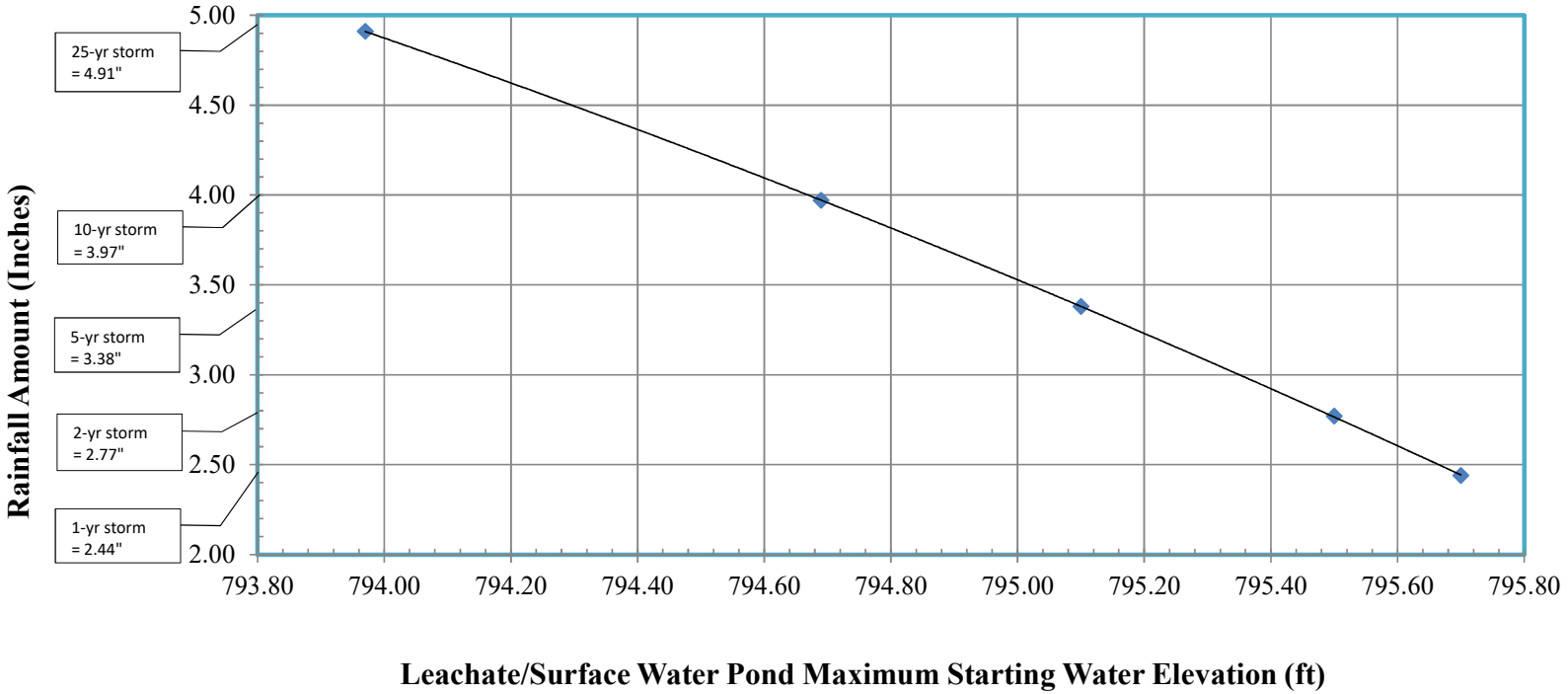
PLAN OF OPERATION UPDATE
COLUMBIA ENERGY CENTER
ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

SITE

FILL SEQUENCE – MODULE 12

FIGURE 1

Figure 1A
Columbia Energy Center
Phase 5 Filling- Open Landfill Area
Leachate/Surface Water Pond Maximum Starting Water Elevation



Notes/Assumptions:

1. Maximum starting water elevations based on 2011 Mod 2 as-built survey which determined the top of pond liner elevation = 796.97.
2. Maximum starting water elevation assumes no freeboard.
3. Previously developed HydroCAD model utilized with curve number for intermediate cover areas and ash surfaces assumed at CN = 98.
4. HydroCAD model assumes drainage areas contributing to pond include (Figure 1):
   - Landfill open area plus contact water sump area = 6.24 acres.
   - Leachate/Surface Water Pond Area, 2.98 acres.
5. Maximum open area per HydroCAD model during filling is 8.51 acres.

I:\25220183.00\Data and Calculations\Leachate_Surface Water Pond Evaluation\Issued for Permitting_POO Update\

540,500 N | 541,000 N | 541,500 N | 542,000 N | 542,500 N | 543,000 N | 543,500 N

2,123,500 E | 2,124,000 E | 2,124,500 E | 2,125,000 E

COAL PILE

SOUTH SEDIMENTATION BASIN

WPDES POND

EXISTING FINAL COVER

ESTIMATED INTERMEDIATE COVER

ACTIVE AREA
(ESTIMATED OPEN AREA 7.8 ACRES)

MODULE 13 LINER
(ESTIMATED 0.7 ACRES)

LEACHATE/ SURFACE WATER POND

C. M. ST. P. & P. RR.

MURRAY ROAD

MW-311
MW-83
SG-4
MW-33AR
MW-33B
MW-34A
MW-34B
MW-88B
MW-88A
MW-85
MW-85B
MW-302
MW-5R
MW-310
MW-309
MW-37B
MW-37A
MW-92B
MW-92A
MW-91AR
MW-91B
LP-1
MW-301
MW-17
MW-84A
MW-84B
MW-86
MW-93B
MW-93A
MW-312
LH-10A
LH-10B
LH-11A
LH-11B

LEGEND

- DRY ASH DISPOSAL FACILITY LIMITS
- LIMITS OF WASTE
- FINAL COVER LIMITS
- PAVED ROAD
- UNPAVED ROAD
- VEGETATION
- FENCE
- 810 EXISTING GRADE (10' INTERVAL)
- EXISTING GRADE (2' INTERVAL)
- SWALE
- EDGE OF WATER
- WETLAND
- 800 PROPOSED GRADE (10' INTERVAL)
- 802 PROPOSED GRADE (2' INTERVAL)
- PROPOSED PERIMETER ROAD
- PROPOSED SWALE
- PROPOSED CULVERT
- EXISTING FINAL COVER
- ESTIMATED INTERMEDIATE COVER
- ACTIVE FILLING AREA
- UNFILLED MODULE 13 LINER AREA FOR CONTACT WATER PUMPING

NOTES:

1. PROPOSED GRADES ARE CONCEPTUAL. ACTUAL GRADES WILL BE BASED ON PLANT OPERATIONS.

100 0 100

SCALE: 1" = 100'

N

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PROJECT NO. 2522260.01
DRAWN: 07/24/2023
REVISED: 08/15/2023

DRAWN BY: KP
CHECKED BY: RR/MRH
APPROVED BY: MRH 08/30/2023

Wisconsin Power and Light Company

WISCONSIN POWER AND LIGHT
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ENGINEER

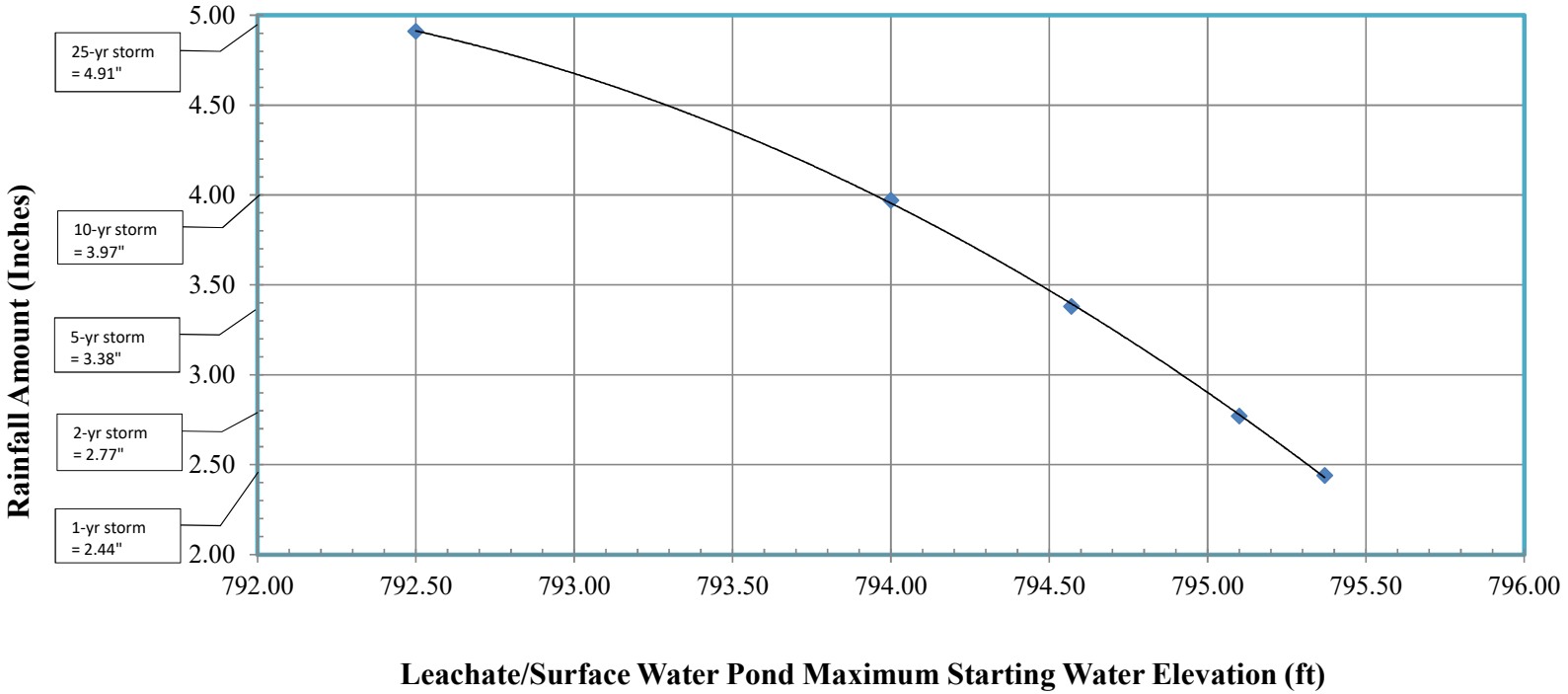
PLAN OF OPERATION UPDATE
COLUMBIA ENERGY CENTER
COLUMBIA COUNTY DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

SITE

FILL SEQUENCE – MODULE 12 AND 13

FIGURE
2

Figure 2A
Columbia Energy Center
Phase 6 Filling- Open Landfill Area
Leachate/Surface Water Pond Maximum Starting Water Elevation



Notes/Assumptions:

1. Maximum starting water elevations based on 2011 Mod 2 as-built survey which determined the top of pond liner elevation = 796.97.
2. Maximum starting water elevation assumes no freeboard.
3. Previously developed HydroCAD model utilized with curve number for intermediate cover areas and ash surfaces assumed at CN = 98.
4. HydroCAD model assumes drainage areas contributing to pond include (Figure 2):
   - Landfill open area plus contact water sump area = 8.475 acres.
   - Leachate/Surface Water Pond Area, 2.98 acres.
5. Maximum open area per HydroCAD model during filling is 8.51 acres.

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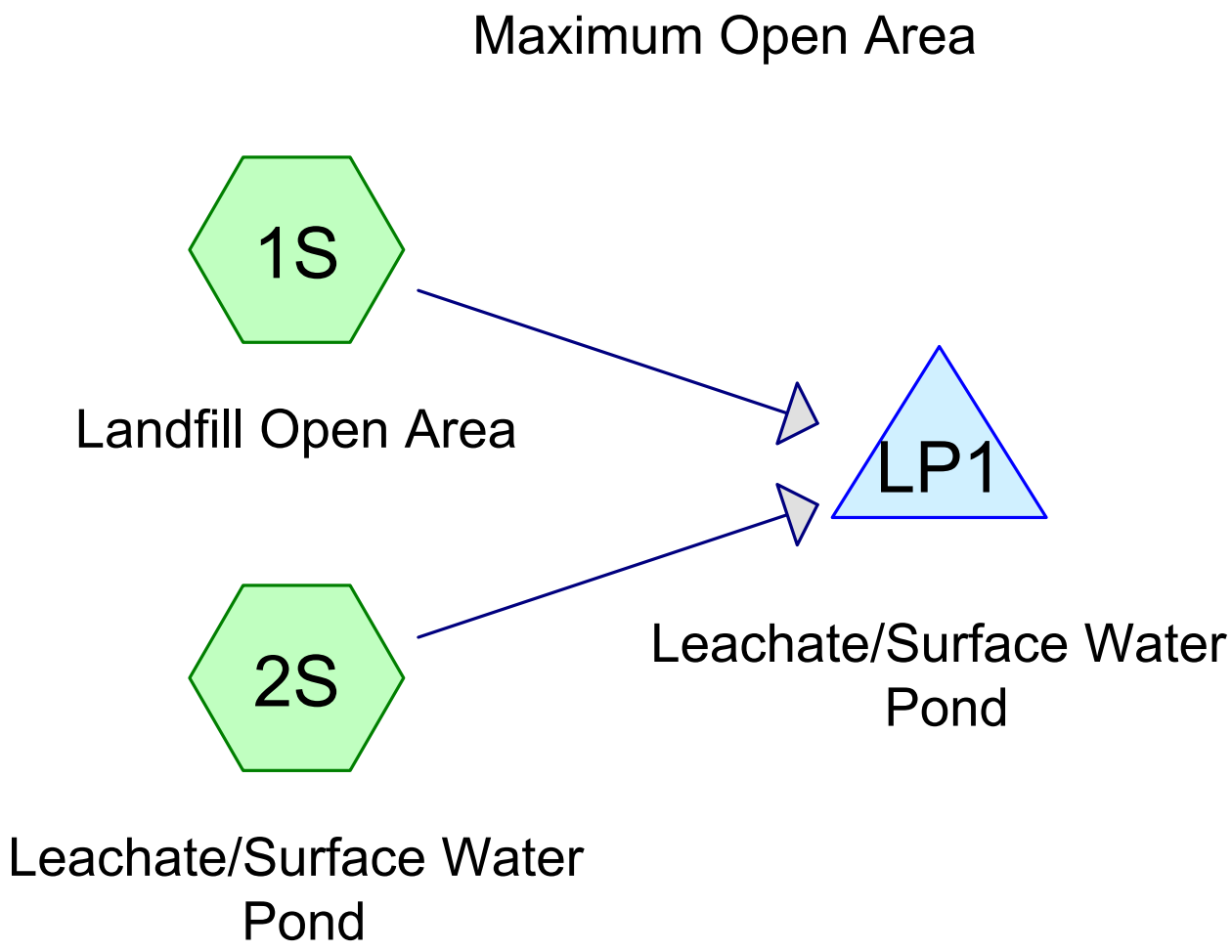
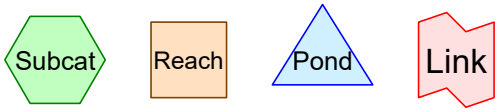


Phase 12 Filling

Phase 13 Filling



Routing Diagram for 230817_WPL Columbia_Leachate Pond Evaluation
Prepared by SCS Engineers, Printed 8/17/2023
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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	4.91	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Landfill Open Area Runoff Area=8.510 ac 100.00% Impervious Runoff Depth=4.67"
Tc=20.0 min CN=98 Runoff=34.73 cfs 3.314 af

Subcatchment2S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=21.19 cfs 1.161 af

Pond LP1: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,946 cf Inflow=39.03 cfs 4.475 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 1S: Landfill Open Area

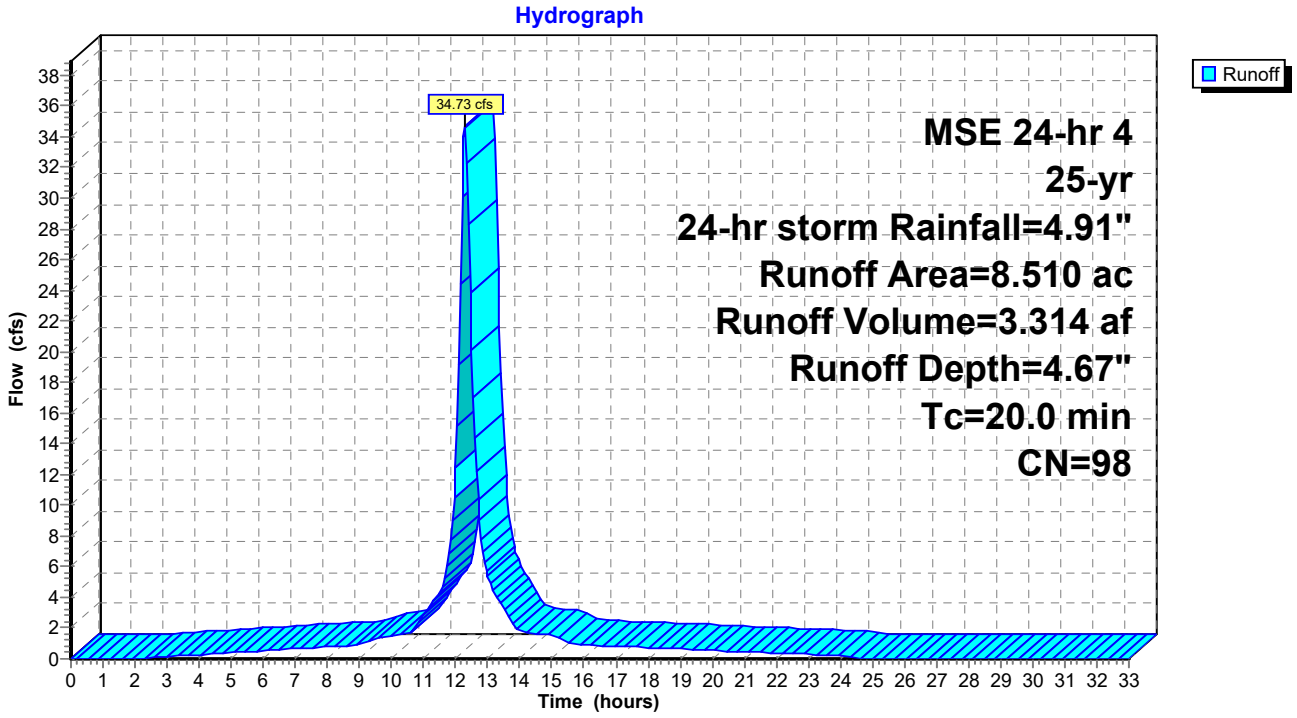
Runoff = 34.73 cfs @ 12.28 hrs, Volume= 3.314 af, Depth= 4.67"
Routed to Pond LP1 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	8.510	98	Mod 2 - 11 Open Area
	8.510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Subcatchment 1S: Landfill Open Area



Summary for Subcatchment 2S: Leachate/Surface Water Pond

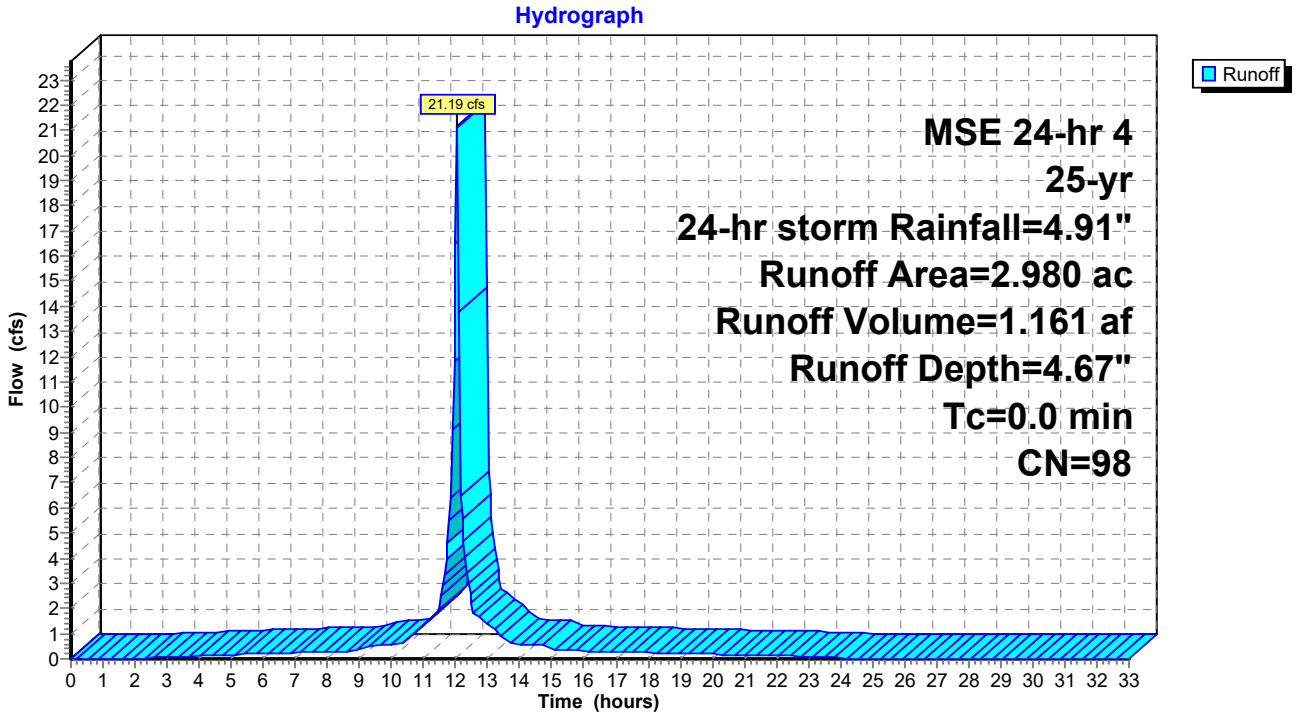
Runoff = 21.19 cfs @ 12.04 hrs, Volume= 1.161 af, Depth= 4.67"
Routed to Pond LP1 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Subcatchment 2S: Leachate/Surface Water Pond



Summary for Pond LP1: Leachate/Surface Water Pond

Inflow Area = 11.490 ac,100.00% Impervious, Inflow Depth = 4.67" for 25-yr, 24-hr storm event
Inflow = 39.03 cfs @ 12.27 hrs, Volume= 4.475 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

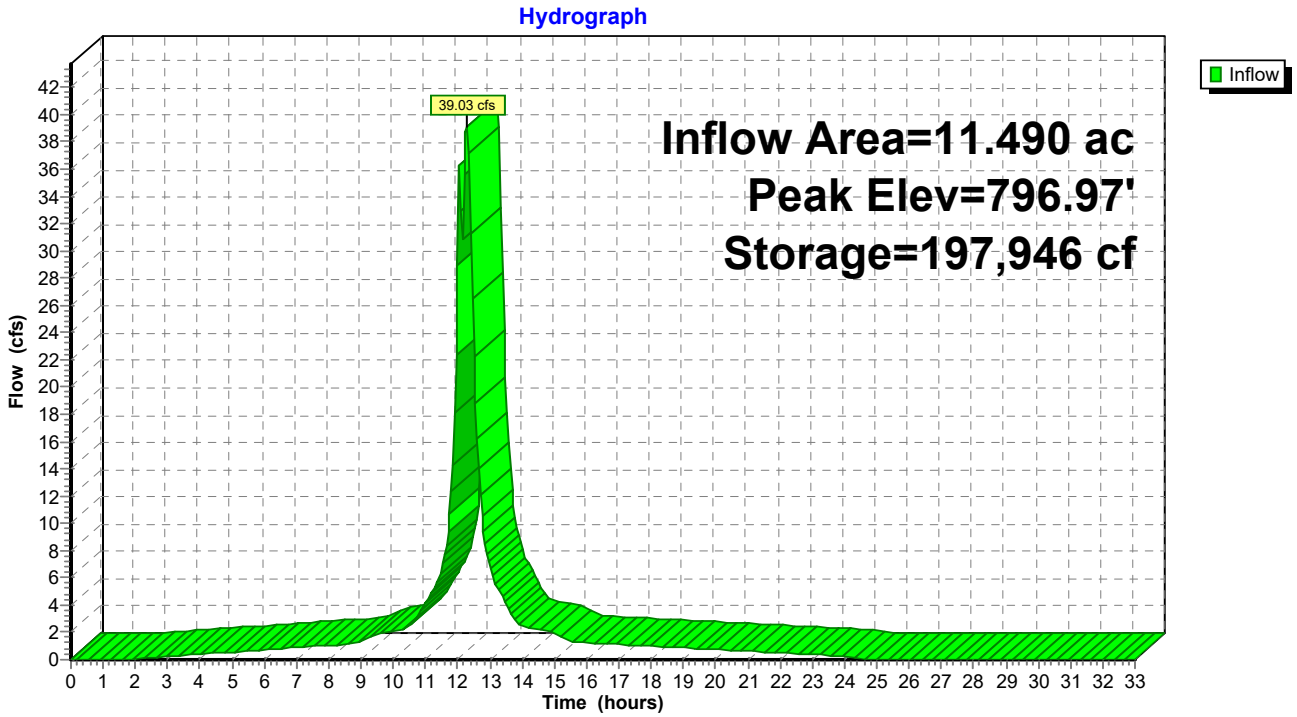
Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 792.50' Surf.Area= 11,070 sf Storage= 3,030 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,611 sf Storage= 197,946 cf (194,915 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (194,617 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

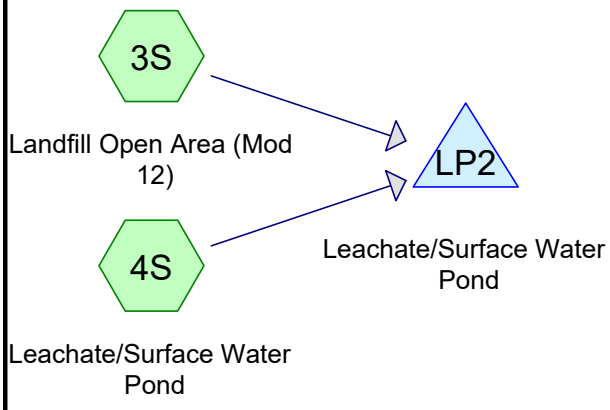
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Pond LP1: Leachate/Surface Water Pond

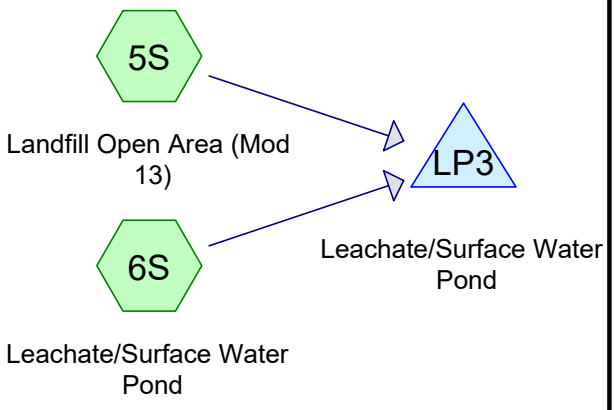


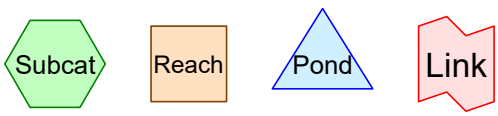
25-Year Storm Analysis

Phase 12 Filling



Phase 13 Filling





Routing Diagram for 230817_WPL Columbia_Leachate Pond Evaluation
Prepared by SCS Engineers, Printed 8/18/2023
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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	4.91	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=4.67"
Tc=20.0 min CN=98 Runoff=25.47 cfs 2.430 af

Subcatchment4S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=21.19 cfs 1.161 af

Subcatchment5S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=4.67"
Tc=20.0 min CN=98 Runoff=34.59 cfs 3.301 af

Subcatchment6S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=4.67"
Tc=0.0 min CN=98 Runoff=21.19 cfs 1.161 af

Pond LP2: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,360 cf Inflow=32.30 cfs 3.591 af
Outflow=0.00 cfs 0.000 af

Pond LP3: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,353 cf Inflow=38.89 cfs 4.461 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 3S: Landfill Open Area (Mod 12)

Runoff = 25.47 cfs @ 12.28 hrs, Volume= 2.430 af, Depth= 4.67"
Routed to Pond LP2 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 4S: Leachate/Surface Water Pond

Runoff = 21.19 cfs @ 12.04 hrs, Volume= 1.161 af, Depth= 4.67"
Routed to Pond LP2 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 5S: Landfill Open Area (Mod 13)

Runoff = 34.59 cfs @ 12.28 hrs, Volume= 3.301 af, Depth= 4.67"
Routed to Pond LP3 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 6S: Leachate/Surface Water Pond

Runoff = 21.19 cfs @ 12.04 hrs, Volume= 1.161 af, Depth= 4.67"
Routed to Pond LP3 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 25-yr, 24-hr storm Rainfall=4.91"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP2: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 4.67" for 25-yr, 24-hr storm event
Inflow = 32.30 cfs @ 12.06 hrs, Volume= 3.591 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 793.97' Surf.Area= 40,525 sf Storage= 40,952 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,565 sf Storage= 197,360 cf (156,408 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (156,695 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP3: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 4.67" for 25-yr, 24-hr storm event
Inflow = 38.89 cfs @ 12.27 hrs, Volume= 4.461 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 792.50' Surf.Area= 11,070 sf Storage= 3,030 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,564 sf Storage= 197,353 cf (194,323 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (194,617 cf above start)

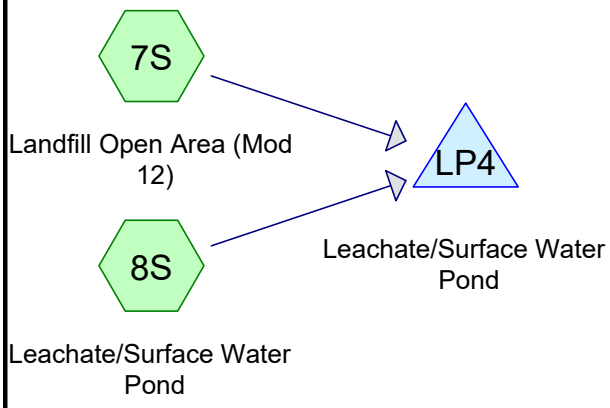
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

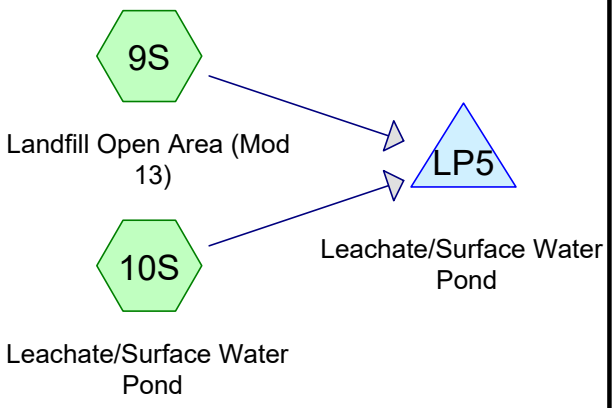
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

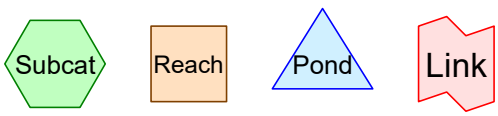
10-Year Storm Analysis

Phase 12 Filling



Phase 13 Filling





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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	3.97	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment7S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=3.74"
Tc=20.0 min CN=98 Runoff=20.53 cfs 1.942 af

Subcatchment8S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=3.74"
Tc=0.0 min CN=98 Runoff=17.09 cfs 0.928 af

Subcatchment9S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=3.74"
Tc=20.0 min CN=98 Runoff=27.88 cfs 2.638 af

Subcatchment10S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=3.74"
Tc=0.0 min CN=98 Runoff=17.09 cfs 0.928 af

Pond LP4: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,440 cf Inflow=26.02 cfs 2.870 af
Outflow=0.00 cfs 0.000 af

Pond LP5: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,491 cf Inflow=31.34 cfs 3.566 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 7S: Landfill Open Area (Mod 12)

Runoff = 20.53 cfs @ 12.29 hrs, Volume= 1.942 af, Depth= 3.74"
Routed to Pond LP4 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr, 24-hr storm Rainfall=3.97"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 8S: Leachate/Surface Water Pond

Runoff = 17.09 cfs @ 12.04 hrs, Volume= 0.928 af, Depth= 3.74"
Routed to Pond LP4 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr, 24-hr storm Rainfall=3.97"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 9S: Landfill Open Area (Mod 13)

Runoff = 27.88 cfs @ 12.29 hrs, Volume= 2.638 af, Depth= 3.74"
Routed to Pond LP5 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr, 24-hr storm Rainfall=3.97"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 10S: Leachate/Surface Water Pond

Runoff = 17.09 cfs @ 12.04 hrs, Volume= 0.928 af, Depth= 3.74"
Routed to Pond LP5 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 10-yr, 24-hr storm Rainfall=3.97"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP4: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 3.74" for 10-yr, 24-hr storm event
Inflow = 26.02 cfs @ 12.06 hrs, Volume= 2.870 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 794.69' Surf.Area= 46,563 sf Storage= 72,430 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,571 sf Storage= 197,440 cf (125,010 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (125,218 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP5: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 3.74" for 10-yr, 24-hr storm event
Inflow = 31.34 cfs @ 12.27 hrs, Volume= 3.566 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 794.00' Surf.Area= 41,126 sf Storage= 42,177 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,575 sf Storage= 197,491 cf (155,314 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (155,470 cf above start)

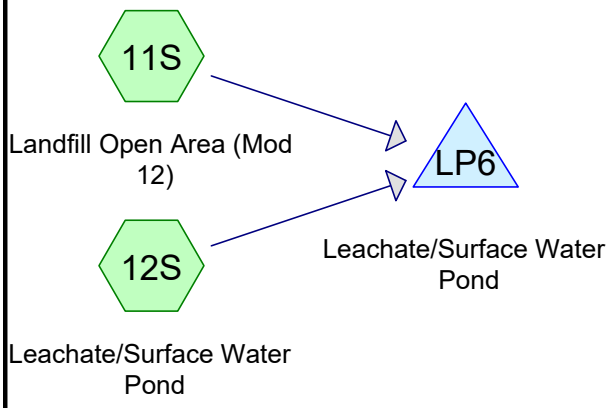
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

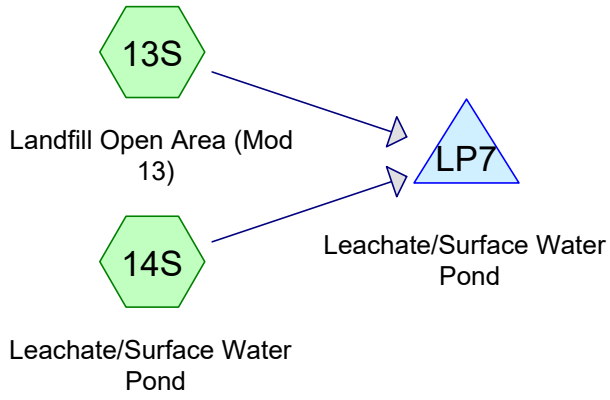
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

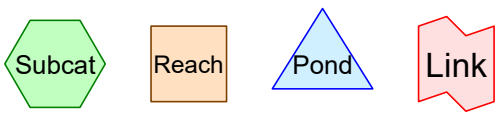
5-Year Storm Analysis

Phase 12 Filling



Phase 13 Filling





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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	5-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	3.38	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment11S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=3.15"
Tc=20.0 min CN=98 Runoff=17.42 cfs 1.636 af

Subcatchment12S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=3.15"
Tc=0.0 min CN=98 Runoff=14.51 cfs 0.781 af

Subcatchment13S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=3.15"
Tc=20.0 min CN=98 Runoff=23.66 cfs 2.222 af

Subcatchment14S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=3.15"
Tc=0.0 min CN=98 Runoff=14.51 cfs 0.781 af

Pond LP6: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,502 cf Inflow=22.07 cfs 2.418 af
Outflow=0.00 cfs 0.000 af

Pond LP7: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,748 cf Inflow=26.60 cfs 3.004 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 11S: Landfill Open Area (Mod 12)

Runoff = 17.42 cfs @ 12.29 hrs, Volume= 1.636 af, Depth= 3.15"
Routed to Pond LP6 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-yr, 24-hr storm Rainfall=3.38"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 12S: Leachate/Surface Water Pond

Runoff = 14.51 cfs @ 12.04 hrs, Volume= 0.781 af, Depth= 3.15"
Routed to Pond LP6 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-yr, 24-hr storm Rainfall=3.38"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 13S: Landfill Open Area (Mod 13)

Runoff = 23.66 cfs @ 12.29 hrs, Volume= 2.222 af, Depth= 3.15"
Routed to Pond LP7 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-yr, 24-hr storm Rainfall=3.38"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 14S: Leachate/Surface Water Pond

Runoff = 14.51 cfs @ 12.04 hrs, Volume= 0.781 af, Depth= 3.15"
Routed to Pond LP7 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 5-yr, 24-hr storm Rainfall=3.38"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP6: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 3.15" for 5-yr, 24-hr storm event
Inflow = 22.07 cfs @ 12.06 hrs, Volume= 2.418 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 795.10' Surf.Area= 49,793 sf Storage= 92,183 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,576 sf Storage= 197,502 cf (105,320 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (105,464 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP7: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 3.15" for 5-yr, 24-hr storm event
Inflow = 26.60 cfs @ 12.27 hrs, Volume= 3.004 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 794.57' Surf.Area= 45,617 sf Storage= 66,899 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,596 sf Storage= 197,748 cf (130,850 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (130,748 cf above start)

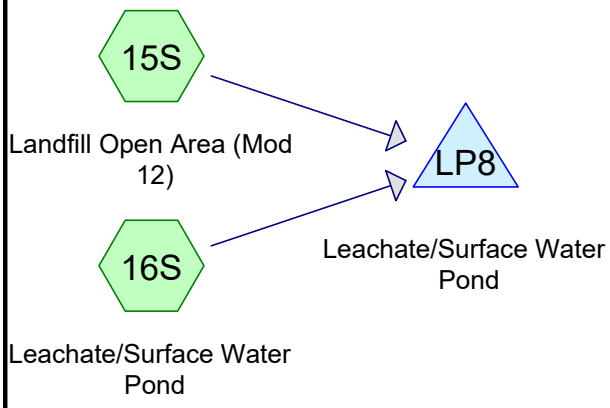
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

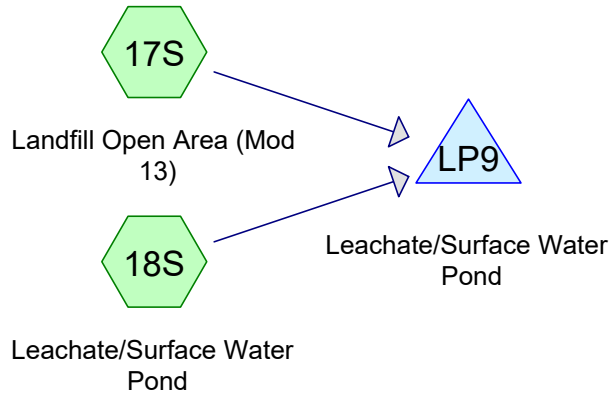
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

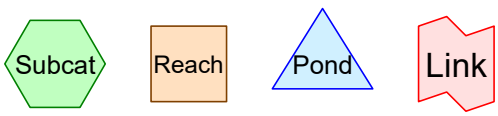
2-Year Storm Analysis

Phase 12 Filling



Phase 13 Filling





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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	2.77	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment15S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=2.54"
Tc=20.0 min CN=98 Runoff=14.19 cfs 1.320 af

Subcatchment16S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=2.54"
Tc=0.0 min CN=98 Runoff=11.83 cfs 0.631 af

Subcatchment17S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=2.54"
Tc=20.0 min CN=98 Runoff=19.28 cfs 1.793 af

Subcatchment18S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=2.54"
Tc=0.0 min CN=98 Runoff=11.83 cfs 0.631 af

Pond LP8: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,715 cf Inflow=17.97 cfs 1.951 af
Outflow=0.00 cfs 0.000 af

Pond LP9: Leachate/SurfaceWater Pond Peak Elev=796.97' Storage=197,769 cf Inflow=21.68 cfs 2.424 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 15S: Landfill Open Area (Mod 12)

Runoff = 14.19 cfs @ 12.29 hrs, Volume= 1.320 af, Depth= 2.54"
Routed to Pond LP8 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr, 24-hr storm Rainfall=2.77"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 16S: Leachate/Surface Water Pond

Runoff = 11.83 cfs @ 12.04 hrs, Volume= 0.631 af, Depth= 2.54"
Routed to Pond LP8 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr, 24-hr storm Rainfall=2.77"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 17S: Landfill Open Area (Mod 13)

Runoff = 19.28 cfs @ 12.29 hrs, Volume= 1.793 af, Depth= 2.54"
Routed to Pond LP9 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr, 24-hr storm Rainfall=2.77"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 18S: Leachate/Surface Water Pond

Runoff = 11.83 cfs @ 12.04 hrs, Volume= 0.631 af, Depth= 2.54"
Routed to Pond LP9 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 2-yr, 24-hr storm Rainfall=2.77"

Area (ac)	CN	Description
* 2.980	98	Leachate Surface Water Pond
2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP8: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 2.54" for 2-yr, 24-hr storm event
Inflow = 17.97 cfs @ 12.06 hrs, Volume= 1.951 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 795.50' Surf.Area= 52,945 sf Storage= 112,730 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,593 sf Storage= 197,715 cf (84,985 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (84,917 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP9: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 2.54" for 2-yr, 24-hr storm event
Inflow = 21.68 cfs @ 12.27 hrs, Volume= 2.424 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 795.10' Surf.Area= 49,793 sf Storage= 92,183 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,597 sf Storage= 197,769 cf (105,586 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (105,464 cf above start)

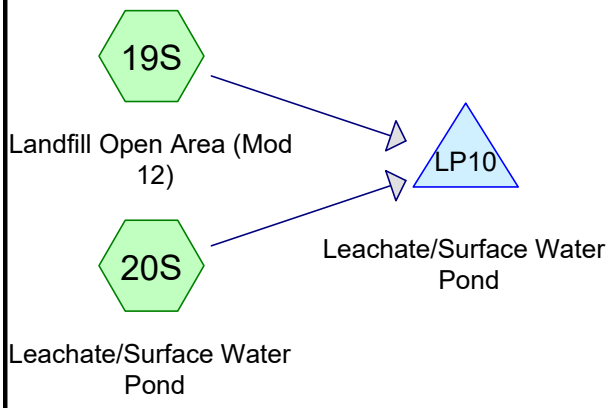
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

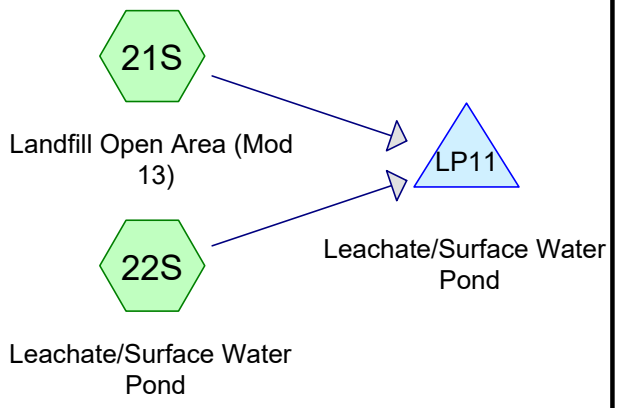
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

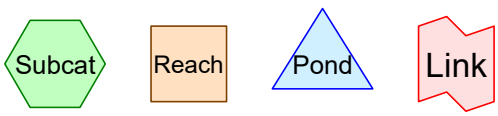
1-Year Storm Analysis

Phase 12 Filling



Phase 13 Filling





Routing Diagram for 230817_WPL Columbia_Leachate Pond Evaluation
Prepared by SCS Engineers, Printed 8/18/2023
HydroCAD® 10.20-2d s/n 05804 © 2021 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr, 24-hr storm	MSE 24-hr	4	Default	24.00	1	2.44	2

Time span=0.00-33.00 hrs, dt=0.05 hrs, 661 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment19S: Landfill Open Area Runoff Area=6.240 ac 100.00% Impervious Runoff Depth=2.21"
Tc=20.0 min CN=98 Runoff=12.44 cfs 1.150 af

Subcatchment20S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=2.21"
Tc=0.0 min CN=98 Runoff=10.38 cfs 0.549 af

Subcatchment21S: Landfill Open Area Runoff Area=8.475 ac 100.00% Impervious Runoff Depth=2.21"
Tc=20.0 min CN=98 Runoff=16.90 cfs 1.562 af

Subcatchment22S: Leachate/Surface Runoff Area=2.980 ac 100.00% Impervious Runoff Depth=2.21"
Tc=0.0 min CN=98 Runoff=10.38 cfs 0.549 af

Pond LP10: Leachate/SurfaceWater Peak Elev=796.97' Storage=197,478 cf Inflow=15.75 cfs 1.699 af
Outflow=0.00 cfs 0.000 af

Pond LP11: Leachate/SurfaceWater Peak Elev=796.97' Storage=197,853 cf Inflow=19.01 cfs 2.111 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 19S: Landfill Open Area (Mod 12)

Runoff = 12.44 cfs @ 12.29 hrs, Volume= 1.150 af, Depth= 2.21"
Routed to Pond LP10 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-yr, 24-hr storm Rainfall=2.44"

	Area (ac)	CN	Description
*	6.240	98	Mod 12 Open Area
	6.240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 20S: Leachate/Surface Water Pond

Runoff = 10.38 cfs @ 12.04 hrs, Volume= 0.549 af, Depth= 2.21"
Routed to Pond LP10 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-yr, 24-hr storm Rainfall=2.44"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Subcatchment 21S: Landfill Open Area (Mod 13)

Runoff = 16.90 cfs @ 12.29 hrs, Volume= 1.562 af, Depth= 2.21"
Routed to Pond LP11 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-yr, 24-hr storm Rainfall=2.44"

	Area (ac)	CN	Description
*	8.475	98	Mod 13 Open Area
	8.475		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry, Estimated**

Summary for Subcatchment 22S: Leachate/Surface Water Pond

Runoff = 10.38 cfs @ 12.04 hrs, Volume= 0.549 af, Depth= 2.21"
Routed to Pond LP11 : Leachate/Surface Water Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
MSE 24-hr 4 1-yr, 24-hr storm Rainfall=2.44"

	Area (ac)	CN	Description
*	2.980	98	Leachate Surface Water Pond
	2.980		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.0					**Direct Entry,**

Summary for Pond LP10: Leachate/Surface Water Pond

Inflow Area = 9.220 ac,100.00% Impervious, Inflow Depth = 2.21" for 1-yr, 24-hr storm event
Inflow = 15.75 cfs @ 12.06 hrs, Volume= 1.699 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs
Starting Elev= 795.70' Surf.Area= 54,521 sf Storage= 123,477 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,574 sf Storage= 197,478 cf (74,001 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (74,170 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Summary for Pond LP11: Leachate/Surface Water Pond

Inflow Area = 11.455 ac,100.00% Impervious, Inflow Depth = 2.21" for 1-yr, 24-hr storm event
Inflow = 19.01 cfs @ 12.27 hrs, Volume= 2.111 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-33.00 hrs, dt= 0.05 hrs

Starting Elev= 795.37' Surf.Area= 51,921 sf Storage= 105,914 cf
Peak Elev= 796.97' @ 25.15 hrs Surf.Area= 61,604 sf Storage= 197,853 cf (91,939 cf above start)
Flood Elev= 796.97' Surf.Area= 61,588 sf Storage= 197,647 cf (91,733 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	792.00'	405,390 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.00	1,051	0	0
794.00	41,126	42,177	42,177
796.00	56,885	98,011	140,188
798.00	66,581	123,466	263,654
800.00	75,155	141,736	405,390

Appendix A3

2024 Interim Cover Drainage to North Basin

Storm Water Management Calculations

Purpose:
The purpose of the storm water runoff calculations is to demonstrate that the interim stormwater conveyance features in the existing Modules 4, 5, and 6 of the Columbia Dry Ash Disposal Facility can accommodate and safely convey the runoff from a 25-year, 24-hour storm event.

Items addressed in these calculations:

- Swales
- Culverts
- Diversion Berms
- Downslope Flumes & Energy Dissipators
- Rock Chutes
- Discharge Aprons
- Sedimentation Basin
- North Infiltration Area

The proposed storm water management conditions are shown on **Figure 1**.
The calculations support the capacity check of the following existing storm water management feature:

Feature	Purpose	Design Method
Swales	Convey storm water runoff from adjacent areas to culverts and offsite during post construction conditions	HydroCAD runoff modeling and Swale Calculation
Culverts	Convey storm water from the final cover perimeter swales during post construction conditions	HydroCAD runoff modeling and HY-8 Culvert Model
Diversion Berms	Reduce storm water runoff from final cover slopes and to divert water to perimeter swales during post construction conditions	HydroCAD runoff modeling and Diversion Berm Calculations
Rock Chutes	Erosion protection and convey storm water from energy dissipators to existing swale during post construction conditions	HydroCAD runoff modeling and Rock Chute Calculation

Approach:

Hydrograph Generation
HydroCAD was used to model the storm water management system and develop the hydrographs using TR-20 methodologies. The model is designed to simulate the surface runoff response of a watershed to a precipitation event. Input parameters for the model include precipitation depth for the design storm events from NOAA ATLAS 14, contributing drainage areas, runoff curve numbers, and time of concentration.

Culvert Sizing
Culverts were sized for the 25-year, 24-hour storm event using the HY-8 computer model developed by the US Department of Transportation, Federal Highway Administration.

Diversion Berms

Diversion berms were sized for the 25-year, 24-hour storm event. A WisDOT HEC-15 spreadsheet based on Manning's Equation was used to calculate the depth of flow and velocity in the swale using the swale geometry and peak flow for the storm event (as determined by the Hydrograph Generation Calculations).

Downslope Flumes Sizing

Flumes sizes are based on final cover modeling and were sized based on a higher flow rate than present with the intermediate cover. Flumes will be reused during final closure.

Rock Chute Sizing

Rock chutes were sized for the 25-year, 24-hour storm event. Rock Chutes were sized based on the flow to each culvert location. The Iowa NRCS Rock Chute Design spreadsheet was used to size the chute and riprap.

Key Assumptions:

- Drainage areas and time of concentration flow paths are as shown on **Figure 1** for Post Construction Conditions.

- An MSE4 rainfall distribution was used based on NRCS Wisconsin rainfall distribution regions.

  The precipitation depth for the 25-year, 24-hour storm was assumed to be 4.91 inches, based on NOAA ATLAS 14 Point Precipitation Frequency Estimates (NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server).

  The precipitation depth for the 100-year, 24-hour storm was assumed to be 6.59 inches, based on NOAA ATLAS 14 Point Precipitation Frequency Estimates.

- Runoff curve numbers were based on tables presented in Urban Hydrology for Small Watersheds, and were assumed as follows and as listed in the modeling.

Cover Type	CN
Final Cover	69 – Pasture/grassland/range in good condition, hydrologic soil group (HSG) (B/C assumed mid value between each soil group)
Pasture, grassland or range	39 – Pasture/grassland/range, Good, HSG A
Gravel	96 – Gravel, HSG A
Paved road	98 – Paved parking, HSG A

- Type A soil group for non-disturbed areas outside the landfill as soils are loamy sand.
- Other assumptions are included with the calculations attached to this appendix.

Results:

Hydrograph Generation

The hydrograph modeling results for the 25-year and 100-year, 24-hour storm events are included in the Post Construction Conditions Hydrograph Generation section.

Culvert Sizing

Culverts will be as shown in the Drawings. The culverts have the capacity to safely convey the 25-year, 24-hour storm event. Refer to the Culvert Sizing Section for the detailed calculations.

Diversion Berm Sizing

The proposed final berms will be constructed as shown on the Drawings. The diversion berms will contain the runoff from the 25-year, 24-hour storm event. Refer to the Diversion Berm Design section.

Rock Chute Sizing

The proposed rock chutes will be constructed as shown in the Drawings. The rock chutes will accommodate the runoff from the 25-year, 24-hour storm event. Refer to the Rock Chute Sizing section.

LEGEND

- DRY ASH DISPOSAL FACILITY LIMITS
- LIMITS OF WASTE
- LINER PHASE/MODULE LIMIT
- APPROXIMATE EXISTING INTERMEDIATE COVER LIMITS/AREA
- APPROXIMATE EXISTING INTERMEDIATE COVER AREA WITH TOPSOIL
- LIMITS OF 2' THICK CLAY LINER
- PAVED ROAD
- UNPAVED ROAD
- RAILROAD TRACKS
- FENCE
- FINAL COVER INTERMEDIATE/TOE DRAIN
- EXISTING GRADE (10' INTERVAL)
- EXISTING GRADE (2' INTERVAL)
- SWALE
- EDGE OF WATER
- CULVERT
- TRANSMISSION TOWER
- UTILITY POLE
- MONITORING WELL
- PIEZOMETER
- LEACHATE HEADWELL
- LEACHATE RISER/CLEANOUT
- LYSIMETER MANHOLE
- ABANDONED MONITORING WELL
- ABANDONED PIEZOMETER
- ABANDONED TEMPORARY WATER TABLE WELL
- DIVERSION BERM
- DRAINAGE AREA DIVIDE
- FLOW PATH

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, PERIODIC SURVEYS BY SCS ENGINEERS AND CEDAR CREEK SURVEYING, LLC, AND DECEMBER 2023 DRONE SURVEY BY AMES.
2. WETLANDS OUTSIDE FACILITY LIMITS ARE FROM THE MAY 19, 2015 ASSURED WETLAND DELINEATION PERFORMED BY STANTEC.
3. UTILITY LOCATIONS ARE APPROXIMATE AND NOT ALL UTILITIES ARE SHOWN.
4. LIMITS OF INTERMEDIATE FINAL COVER ARE APPROXIMATE AREA COVERED BY DECEMBER 2023.

542,500 N

543,000 N

543,500 N

2,124,000 E

2,124,500 E

AREA 1
AREA 2
AREA 3
AREA 4
AREA 4a
AREA 5
AREA 6
AREA 7
AREA 8
AREA 9
AREA 10
AREA 11
AREA 12
AREA 15
AREA 16
AREA 68
AREA 69
AREA 71
TRC1
TRC2
TRC3
TRC4
MW-310
MW-309
MW-37A
MW-37B
MW-313
MW-317
LH-2
LH-5
LH-6
24" CMP ADF 09
NE INV. = 808.51
SE INV. = 807.81

50 0 50

SCALE: 1" = 50'

N

REVISION	TITLE	DATE
	REVISED STORM WATER IMPROVEMENTS	06/26/2024

PROJECT NO.	25224152.00
DRAWN:	07/20/2023
REVISED:	02/04/2025
DRAWN BY:	KP
CHECKED BY:	BSS/RR
APPROVED BY:	RJG

Wisconsin Power and Light Company
WISCONSIN POWER AND LIGHT COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WISCONSIN 53954

CLIENT

SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

ENGINEER

MODULE 12/13 LINER AND 2024 CLOSURE AREA CONSTRUCTION
COLUMBIA ENERGY CENTER
COLUMBIA ENERGY CENTER ASH DISPOSAL FACILITY
TOWN OF PACIFIC, WISCONSIN

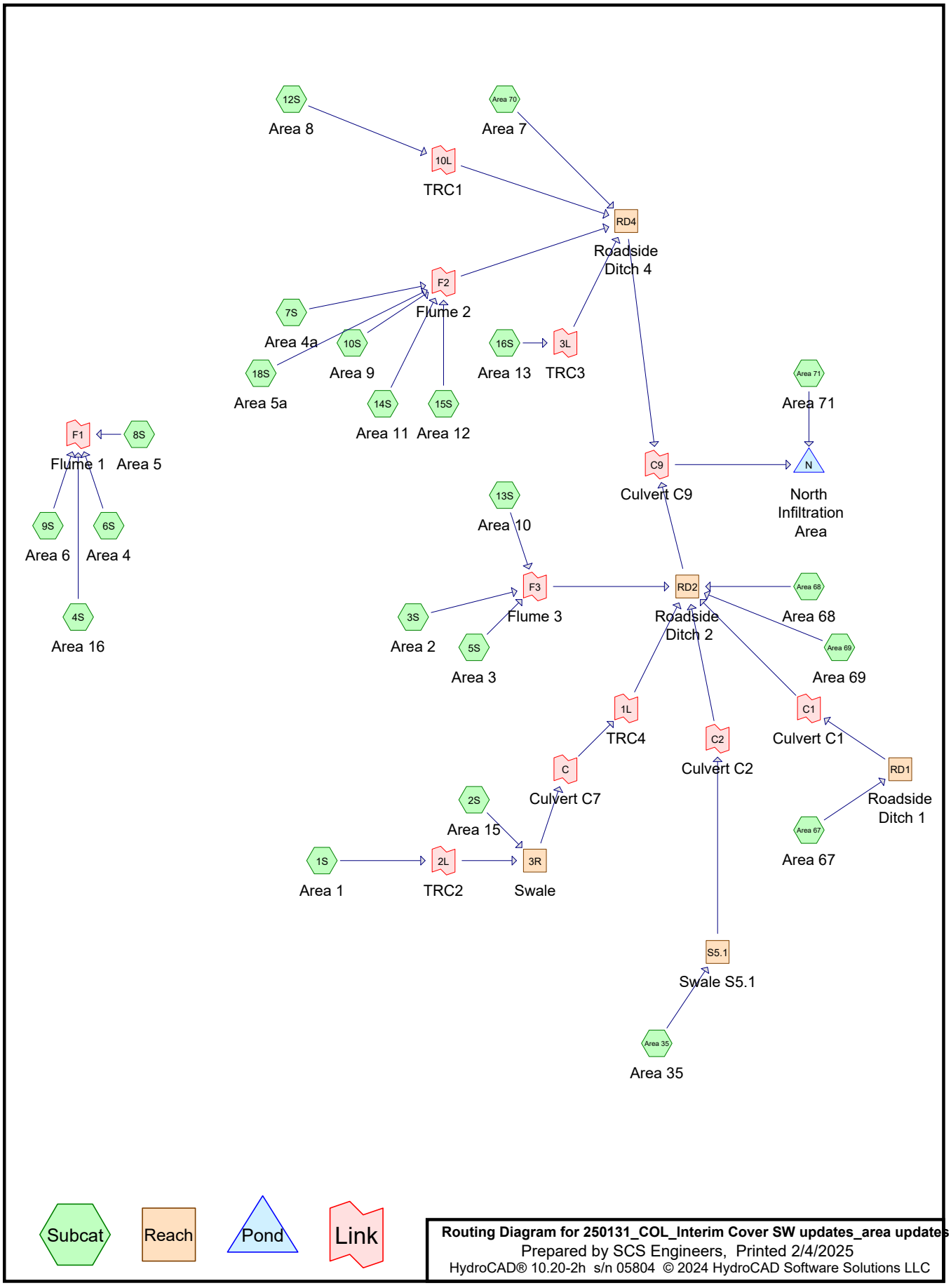
SITE

INTERIM STORM WATER CONVEYANCE FEATURES

SHEET 29 of 30

Post Construction Conditions Hydrograph Generation

- 25-year, 24-hour Storm Event
- 100-year, 24-hour Storm Event



Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25-yr, 24-hr	MSE 24-hr	4	Default	24.00	1	4.91	2
2	100-yr, 24-hr	MSE 24-hr	4	Default	24.00	1	6.59	2

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Area 1 Runoff Area=44,983 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=656' Tc=8.4 min CN=69 Runoff=2.84 cfs 0.163 af

Subcatchment2S: Area 15 Runoff Area=44,721 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=58' Slope=0.2500 '/' Tc=2.5 min CN=69 Runoff=3.67 cfs 0.162 af

Subcatchment3S: Area 2 Runoff Area=65,572 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=937' Tc=5.2 min CN=69 Runoff=4.81 cfs 0.237 af

Subcatchment4S: Area 16 Runoff Area=48,706 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=443' Slope=0.0200 '/' Tc=16.3 min CN=69 Runoff=2.29 cfs 0.176 af

Subcatchment5S: Area 3 Runoff Area=33,787 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=701' Tc=5.7 min CN=69 Runoff=2.41 cfs 0.122 af

Subcatchment6S: Area 4 Runoff Area=28,852 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=427' Tc=4.4 min CN=69 Runoff=2.19 cfs 0.104 af

Subcatchment7S: Area 4a Runoff Area=19,738 sf 0.00% Impervious Runoff Depth=1.97"
Flow Length=504' Tc=3.8 min CN=70 Runoff=1.60 cfs 0.074 af

Subcatchment8S: Area 5 Runoff Area=16,748 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=496' Tc=4.6 min CN=69 Runoff=1.26 cfs 0.061 af

Subcatchment9S: Area 6 Runoff Area=7,509 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=320' Tc=3.1 min CN=69 Runoff=0.60 cfs 0.027 af

Subcatchment10S: Area 9 Runoff Area=16,945 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=464' Tc=3.9 min CN=69 Runoff=1.32 cfs 0.061 af

Subcatchment12S: Area 8 Runoff Area=16,134 sf 0.00% Impervious Runoff Depth=2.55"
Flow Length=275' Tc=2.5 min CN=77 Runoff=1.75 cfs 0.079 af

Subcatchment13S: Area 10 Runoff Area=28,456 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=420' Tc=3.7 min CN=69 Runoff=2.23 cfs 0.103 af

Subcatchment14S: Area 11 Runoff Area=7,785 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=217' Tc=2.1 min CN=69 Runoff=0.65 cfs 0.028 af

Subcatchment15S: Area 12 Runoff Area=5,681 sf 0.00% Impervious Runoff Depth=4.44"
Flow Length=204' Slope=0.0250 '/' Tc=10.3 min CN=96 Runoff=0.70 cfs 0.048 af

Subcatchment16S: Area 13 Runoff Area=10,365 sf 0.00% Impervious Runoff Depth=4.44"
Flow Length=116' Slope=0.0250 '/' Tc=9.7 min CN=96 Runoff=1.30 cfs 0.088 af

Subcatchment18S: Area 5a Runoff Area=8,575 sf 0.00% Impervious Runoff Depth=2.05"
Flow Length=606' Tc=1.8 min CN=71 Runoff=0.77 cfs 0.034 af

SubcatchmentArea 35: Area 35 Runoff Area=28,800 sf 0.00% Impervious Runoff Depth=2.46"
Flow Length=104' Tc=4.6 min CN=76 Runoff=2.81 cfs 0.136 af

SubcatchmentArea 67: Area 67 Runoff Area=133,081 sf 0.00% Impervious Runoff Depth=0.51"
Flow Length=886' Slope=0.0068 '/' Tc=38.9 min CN=47 Runoff=0.62 cfs 0.129 af

SubcatchmentArea 68: Area 68 Runoff Area=10,937 sf 14.67% Impervious Runoff Depth=1.06"
Flow Length=52' Slope=0.1154 '/' Tc=3.1 min CN=57 Runoff=0.46 cfs 0.022 af

SubcatchmentArea 69: Area 69 Runoff Area=42,860 sf 11.82% Impervious Runoff Depth=1.18"
Flow Length=86' Slope=0.2326 '/' Tc=3.5 min CN=59 Runoff=2.03 cfs 0.097 af

SubcatchmentArea 70: Area 7 Runoff Area=79,588 sf 8.71% Impervious Runoff Depth=1.67"
Flow Length=147' Tc=4.1 min CN=66 Runoff=5.37 cfs 0.254 af

SubcatchmentArea 71: Area 71 Runoff Area=430,155 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=1,337' Tc=16.6 min CN=42 Runoff=0.99 cfs 0.238 af

Reach 3R: Swale Avg. Flow Depth=0.17' Max Vel=1.47 fps Inflow=5.95 cfs 0.325 af
n=0.022 L=368.0' S=0.0054 '/' Capacity=1,396.44 cfs Outflow=5.04 cfs 0.325 af

Reach RD1: Roadside Ditch 1 Avg. Flow Depth=0.10' Max Vel=1.35 fps Inflow=0.62 cfs 0.129 af
n=0.030 L=440.6' S=0.0188 '/' Capacity=47.16 cfs Outflow=0.61 cfs 0.129 af

Reach RD2: Roadside Ditch 2 Avg. Flow Depth=0.47' Max Vel=2.97 fps Inflow=15.87 cfs 1.171 af
n=0.030 L=433.0' S=0.0162 '/' Capacity=72.77 cfs Outflow=14.76 cfs 1.171 af

Reach RD4: Roadside Ditch 4 Avg. Flow Depth=0.47' Max Vel=2.22 fps Inflow=12.97 cfs 0.666 af
n=0.030 L=495.6' S=0.0090 '/' Capacity=54.26 cfs Outflow=11.08 cfs 0.666 af

Reach S5.1: Swale S5.1 Avg. Flow Depth=0.16' Max Vel=1.72 fps Inflow=2.81 cfs 0.136 af
n=0.030 L=478.0' S=0.0154 '/' Capacity=235.22 cfs Outflow=2.37 cfs 0.136 af

Pond N: North Infiltration Area Peak Elev=802.09' Storage=481 cf Inflow=25.98 cfs 2.075 af
Primary=24.89 cfs 2.037 af Secondary=0.47 cfs 0.039 af Outflow=25.36 cfs 2.075 af

Link 1L: TRC4 Inflow=5.04 cfs 0.325 af
Primary=5.04 cfs 0.325 af

Link 2L: TRC2 Inflow=2.84 cfs 0.163 af
Primary=2.84 cfs 0.163 af

Link 3L: TRC3 Inflow=1.30 cfs 0.088 af
Primary=1.30 cfs 0.088 af

Link 10L: TRC1 Inflow=1.75 cfs 0.079 af
Primary=1.75 cfs 0.079 af

Link C: Culvert C7 Inflow=5.04 cfs 0.325 af
Primary=5.04 cfs 0.325 af

Link C1: Culvert C1 Inflow=0.61 cfs 0.129 af
Primary=0.61 cfs 0.129 af

Link C2: Culvert C2 Inflow=2.37 cfs 0.136 af
Primary=2.37 cfs 0.136 af

Link C9: Culvert C9 Inflow=25.84 cfs 1.837 af
Primary=25.84 cfs 1.837 af

Link F1: Flume 1 Inflow=5.33 cfs 0.369 af
Primary=5.33 cfs 0.369 af

Link F2: Flume 2 Inflow=4.85 cfs 0.246 af
Primary=4.85 cfs 0.246 af

Link F3: Flume 3 Inflow=9.37 cfs 0.463 af
Primary=9.37 cfs 0.463 af

Total Runoff Area = 25.941 ac Runoff Volume = 2.444 af Average Runoff Depth = 1.13"
98.80% Pervious = 25.628 ac 1.20% Impervious = 0.312 ac

Summary for Subcatchment 1S: Area 1

Runoff = 2.84 cfs @ 12.16 hrs, Volume= 0.163 af, Depth= 1.89"
Routed to Link 2L : TRC2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
44,983	69	Pasture/grassland/range, Fair, HSG B
44,983		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	30	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	226	0.0575	11.57	161.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 & 4.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
1.1	400	0.0575	6.27	125.43	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=2.00' Z= 2.0 '/' Top.W=14.00' n= 0.069 Riprap, 6-inch
8.4	656	Total			

Summary for Subcatchment 2S: Area 15

Runoff = 3.67 cfs @ 12.11 hrs, Volume= 0.162 af, Depth= 1.89"
Routed to Reach 3R : Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
44,721	69	Pasture/grassland/range, Fair, HSG B
44,721		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	58	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment 3S: Area 2

Runoff = 4.81 cfs @ 12.13 hrs, Volume= 0.237 af, Depth= 1.89"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
65,572	69	Pasture/grassland/range, Fair, HSG B
65,572		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	64	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.2	627	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.3	246	0.2500	13.08	261.54	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=2.00' Z= 2.0 '/' Top.W=14.00' n= 0.069 Riprap, 6-inch
5.2	937	Total			

Summary for Subcatchment 4S: Area 16

Runoff = 2.29 cfs @ 12.26 hrs, Volume= 0.176 af, Depth= 1.89"
Routed to Link F1 : Flume 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
48,706	69	Pasture/grassland/range, Fair, HSG B
48,706		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
5.8	343	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.3	443	Total			

Summary for Subcatchment 5S: Area 3

Runoff = 2.41 cfs @ 12.13 hrs, Volume= 0.122 af, Depth= 1.89"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
33,787	69	Pasture/grassland/range, Fair, HSG B
33,787		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	497	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.2	97	0.1237	9.20	183.97	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=2.00' Z= 2.0 '/' Top.W=14.00' n= 0.069 Riprap, 6-inch
5.7	701	Total			

Summary for Subcatchment 6S: Area 4

Runoff = 2.19 cfs @ 12.12 hrs, Volume= 0.104 af, Depth= 1.89"
Routed to Link F1 : Flume 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
28,852	69	Pasture/grassland/range, Fair, HSG B
28,852		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	80	0.2500	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.2	347	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
4.4	427	Total			

Summary for Subcatchment 7S: Area 4a

Runoff = 1.60 cfs @ 12.12 hrs, Volume= 0.074 af, Depth= 1.97"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
18,869	69	Pasture/grassland/range, Fair, HSG B
869	96	Gravel surface, HSG C
19,738	70	Weighted Average
19,738		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	64	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	166	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.5	274	0.2500	9.00	71.99	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=1.00' Z= 2.0 '/' Top.W=10.00' n= 0.069 Riprap, 6-inch
3.8	504	Total			

Summary for Subcatchment 8S: Area 5

Runoff = 1.26 cfs @ 12.12 hrs, Volume= 0.061 af, Depth= 1.89"
Routed to Link F1 : Flume 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
16,748	69	Pasture/grassland/range, Fair, HSG B
16,748		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	76	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.5	420	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
4.6	496	Total			

Summary for Subcatchment 9S: Area 6

Runoff = 0.60 cfs @ 12.11 hrs, Volume= 0.027 af, Depth= 1.89"
Routed to Link F1 : Flume 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
7,509	69	Pasture/grassland/range, Fair, HSG B
7,509		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	31	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.6	289	0.0100	3.00	9.01	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.00' Z= 2.0 & 4.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
3.1	320	Total			

Summary for Subcatchment 10S: Area 9

Runoff = 1.32 cfs @ 12.12 hrs, Volume= 0.061 af, Depth= 1.89"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
16,945	69	Pasture/grassland/range, Fair, HSG B
16,945		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	66	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	201	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.4	197	0.2500	9.00	71.99	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=1.00' Z= 2.0 '/' Top.W=10.00' n= 0.069 Riprap, 6-inch
3.9	464	Total			

Summary for Subcatchment 12S: Area 8

Runoff = 1.75 cfs @ 12.11 hrs, Volume= 0.079 af, Depth= 2.55"
Routed to Link 10L : TRC1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
11,330	69	Pasture/grassland/range, Fair, HSG B
4,804	96	Gravel surface, HSG B
16,134	77	Weighted Average
16,134		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	31	0.1000	1.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
1.5	30	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	214	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
2.5	275	Total			

Summary for Subcatchment 13S: Area 10

Runoff = 2.23 cfs @ 12.12 hrs, Volume= 0.103 af, Depth= 1.89"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
28,456	69	Pasture/grassland/range, Fair, HSG B
28,456		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	56	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	364	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
3.7	420	Total			

Summary for Subcatchment 14S: Area 11

Runoff = 0.65 cfs @ 12.11 hrs, Volume= 0.028 af, Depth= 1.89"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
7,785	69	Pasture/grassland/range, Fair, HSG B
7,785		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	31	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	186	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
2.1	217	Total			

Summary for Subcatchment 15S: Area 12

Runoff = 0.70 cfs @ 12.17 hrs, Volume= 0.048 af, Depth= 4.44"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
5,681	96	Gravel surface, HSG C
5,681		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0250	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	104	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	204	Total			

Summary for Subcatchment 16S: Area 13

Runoff = 1.30 cfs @ 12.17 hrs, Volume= 0.088 af, Depth= 4.44"
Routed to Link 3L : TRC3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
10,365	96	Gravel surface, HSG C
10,365		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0250	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	16	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.7	116	Total			

Summary for Subcatchment 18S: Area 5a

Runoff = 0.77 cfs @ 12.10 hrs, Volume= 0.034 af, Depth= 2.05"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
7,849	69	Pasture/grassland/range, Fair, HSG B
726	96	Gravel surface, HSG C
8,575	71	Weighted Average
8,575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.2500	3.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	36	0.2500	8.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	30	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	166	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.5	274	0.2500	9.00	71.99	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=1.00' Z= 2.0 '/' Top.W=10.00' n= 0.069 Riprap, 6-inch
1.8	606	Total			

Summary for Subcatchment Area 35: Area 35

Runoff = 2.81 cfs @ 12.12 hrs, Volume= 0.136 af, Depth= 2.46"
Routed to Reach S5.1 : Swale S5.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
21,181	69	Pasture/grassland/range, Fair, HSG B
7,619	96	Gravel surface, HSG A
28,800	76	Weighted Average
28,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	70	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.7	10	0.1766	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	4	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	104	Total			

Summary for Subcatchment Area 67: Area 67

Runoff = 0.62 cfs @ 12.74 hrs, Volume= 0.129 af, Depth= 0.51"
Routed to Reach RD1 : Roadside Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
113,871	39	Pasture/grassland/range, Good, HSG A
2,657	69	Pasture/grassland/range, Fair, HSG B
16,553	96	Gravel surface, HSG A
133,081	47	Weighted Average
133,081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0068	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
22.7	786	0.0068	0.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	886	Total			

Summary for Subcatchment Area 68: Area 68

Runoff = 0.46 cfs @ 12.11 hrs, Volume= 0.022 af, Depth= 1.06"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

	Area (sf)	CN	Description
	7,039	39	Pasture/grassland/range, Good, HSG A
	1,049	69	Pasture/grassland/range, Fair, HSG B
	1,244	96	Gravel surface, HSG C
*	1,605	98	Paved road
	10,937	57	Weighted Average
	9,332		85.33% Pervious Area
	1,605		14.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.1154	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 69: Area 69

Runoff = 2.03 cfs @ 12.12 hrs, Volume= 0.097 af, Depth= 1.18"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

	Area (sf)	CN	Description
	23,149	39	Pasture/grassland/range, Good, HSG A
	9,496	69	Pasture/grassland/range, Fair, HSG B
*	5,147	96	Gravel Road
*	5,068	98	Paved Road
	42,860	59	Weighted Average
	37,792		88.18% Pervious Area
	5,068		11.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	86	0.2326	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 70: Area 7

Runoff = 5.37 cfs @ 12.12 hrs, Volume= 0.254 af, Depth= 1.67"
Routed to Reach RD4 : Roadside Ditch 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
21,231	39	Pasture/grassland/range, Good, HSG A
45,419	69	Pasture/grassland/range, Fair, HSG B
6,006	96	Gravel surface, HSG A
6,932	98	Paved parking, HSG C
79,588	66	Weighted Average
72,656		91.29% Pervious Area
6,932		8.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	47	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	147	Total			

Summary for Subcatchment Area 71: Area 71

Runoff = 0.99 cfs @ 12.52 hrs, Volume= 0.238 af, Depth= 0.29"
Routed to Pond N : North Infiltration Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 25-yr, 24-hr Rainfall=4.91"

Area (sf)	CN	Description
407,722	39	Pasture/grassland/range, Good, HSG A
22,433	96	Gravel surface, HSG A
430,155	42	Weighted Average
430,155		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	1,137	0.0193	4.31	32.30	**Trap/Vee/Rect Channel Flow, Roadside Ditch** Bot.W=0.00' D=1.00' Z= 5.0 & 10.0 '/' Top.W=15.00' n= 0.030
16.6	1,337	Total			

Summary for Reach 3R: Swale

Inflow Area = 2.059 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 5.95 cfs @ 12.11 hrs, Volume= 0.325 af
Outflow = 5.04 cfs @ 12.21 hrs, Volume= 0.325 af, Atten= 15%, Lag= 5.7 min
Routed to Link C : Culvert C7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.47 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 10.0 min

Peak Storage= 1,259 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 21.32'
Bank-Full Depth= 4.00' Flow Area= 144.0 sf, Capacity= 1,396.44 cfs

20.00' x 4.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 52.00'
Length= 368.0' Slope= 0.0054 '/'
Inlet Invert= 822.00', Outlet Invert= 820.00'

‡

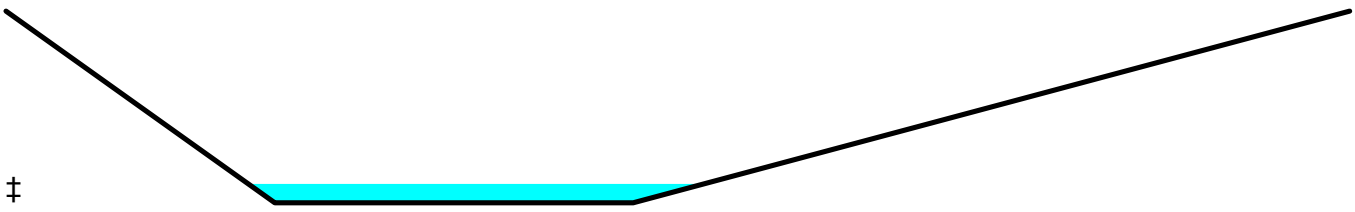
Summary for Reach RD1: Roadside Ditch 1

Inflow Area = 3.055 ac, 0.00% Impervious, Inflow Depth = 0.51" for 25-yr, 24-hr event
Inflow = 0.62 cfs @ 12.74 hrs, Volume= 0.129 af
Outflow = 0.61 cfs @ 12.88 hrs, Volume= 0.129 af, Atten= 2%, Lag= 8.3 min
Routed to Link C1 : Culvert C1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.35 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 11.7 min

Peak Storage= 198 cf @ 12.79 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 5.09'
Bank-Full Depth= 1.00' Flow Area= 9.5 sf, Capacity= 47.16 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 8.0 '/' Top Width= 15.00'
Length= 440.6' Slope= 0.0188 '/'
Inlet Invert= 824.00', Outlet Invert= 815.70'



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Summary for Reach RD2: Roadside Ditch 2

Inflow Area = 9.945 ac, 1.54% Impervious, Inflow Depth = 1.41" for 25-yr, 24-hr event
Inflow = 15.87 cfs @ 12.13 hrs, Volume= 1.171 af
Outflow = 14.76 cfs @ 12.20 hrs, Volume= 1.171 af, Atten= 7%, Lag= 4.1 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.97 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 8.3 min

Peak Storage= 2,153 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 15.32'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 72.77 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 433.0' Slope= 0.0162 '/'
Inlet Invert= 814.55', Outlet Invert= 807.54'

‡

Summary for Reach RD4: Roadside Ditch 4

Inflow Area = 3.784 ac, 4.21% Impervious, Inflow Depth = 2.11" for 25-yr, 24-hr event
Inflow = 12.97 cfs @ 12.11 hrs, Volume= 0.666 af
Outflow = 11.08 cfs @ 12.20 hrs, Volume= 0.666 af, Atten= 15%, Lag= 5.3 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.22 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 16.5 min

Peak Storage= 2,479 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 15.36'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 54.26 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 495.6' Slope= 0.0090 '/'
Inlet Invert= 812.00', Outlet Invert= 807.54'

‡

Summary for Reach S5.1: Swale S5.1

Inflow Area = 0.661 ac, 0.00% Impervious, Inflow Depth = 2.46" for 25-yr, 24-hr event
Inflow = 2.81 cfs @ 12.12 hrs, Volume= 0.136 af
Outflow = 2.37 cfs @ 12.23 hrs, Volume= 0.136 af, Atten= 16%, Lag= 6.4 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.72 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 15.5 min

Peak Storage= 660 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 9.28'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 235.22 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 478.0' Slope= 0.0154 '/'
Inlet Invert= 825.20', Outlet Invert= 817.83'

‡

Summary for Pond N: North Infiltration Area

Inflow Area = 23.603 ac, 1.32% Impervious, Inflow Depth = 1.06" for 25-yr, 24-hr event
Inflow = 25.98 cfs @ 12.20 hrs, Volume= 2.075 af
Outflow = 25.36 cfs @ 12.22 hrs, Volume= 2.075 af, Atten= 2%, Lag= 1.1 min
Primary = 24.89 cfs @ 12.22 hrs, Volume= 2.037 af
Secondary = 0.47 cfs @ 12.22 hrs, Volume= 0.039 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 802.09' @ 12.22 hrs Surf.Area= 5,686 sf Storage= 481 cf

Plug-Flow detention time= 0.3 min calculated for 2.075 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (860.9 - 860.6)

Volume	Invert	Avail.Storage	Storage Description
#1	802.00'	256,569 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
802.00	5,140	0	0
804.00	17,424	22,564	22,564
806.00	32,191	49,615	72,179
808.00	46,130	78,321	150,500
810.00	59,939	106,069	256,569

Device	Routing	Invert	Outlet Devices
#1	Secondary	802.00'	**3.600 in/hr Exfiltration over Surface area**
#2	Primary	799.38'	**36.0" Round Culvert** L= 302.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 799.38' / 796.92' S= 0.0081 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=24.89 cfs @ 12.22 hrs HW=802.09' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 24.89 cfs @ 4.89 fps)

Secondary OutFlow Max=0.47 cfs @ 12.22 hrs HW=802.09' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.47 cfs)

Summary for Link 1L: TRC4

Inflow Area = 2.059 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 5.04 cfs @ 12.21 hrs, Volume= 0.325 af
Primary = 5.04 cfs @ 12.21 hrs, Volume= 0.325 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 2L: TRC2

Inflow Area = 1.033 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 2.84 cfs @ 12.16 hrs, Volume= 0.163 af
Primary = 2.84 cfs @ 12.16 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 3R : Swale

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 3L: TRC3

Inflow Area = 0.238 ac, 0.00% Impervious, Inflow Depth = 4.44" for 25-yr, 24-hr event
Inflow = 1.30 cfs @ 12.17 hrs, Volume= 0.088 af
Primary = 1.30 cfs @ 12.17 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD4 : Roadside Ditch 4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 10L: TRC1

Inflow Area = 0.370 ac, 0.00% Impervious, Inflow Depth = 2.55" for 25-yr, 24-hr event
Inflow = 1.75 cfs @ 12.11 hrs, Volume= 0.079 af
Primary = 1.75 cfs @ 12.11 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD4 : Roadside Ditch 4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link C: Culvert C7

Inflow Area = 2.059 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 5.04 cfs @ 12.21 hrs, Volume= 0.325 af
Primary = 5.04 cfs @ 12.21 hrs, Volume= 0.325 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1L : TRC4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link C1: Culvert C1

Inflow Area = 3.055 ac, 0.00% Impervious, Inflow Depth = 0.51" for 25-yr, 24-hr event
Inflow = 0.61 cfs @ 12.88 hrs, Volume= 0.129 af
Primary = 0.61 cfs @ 12.88 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link C2: Culvert C2

Inflow Area = 0.661 ac, 0.00% Impervious, Inflow Depth = 2.46" for 25-yr, 24-hr event
Inflow = 2.37 cfs @ 12.23 hrs, Volume= 0.136 af
Primary = 2.37 cfs @ 12.23 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link C9: Culvert C9

Inflow Area = 13.728 ac, 2.28% Impervious, Inflow Depth = 1.61" for 25-yr, 24-hr event
Inflow = 25.84 cfs @ 12.20 hrs, Volume= 1.837 af
Primary = 25.84 cfs @ 12.20 hrs, Volume= 1.837 af, Atten= 0%, Lag= 0.0 min
Routed to Pond N : North Infiltration Area

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link F1: Flume 1

Inflow Area = 2.337 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 5.33 cfs @ 12.13 hrs, Volume= 0.369 af
Primary = 5.33 cfs @ 12.13 hrs, Volume= 0.369 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link F2: Flume 2

Inflow Area = 1.348 ac, 0.00% Impervious, Inflow Depth = 2.19" for 25-yr, 24-hr event
Inflow = 4.85 cfs @ 12.11 hrs, Volume= 0.246 af
Primary = 4.85 cfs @ 12.11 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD4 : Roadside Ditch 4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link F3: Flume 3

Inflow Area = 2.934 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr, 24-hr event
Inflow = 9.37 cfs @ 12.13 hrs, Volume= 0.463 af
Primary = 9.37 cfs @ 12.13 hrs, Volume= 0.463 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Area 1 Runoff Area=44,983 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=656' Tc=8.4 min CN=69 Runoff=4.82 cfs 0.274 af

Subcatchment2S: Area 15 Runoff Area=44,721 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=58' Slope=0.2500 '/' Tc=2.5 min CN=69 Runoff=6.11 cfs 0.272 af

Subcatchment3S: Area 2 Runoff Area=65,572 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=937' Tc=5.2 min CN=69 Runoff=8.09 cfs 0.399 af

Subcatchment4S: Area 16 Runoff Area=48,706 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=443' Slope=0.0200 '/' Tc=16.3 min CN=69 Runoff=3.92 cfs 0.296 af

Subcatchment5S: Area 3 Runoff Area=33,787 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=701' Tc=5.7 min CN=69 Runoff=4.07 cfs 0.206 af

Subcatchment6S: Area 4 Runoff Area=28,852 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=427' Tc=4.4 min CN=69 Runoff=3.67 cfs 0.176 af

Subcatchment7S: Area 4a Runoff Area=19,738 sf 0.00% Impervious Runoff Depth=3.28"
Flow Length=504' Tc=3.8 min CN=70 Runoff=2.66 cfs 0.124 af

Subcatchment8S: Area 5 Runoff Area=16,748 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=496' Tc=4.6 min CN=69 Runoff=2.11 cfs 0.102 af

Subcatchment9S: Area 6 Runoff Area=7,509 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=320' Tc=3.1 min CN=69 Runoff=1.00 cfs 0.046 af

Subcatchment10S: Area 9 Runoff Area=16,945 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=464' Tc=3.9 min CN=69 Runoff=2.21 cfs 0.103 af

Subcatchment12S: Area 8 Runoff Area=16,134 sf 0.00% Impervious Runoff Depth=4.00"
Flow Length=275' Tc=2.5 min CN=77 Runoff=2.69 cfs 0.123 af

Subcatchment13S: Area 10 Runoff Area=28,456 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=420' Tc=3.7 min CN=69 Runoff=3.72 cfs 0.173 af

Subcatchment14S: Area 11 Runoff Area=7,785 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=217' Tc=2.1 min CN=69 Runoff=1.06 cfs 0.047 af

Subcatchment15S: Area 12 Runoff Area=5,681 sf 0.00% Impervious Runoff Depth=6.12"
Flow Length=204' Slope=0.0250 '/' Tc=10.3 min CN=96 Runoff=0.95 cfs 0.066 af

Subcatchment16S: Area 13 Runoff Area=10,365 sf 0.00% Impervious Runoff Depth=6.12"
Flow Length=116' Slope=0.0250 '/' Tc=9.7 min CN=96 Runoff=1.76 cfs 0.121 af

Subcatchment18S: Area 5a Runoff Area=8,575 sf 0.00% Impervious Runoff Depth=3.38"
Flow Length=606' Tc=1.8 min CN=71 Runoff=1.25 cfs 0.055 af

SubcatchmentArea 35: Area 35 Runoff Area=28,800 sf 0.00% Impervious Runoff Depth=3.89"
Flow Length=104' Tc=4.6 min CN=76 Runoff=4.38 cfs 0.215 af

SubcatchmentArea 67: Area 67 Runoff Area=133,081 sf 0.00% Impervious Runoff Depth=1.20"
Flow Length=886' Slope=0.0068 '/' Tc=38.9 min CN=47 Runoff=2.00 cfs 0.306 af

SubcatchmentArea 68: Area 68 Runoff Area=10,937 sf 14.67% Impervious Runoff Depth=2.05"
Flow Length=52' Slope=0.1154 '/' Tc=3.1 min CN=57 Runoff=0.94 cfs 0.043 af

SubcatchmentArea 69: Area 69 Runoff Area=42,860 sf 11.82% Impervious Runoff Depth=2.23"
Flow Length=86' Slope=0.2326 '/' Tc=3.5 min CN=59 Runoff=3.96 cfs 0.183 af

SubcatchmentArea 70: Area 7 Runoff Area=79,588 sf 8.71% Impervious Runoff Depth=2.89"
Flow Length=147' Tc=4.1 min CN=66 Runoff=9.36 cfs 0.439 af

SubcatchmentArea 71: Area 71 Runoff Area=430,155 sf 0.00% Impervious Runoff Depth=0.83"
Flow Length=1,337' Tc=16.6 min CN=42 Runoff=5.66 cfs 0.684 af

Reach 3R: Swale Avg. Flow Depth=0.23' Max Vel=1.84 fps Inflow=10.05 cfs 0.546 af
n=0.022 L=368.0' S=0.0054 '/' Capacity=1,396.44 cfs Outflow=8.95 cfs 0.546 af

Reach RD1: Roadside Ditch 1 Avg. Flow Depth=0.20' Max Vel=2.00 fps Inflow=2.00 cfs 0.306 af
n=0.030 L=440.6' S=0.0188 '/' Capacity=47.16 cfs Outflow=1.98 cfs 0.306 af

Reach RD2: Roadside Ditch 2 Avg. Flow Depth=0.63' Max Vel=3.52 fps Inflow=29.17 cfs 2.070 af
n=0.030 L=433.0' S=0.0162 '/' Capacity=72.77 cfs Outflow=27.53 cfs 2.070 af

Reach RD4: Roadside Ditch 4 Avg. Flow Depth=0.61' Max Vel=2.56 fps Inflow=21.27 cfs 1.080 af
n=0.030 L=495.6' S=0.0090 '/' Capacity=54.26 cfs Outflow=18.76 cfs 1.080 af

Reach S5.1: Swale S5.1 Avg. Flow Depth=0.21' Max Vel=2.05 fps Inflow=4.38 cfs 0.215 af
n=0.030 L=478.0' S=0.0154 '/' Capacity=235.22 cfs Outflow=3.86 cfs 0.215 af

Pond N: North Infiltration Area Peak Elev=802.97' Storage=7,920 cf Inflow=49.39 cfs 3.834 af
Primary=34.14 cfs 3.757 af Secondary=0.93 cfs 0.077 af Outflow=35.07 cfs 3.834 af

Link 1L: TRC4 Inflow=8.95 cfs 0.546 af
Primary=8.95 cfs 0.546 af

Link 2L: TRC2 Inflow=4.82 cfs 0.274 af
Primary=4.82 cfs 0.274 af

Link 3L: TRC3 Inflow=1.76 cfs 0.121 af
Primary=1.76 cfs 0.121 af

Link 10L: TRC1 Inflow=2.69 cfs 0.123 af
Primary=2.69 cfs 0.123 af

Link C: Culvert C7 Inflow=8.95 cfs 0.546 af
Primary=8.95 cfs 0.546 af

Link C1: Culvert C1 Inflow=1.98 cfs 0.306 af
Primary=1.98 cfs 0.306 af

Link C2: Culvert C2 Inflow=3.86 cfs 0.215 af
Primary=3.86 cfs 0.215 af

Link C9: Culvert C9 Inflow=46.28 cfs 3.150 af
Primary=46.28 cfs 3.150 af

Link F1: Flume 1 Inflow=9.11 cfs 0.620 af
Primary=9.11 cfs 0.620 af

Link F2: Flume 2 Inflow=7.88 cfs 0.396 af
Primary=7.88 cfs 0.396 af

Link F3: Flume 3 Inflow=15.75 cfs 0.778 af
Primary=15.75 cfs 0.778 af

Total Runoff Area = 25.941 ac Runoff Volume = 4.453 af Average Runoff Depth = 2.06"
98.80% Pervious = 25.628 ac 1.20% Impervious = 0.312 ac

Summary for Subcatchment 1S: Area 1

Runoff = 4.82 cfs @ 12.16 hrs, Volume= 0.274 af, Depth= 3.18"
Routed to Link 2L : TRC2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
44,983	69	Pasture/grassland/range, Fair, HSG B
44,983		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	30	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	226	0.0575	11.57	161.92	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 3.0 & 4.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
1.1	400	0.0575	6.27	125.43	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=2.00' Z= 2.0 '/' Top.W=14.00' n= 0.069 Riprap, 6-inch
8.4	656	Total			

Summary for Subcatchment 2S: Area 15

Runoff = 6.11 cfs @ 12.11 hrs, Volume= 0.272 af, Depth= 3.18"
Routed to Reach 3R : Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
44,721	69	Pasture/grassland/range, Fair, HSG B
44,721		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	58	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment 3S: Area 2

Runoff = 8.09 cfs @ 12.13 hrs, Volume= 0.399 af, Depth= 3.18"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
65,572	69	Pasture/grassland/range, Fair, HSG B
65,572		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	64	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
2.2	627	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.3	246	0.2500	13.08	261.54	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=2.00' Z= 2.0 '/' Top.W=14.00' n= 0.069 Riprap, 6-inch
5.2	937	Total			

Summary for Subcatchment 4S: Area 16

Runoff = 3.92 cfs @ 12.25 hrs, Volume= 0.296 af, Depth= 3.18"
Routed to Link F1 : Flume 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
48,706	69	Pasture/grassland/range, Fair, HSG B
48,706		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
5.8	343	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.3	443	Total			

Summary for Subcatchment 5S: Area 3

Runoff = 4.07 cfs @ 12.13 hrs, Volume= 0.206 af, Depth= 3.18"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
33,787	69	Pasture/grassland/range, Fair, HSG B
33,787		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	7	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	497	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.2	97	0.1237	9.20	183.97	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=2.00' Z= 2.0 '/' Top.W=14.00' n= 0.069 Riprap, 6-inch
5.7	701	Total			

Summary for Subcatchment 6S: Area 4

Runoff = 3.67 cfs @ 12.12 hrs, Volume= 0.176 af, Depth= 3.18"
Routed to Link F1 : Flume 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
28,852	69	Pasture/grassland/range, Fair, HSG B
28,852		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	80	0.2500	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.2	347	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
4.4	427	Total			

Summary for Subcatchment 7S: Area 4a

Runoff = 2.66 cfs @ 12.12 hrs, Volume= 0.124 af, Depth= 3.28"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
18,869	69	Pasture/grassland/range, Fair, HSG B
869	96	Gravel surface, HSG C
19,738	70	Weighted Average
19,738		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	64	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	166	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.5	274	0.2500	9.00	71.99	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=1.00' Z= 2.0 '/' Top.W=10.00' n= 0.069 Riprap, 6-inch
3.8	504	Total			

Summary for Subcatchment 8S: Area 5

Runoff = 2.11 cfs @ 12.12 hrs, Volume= 0.102 af, Depth= 3.18"
Routed to Link F1 : Flume 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
16,748	69	Pasture/grassland/range, Fair, HSG B
16,748		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	76	0.2500	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.5	420	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
4.6	496	Total			

Summary for Subcatchment 9S: Area 6

Runoff = 1.00 cfs @ 12.11 hrs, Volume= 0.046 af, Depth= 3.18"
Routed to Link F1 : Flume 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
7,509	69	Pasture/grassland/range, Fair, HSG B
7,509		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	31	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.6	289	0.0100	3.00	9.01	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=1.00' Z= 2.0 & 4.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
3.1	320	Total			

Summary for Subcatchment 10S: Area 9

Runoff = 2.21 cfs @ 12.12 hrs, Volume= 0.103 af, Depth= 3.18"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
16,945	69	Pasture/grassland/range, Fair, HSG B
16,945		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	66	0.2500	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	201	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.4	197	0.2500	9.00	71.99	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=1.00' Z= 2.0 '/' Top.W=10.00' n= 0.069 Riprap, 6-inch
3.9	464	Total			

Summary for Subcatchment 12S: Area 8

Runoff = 2.69 cfs @ 12.11 hrs, Volume= 0.123 af, Depth= 4.00"
Routed to Link 10L : TRC1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
11,330	69	Pasture/grassland/range, Fair, HSG B
4,804	96	Gravel surface, HSG B
16,134	77	Weighted Average
16,134		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	31	0.1000	1.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
1.5	30	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	214	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
2.5	275	Total			

Summary for Subcatchment 13S: Area 10

Runoff = 3.72 cfs @ 12.11 hrs, Volume= 0.173 af, Depth= 3.18"
Routed to Link F3 : Flume 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
28,456	69	Pasture/grassland/range, Fair, HSG B
28,456		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	56	0.2500	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.3	364	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
3.7	420	Total			

Summary for Subcatchment 14S: Area 11

Runoff = 1.06 cfs @ 12.10 hrs, Volume= 0.047 af, Depth= 3.18"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
7,785	69	Pasture/grassland/range, Fair, HSG B
7,785		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	31	0.2500	0.34		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	186	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
2.1	217	Total			

Summary for Subcatchment 15S: Area 12

Runoff = 0.95 cfs @ 12.17 hrs, Volume= 0.066 af, Depth= 6.12"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
5,681	96	Gravel surface, HSG C
5,681		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0250	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.7	104	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.3	204	Total			

Summary for Subcatchment 16S: Area 13

Runoff = 1.76 cfs @ 12.17 hrs, Volume= 0.121 af, Depth= 6.12"
Routed to Link 3L : TRC3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
10,365	96	Gravel surface, HSG C
10,365		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0250	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.1	16	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.7	116	Total			

Summary for Subcatchment 18S: Area 5a

Runoff = 1.25 cfs @ 12.10 hrs, Volume= 0.055 af, Depth= 3.38"
Routed to Link F2 : Flume 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
7,849	69	Pasture/grassland/range, Fair, HSG B
726	96	Gravel surface, HSG C
8,575	71	Weighted Average
8,575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.2500	3.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.1	36	0.2500	8.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	30	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	166	0.0100	4.82	67.52	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=2.00' Z= 4.0 & 3.0 '/' Top.W=14.00' n= 0.030 Earth, grassed & winding
0.5	274	0.2500	9.00	71.99	**Trap/Vee/Rect Channel Flow,** Bot.W=6.00' D=1.00' Z= 2.0 '/' Top.W=10.00' n= 0.069 Riprap, 6-inch
1.8	606	Total			

Summary for Subcatchment Area 35: Area 35

Runoff = 4.38 cfs @ 12.12 hrs, Volume= 0.215 af, Depth= 3.89"
Routed to Reach S5.1 : Swale S5.1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
21,181	69	Pasture/grassland/range, Fair, HSG B
7,619	96	Gravel surface, HSG A
28,800	76	Weighted Average
28,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	70	0.1736	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.6	20	0.0050	0.53		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.77"
0.7	10	0.1766	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.0	4	0.1766	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	104	Total			

Summary for Subcatchment Area 67: Area 67

Runoff = 2.00 cfs @ 12.63 hrs, Volume= 0.306 af, Depth= 1.20"
Routed to Reach RD1 : Roadside Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
113,871	39	Pasture/grassland/range, Good, HSG A
2,657	69	Pasture/grassland/range, Fair, HSG B
16,553	96	Gravel surface, HSG A
133,081	47	Weighted Average
133,081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	100	0.0068	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
22.7	786	0.0068	0.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	886	Total			

Summary for Subcatchment Area 68: Area 68

Runoff = 0.94 cfs @ 12.11 hrs, Volume= 0.043 af, Depth= 2.05"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

	Area (sf)	CN	Description
	7,039	39	Pasture/grassland/range, Good, HSG A
	1,049	69	Pasture/grassland/range, Fair, HSG B
	1,244	96	Gravel surface, HSG C
*	1,605	98	Paved road
	10,937	57	Weighted Average
	9,332		85.33% Pervious Area
	1,605		14.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.1154	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 69: Area 69

Runoff = 3.96 cfs @ 12.12 hrs, Volume= 0.183 af, Depth= 2.23"
Routed to Reach RD2 : Roadside Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

	Area (sf)	CN	Description
	23,149	39	Pasture/grassland/range, Good, HSG A
	9,496	69	Pasture/grassland/range, Fair, HSG B
*	5,147	96	Gravel Road
*	5,068	98	Paved Road
	42,860	59	Weighted Average
	37,792		88.18% Pervious Area
	5,068		11.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	86	0.2326	0.41		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"

Summary for Subcatchment Area 70: Area 7

Runoff = 9.36 cfs @ 12.12 hrs, Volume= 0.439 af, Depth= 2.89"
Routed to Reach RD4 : Roadside Ditch 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
21,231	39	Pasture/grassland/range, Good, HSG A
45,419	69	Pasture/grassland/range, Fair, HSG B
6,006	96	Gravel surface, HSG A
6,932	98	Paved parking, HSG C
79,588	66	Weighted Average
72,656		91.29% Pervious Area
6,932		8.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	100	0.2500	0.43		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
0.3	47	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.1	147	Total			

Summary for Subcatchment Area 71: Area 71

Runoff = 5.66 cfs @ 12.32 hrs, Volume= 0.684 af, Depth= 0.83"
Routed to Pond N : North Infiltration Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 4 100-yr, 24-hr Rainfall=6.59"

Area (sf)	CN	Description
407,722	39	Pasture/grassland/range, Good, HSG A
22,433	96	Gravel surface, HSG A
430,155	42	Weighted Average
430,155		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.77"
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.4	1,137	0.0193	4.31	32.30	**Trap/Vee/Rect Channel Flow, Roadside Ditch** Bot.W=0.00' D=1.00' Z= 5.0 & 10.0 '/' Top.W=15.00' n= 0.030
16.6	1,337	Total			

Summary for Reach 3R: Swale

Inflow Area = 2.059 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 10.05 cfs @ 12.11 hrs, Volume= 0.546 af
Outflow = 8.95 cfs @ 12.19 hrs, Volume= 0.546 af, Atten= 11%, Lag= 4.6 min
Routed to Link C : Culvert C7

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.84 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 9.7 min

Peak Storage= 1,801 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 21.87'
Bank-Full Depth= 4.00' Flow Area= 144.0 sf, Capacity= 1,396.44 cfs

20.00' x 4.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 52.00'
Length= 368.0' Slope= 0.0054 '/'
Inlet Invert= 822.00', Outlet Invert= 820.00'

‡

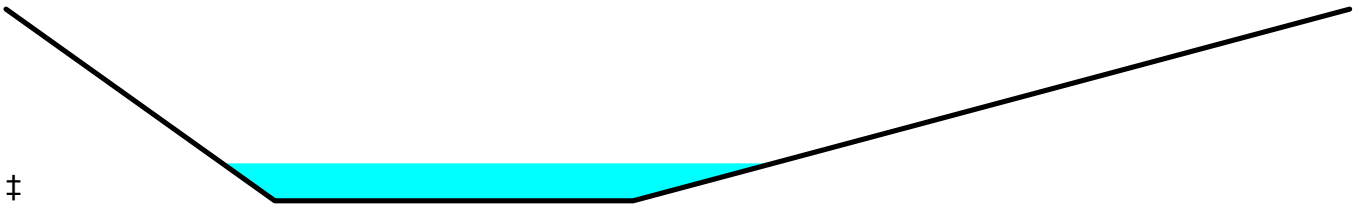
Summary for Reach RD1: Roadside Ditch 1

Inflow Area = 3.055 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-yr, 24-hr event
Inflow = 2.00 cfs @ 12.63 hrs, Volume= 0.306 af
Outflow = 1.98 cfs @ 12.74 hrs, Volume= 0.306 af, Atten= 1%, Lag= 6.6 min
Routed to Link C1 : Culvert C1

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.00 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 9.2 min

Peak Storage= 436 cf @ 12.68 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 6.15'
Bank-Full Depth= 1.00' Flow Area= 9.5 sf, Capacity= 47.16 cfs

4.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 8.0 '/' Top Width= 15.00'
Length= 440.6' Slope= 0.0188 '/'
Inlet Invert= 824.00', Outlet Invert= 815.70'



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Summary for Reach RD2: Roadside Ditch 2

Inflow Area = 9.945 ac, 1.54% Impervious, Inflow Depth = 2.50" for 100-yr, 24-hr event
Inflow = 29.17 cfs @ 12.13 hrs, Volume= 2.070 af
Outflow = 27.53 cfs @ 12.19 hrs, Volume= 2.070 af, Atten= 6%, Lag= 3.4 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.52 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 7.2 min

Peak Storage= 3,392 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.63' , Surface Width= 18.69'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 72.77 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 433.0' Slope= 0.0162 '/'
Inlet Invert= 814.55', Outlet Invert= 807.54'

‡

Summary for Reach RD4: Roadside Ditch 4

Inflow Area = 3.784 ac, 4.21% Impervious, Inflow Depth = 3.43" for 100-yr, 24-hr event
Inflow = 21.27 cfs @ 12.11 hrs, Volume= 1.080 af
Outflow = 18.76 cfs @ 12.19 hrs, Volume= 1.080 af, Atten= 12%, Lag= 4.6 min
Routed to Link C9 : Culvert C9

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.56 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 14.4 min

Peak Storage= 3,637 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.61' , Surface Width= 18.15'
Bank-Full Depth= 1.00' Flow Area= 16.0 sf, Capacity= 54.26 cfs

6.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 495.6' Slope= 0.0090 '/'
Inlet Invert= 812.00', Outlet Invert= 807.54'

‡

Summary for Reach S5.1: Swale S5.1

Inflow Area = 0.661 ac, 0.00% Impervious, Inflow Depth = 3.89" for 100-yr, 24-hr event
Inflow = 4.38 cfs @ 12.12 hrs, Volume= 0.215 af
Outflow = 3.86 cfs @ 12.21 hrs, Volume= 0.215 af, Atten= 12%, Lag= 5.5 min
Routed to Link C2 : Culvert C2

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.05 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 14.6 min

Peak Storage= 899 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 9.70'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 235.22 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 478.0' Slope= 0.0154 '/'
Inlet Invert= 825.20', Outlet Invert= 817.83'

‡

Summary for Pond N: North Infiltration Area

Inflow Area = 23.603 ac, 1.32% Impervious, Inflow Depth = 1.95" for 100-yr, 24-hr event
Inflow = 49.39 cfs @ 12.19 hrs, Volume= 3.834 af
Outflow = 35.07 cfs @ 12.30 hrs, Volume= 3.834 af, Atten= 29%, Lag= 6.7 min
Primary = 34.14 cfs @ 12.30 hrs, Volume= 3.757 af
Secondary = 0.93 cfs @ 12.30 hrs, Volume= 0.077 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 802.97' @ 12.30 hrs Surf.Area= 11,123 sf Storage= 7,920 cf

Plug-Flow detention time= 1.0 min calculated for 3.834 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (849.1 - 848.1)

Volume	Invert	Avail.Storage	Storage Description
#1	802.00'	256,569 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
802.00	5,140	0	0
804.00	17,424	22,564	22,564
806.00	32,191	49,615	72,179
808.00	46,130	78,321	150,500
810.00	59,939	106,069	256,569

Device	Routing	Invert	Outlet Devices
#1	Secondary	802.00'	**3.600 in/hr Exfiltration over Surface area**
#2	Primary	799.38'	**36.0" Round Culvert** L= 302.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 799.38' / 796.92' S= 0.0081 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=34.15 cfs @ 12.30 hrs HW=802.97' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 34.15 cfs @ 5.10 fps)

Secondary OutFlow Max=0.93 cfs @ 12.30 hrs HW=802.97' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.93 cfs)

Summary for Link 1L: TRC4

Inflow Area = 2.059 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 8.95 cfs @ 12.19 hrs, Volume= 0.546 af
Primary = 8.95 cfs @ 12.19 hrs, Volume= 0.546 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 2L: TRC2

Inflow Area = 1.033 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 4.82 cfs @ 12.16 hrs, Volume= 0.274 af
Primary = 4.82 cfs @ 12.16 hrs, Volume= 0.274 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 3R : Swale

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 3L: TRC3

Inflow Area = 0.238 ac, 0.00% Impervious, Inflow Depth = 6.12" for 100-yr, 24-hr event
Inflow = 1.76 cfs @ 12.17 hrs, Volume= 0.121 af
Primary = 1.76 cfs @ 12.17 hrs, Volume= 0.121 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD4 : Roadside Ditch 4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link 10L: TRC1

Inflow Area = 0.370 ac, 0.00% Impervious, Inflow Depth = 4.00" for 100-yr, 24-hr event
Inflow = 2.69 cfs @ 12.11 hrs, Volume= 0.123 af
Primary = 2.69 cfs @ 12.11 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD4 : Roadside Ditch 4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link C: Culvert C7

Inflow Area = 2.059 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 8.95 cfs @ 12.19 hrs, Volume= 0.546 af
Primary = 8.95 cfs @ 12.19 hrs, Volume= 0.546 af, Atten= 0%, Lag= 0.0 min
Routed to Link 1L : TRC4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link C1: Culvert C1

Inflow Area = 3.055 ac, 0.00% Impervious, Inflow Depth = 1.20" for 100-yr, 24-hr event
Inflow = 1.98 cfs @ 12.74 hrs, Volume= 0.306 af
Primary = 1.98 cfs @ 12.74 hrs, Volume= 0.306 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link C2: Culvert C2

Inflow Area = 0.661 ac, 0.00% Impervious, Inflow Depth = 3.89" for 100-yr, 24-hr event
Inflow = 3.86 cfs @ 12.21 hrs, Volume= 0.215 af
Primary = 3.86 cfs @ 12.21 hrs, Volume= 0.215 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link C9: Culvert C9

Inflow Area = 13.728 ac, 2.28% Impervious, Inflow Depth = 2.75" for 100-yr, 24-hr event
Inflow = 46.28 cfs @ 12.19 hrs, Volume= 3.150 af
Primary = 46.28 cfs @ 12.19 hrs, Volume= 3.150 af, Atten= 0%, Lag= 0.0 min
Routed to Pond N : North Infiltration Area

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link F1: Flume 1

Inflow Area = 2.337 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 9.11 cfs @ 12.12 hrs, Volume= 0.620 af
Primary = 9.11 cfs @ 12.12 hrs, Volume= 0.620 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link F2: Flume 2

Inflow Area = 1.348 ac, 0.00% Impervious, Inflow Depth = 3.53" for 100-yr, 24-hr event
Inflow = 7.88 cfs @ 12.11 hrs, Volume= 0.396 af
Primary = 7.88 cfs @ 12.11 hrs, Volume= 0.396 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD4 : Roadside Ditch 4

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link F3: Flume 3

Inflow Area = 2.934 ac, 0.00% Impervious, Inflow Depth = 3.18" for 100-yr, 24-hr event
Inflow = 15.75 cfs @ 12.12 hrs, Volume= 0.778 af
Primary = 15.75 cfs @ 12.12 hrs, Volume= 0.778 af, Atten= 0%, Lag= 0.0 min
Routed to Reach RD2 : Roadside Ditch 2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Culvert Sizing

HY-8 Culvert Analysis Report

Culvert Data: ADF C7 Moved

Site Data - ADF C7 Moved

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 818.00 ft
Outlet Station: 84.00 ft
Outlet Elevation: 816.50 ft
Number of Barrels: 1

Culvert Data Summary - ADF C7 Moved

Barrel Shape: Circular
Barrel Diameter: 2.50 ft
Barrel Material: Smooth HDPE
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

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 818.00 ft,
Outlet Elevation (invert): 816.50 ft
Culvert Length: 84.01 ft,
Culvert Slope: 0.0179

Tailwater Channel Data - Crossing 1

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 10.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0100
Channel Manning's n: 0.0350
Channel Invert Elevation: 818.00 ft

Roadway Data for Crossing: Crossing 1

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 24.00 ft
Crest Elevation: 822.00 ft
Roadway Surface: Paved
Roadway Top Width: 30.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 5.04 cfs
Design Flow: 5.04 cfs
Maximum Flow: 8.95 cfs

Table 1 - Culvert Summary Table: ADF C7 Moved

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)
5.04 cfs	5.04 cfs	819.00	1.00	0.308	1-JS1t	0.49	0.74	1.77	0.27	1.35	1.67
5.43 cfs	5.43 cfs	819.04	1.04	0.325	1-JS1t	0.51	0.77	1.78	0.28	1.45	1.71
5.82 cfs	5.82 cfs	819.08	1.08	0.343	1-JS1t	0.53	0.80	1.80	0.30	1.54	1.76
6.21 cfs	6.21 cfs	819.12	1.12	0.361	1-JS1t	0.54	0.82	1.81	0.31	1.63	1.80
6.60 cfs	6.60 cfs	819.16	1.16	0.379	1-JS1t	0.56	0.85	1.82	0.32	1.73	1.84
6.99 cfs	6.99 cfs	819.20	1.20	0.398	1-JS1t	0.58	0.88	1.83	0.33	1.82	1.87
7.39 cfs	7.39 cfs	819.23	1.23	0.416	1-JS1t	0.59	0.90	1.84	0.34	1.91	1.91
7.78 cfs	7.78 cfs	819.27	1.27	0.435	1-JS1t	0.61	0.93	1.85	0.35	2.00	1.95
8.17 cfs	8.17 cfs	819.31	1.31	0.454	1-JS1t	0.63	0.95	1.86	0.36	2.08	1.98
8.56 cfs	8.56 cfs	819.35	1.35	0.472	1-JS1t	0.64	0.97	1.87	0.37	2.17	2.01
8.95 cfs	8.95 cfs	819.39	1.39	0.492	1-JS1t	0.65	1.00	1.88	0.38	2.26	2.04

Tailwater Data for Crossing: Crossing 1

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

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.04	818.27	0.27	1.67	0.17	0.59
5.43	818.28	0.28	1.71	0.18	0.59
5.82	818.30	0.30	1.76	0.18	0.60
6.21	818.31	0.31	1.80	0.19	0.60
6.60	818.32	0.32	1.84	0.20	0.61
6.99	818.33	0.33	1.87	0.21	0.61
7.39	818.34	0.34	1.91	0.21	0.61
7.78	818.35	0.35	1.95	0.22	0.61
8.17	818.36	0.36	1.98	0.23	0.62
8.56	818.37	0.37	2.01	0.23	0.62
8.95	818.38	0.38	2.04	0.24	0.62

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

Headwater Elevation (ft)	Total Discharge (cfs)	ADF C7 Moved Discharge (cfs)	Roadway Discharge (cfs)	Iterations
819.00	5.04	5.04	0.00	1
819.04	5.43	5.43	0.00	1
819.08	5.82	5.82	0.00	1
819.12	6.21	6.21	0.00	1
819.16	6.60	6.60	0.00	1
819.20	6.99	6.99	0.00	1
819.23	7.39	7.39	0.00	1
819.27	7.78	7.78	0.00	1
819.31	8.17	8.17	0.00	1
819.35	8.56	8.56	0.00	1
819.39	8.95	8.95	0.00	1
822.00	37.86	37.86	0.00	Overtopping

HY-8 Culvert Analysis Report

Culvert Data: C9a_250203

Site Data - C9a_250203

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 807.54 ft
Outlet Station: 99.86 ft
Outlet Elevation: 806.81 ft
Number of Barrels: 1

Culvert Data Summary - C9a_250203

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Smooth HDPE
Embedment: 0.00 in
Barrel Manning's n: 0.0120
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting (Ke=0.9)
Inlet Depression: None

Culvert Barrel Data

Culvert Barrel Type Straight Culvert
Inlet Elevation (invert): 807.54 ft,
Outlet Elevation (invert): 806.81 ft
Culvert Length: 99.86 ft,
Culvert Slope: 0.0073

Tailwater Channel Data - Culvert C9a

Tailwater Channel Option: Trapezoidal Channel
Bottom Width: 12.00 ft
Side Slope (H:V): 4.00 (_:1)
Channel Slope: 0.0560
Channel Manning's n: 0.0450
Channel Invert Elevation: 807.44 ft

Roadway Data for Crossing: Culvert C9a

Roadway Profile Shape: Constant Roadway Elevation
Crest Length: 50.00 ft
Crest Elevation: 812.87 ft
Roadway Surface: Paved
Roadway Top Width: 24.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow
Minimum Flow: 25.84 cfs
Design Flow: 25.84 cfs
Maximum Flow: 46.28 cfs

Table 1 - Culvert Summary Table: C9a_250203

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)
25.84 cfs	25.84 cfs	812.45	4.91	4.257	7-M2c	2.00	1.78	1.78	0.45	8.74	4.19
27.88 cfs	27.32 cfs	812.89	5.35	4.650	7-M2c	2.00	1.81	1.81	0.47	9.12	4.30
29.93 cfs	27.46 cfs	812.94	5.40	4.682	7-M2c	2.00	1.82	1.82	0.49	9.16	4.41
31.97 cfs	27.56 cfs	812.97	5.43	4.709	7-M2c	2.00	1.82	1.82	0.51	9.18	4.51
34.02 cfs	27.64 cfs	812.99	5.45	4.732	7-M2c	2.00	1.82	1.82	0.52	9.20	4.61
36.06 cfs	27.72 cfs	813.02	5.48	4.753	7-M2c	2.00	1.82	1.82	0.54	9.22	4.70
38.10 cfs	27.79 cfs	813.04	5.50	4.772	7-M2c	2.00	1.82	1.82	0.56	9.24	4.79
40.15 cfs	27.85 cfs	813.06	5.52	4.789	7-M2c	2.00	1.83	1.83	0.58	9.26	4.87
42.19 cfs	27.91 cfs	813.08	5.54	4.810	7-M2c	2.00	1.83	1.83	0.59	9.28	4.95
44.24 cfs	27.97 cfs	813.10	5.56	4.822	7-M2c	2.00	1.83	1.83	0.61	9.29	5.03
46.28 cfs	28.03 cfs	813.12	5.58	4.838	7-M2c	2.00	1.83	1.83	0.62	9.31	5.11

Table 1 - Downstream Channel Rating Curve (Crossing: Culvert C9a)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
25.84	807.89	0.45	4.19	1.56	1.17
27.88	807.91	0.47	4.30	1.63	1.18
29.93	807.93	0.49	4.41	1.70	1.19
31.97	807.95	0.51	4.51	1.77	1.20
34.02	807.96	0.52	4.61	1.83	1.20
36.06	807.98	0.54	4.70	1.89	1.21
38.10	808.00	0.56	4.79	1.95	1.21
40.15	808.02	0.58	4.87	2.01	1.22
42.19	808.03	0.59	4.95	2.07	1.22
44.24	808.05	0.61	5.03	2.13	1.23
46.28	808.06	0.62	5.11	2.18	1.23

Table 2 - Summary of Culvert Flows at Crossing: Culvert C9a

Headwater Elevation (ft)	Total Discharge (cfs)	C9a_250203 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
812.45	25.84	25.84	0.00	1
812.89	27.88	27.32	0.51	36
812.94	29.93	27.46	2.43	7
812.97	31.97	27.56	4.39	6
812.99	34.02	27.64	6.34	5
813.02	36.06	27.72	8.32	5
813.04	38.10	27.79	10.31	5
813.06	40.15	27.85	12.27	4
813.08	42.19	27.91	14.26	4
813.10	44.24	27.97	16.25	4
813.12	46.28	28.03	18.24	4
812.87	27.25	27.25	0.00	Overtopping

Diversion Berm Sizing

SCS ENGINEERS

		Sheet No: 1 of 3	
		Calc. No.	
		Rev. No.	
Job No. 25224034.00	Project: Columbia Energy Center Interim SW	By: RAR	Date: 2/03/25
Client: WPL	Subject: Diversion Berm Sizing	Chk'd: RJG	Date: 2/04/25

Purpose:

To size the post closure diversion berms on the final cover to accommodate the 25-year, 24-hour storm event.

References:

1. WisDOT Facilities Development Manual Chapter 13, Section 30-15 - Grass Lined Channels.
2. Design of Roadside Channels with Flexible Linings, HEC-15, USDOT FHWA.
3. 250203_HydroCAD Report
4. Wisconsin Department of Natural Resources Conservation Practice Standard 1053 - Channel Erosion Mat.

Approach:

Use the HydroCAD Model results to obtain the peak flow during a 25-year, 24-hour storm event along the diversion berms.

Use Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2 (from Reference #1) to size the swale for each design swale cross section. The WisDOT spreadsheet incorporates the design guidelines and equations described in "Design of Roadside Channels with Flexible Linings", HEC-15, USDOT FHWA (Reference #2).

Confirm the swale is stable and has enough capacity for the design flow rate.

Assumptions:

1. Assume the channel geometry is a v-notch swale with one sideslope at 4:1 and one sideslope at 2:1 and a depth of 2.0 ft.
2. Assume 2.0% slope along the flowpath of the diversion swale.
3. Assume the following parameters per Section 15.2 - Grass Lining Properties from Reference #1:
   Vegetation Retardance Class = C for Swales
   Vegetation Condition = Good
   Vegetation Growth Form = Turf
4. Assume cohesive soil type with ASTM Soil Class SC and a Plasticity Index (PI) of 16.

Calculations:

From the HydroCAD Report, the peak flow rate along the diversion berms are as follows:

Areas			
2	4.81	cfs	highest flow

Use highest flow to confirm diversion berm functions.

Use the Grass Swale Design Spreadsheet (Page 2) to determine the flow depth, velocity and shear stress in the swales.

Results:

The diversion berms are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

The diversion berms are stable at the design flow rates.

Based on shear stress, use erosion mat Class I, Type B along the flow path of the diversion berms.

Channel/Ditch Geometry	*Area 2*
Channel Slope, S_o (ft/ft)	**0.02**
Channel Bottom Width, B (ft)	**0**
Channel Side Slope, z_1	**4**
Channel Side Slope, z_2	**2**
Flow Depth, d (ft) Solve iteratively	**0.85**
Safety Factor, SF	**1.0**
Vegetation/Soil Parameters	
Vegetation Retardance Class	**C**
Vegetation Condition	**good**
Vegetation Growth Form	**turf**
Soil Type	**cohesive**
D_{75} (in) (Set at 0.00 for cohesive soils)	
ASTM Soil Class	**SC**
Plasticity Index, PI	**16**
Results Summary	
Design Q (ft^3/s)	**3.7**
Calculated Q (ft^3/s)	3.7
Difference Between Design & Calc. Flow (%)	1.6%
Stable (Yes or No)	**YES**
Channel Parameters	
Vegetation Height, h (ft)	0.67
Grass Roughness Coefficient, C_n	0.238
Cover Factor, C_f	0.90
Noncohesive Soil	
Soil Grain Roughness, n_s	0.016
Permissible Soil Shear Stress, τ_p (lb/ft^2)	N/A
Cohesive Soil	
Porosity, e	0.35
Soil Coefficient 1, c_1	1.0700
Soil Coefficient 2, c_2	14.30
Soil Coefficient 3, c_3	47.700
Soil Coefficient 4, c_4	1.42
Soil Coefficient 5, c_5	-0.61
Soil Coefficient 6, c_6	0.00010
Permissible Soil Shear Stress, τ_p (lb/ft^2)	0.080
Total Permissible Shear Stress, τ_p (lb/ft^2)	0.080
Cross Sectional Area, A (ft^2)	2.168
Wetted Perimeter, P (ft)	5.41
Hydraulic Radius, R (ft)	0.401
Top Width, T (ft)	5.10
Hydraulic Depth, D (ft)	0.425
Froude Number (Q design)	0.462
Channel Shear Stress, τ_o (lb/ft^2)	0.50
Actual Sheer Stress, τ_d (lb/ft^2)	1.06
Mannings n	0.067
Average Velocity, V (ft/s)	1.68
Calculated Flow, Q (ft^3/s)	3.7
Difference Between Design & Calc. Flow (%)	1.6%
Effective Shear on Soil Surface, τ_e (lb/ft^2)	0.006
Total Permissible Shear on Veg., $\tau_{p\,veg}$ (lb/ft^2)	14.05
Stable (Y or N)	YES

Source: Grass Lined Channel Design WisDOT Spreadsheet, FDM 13-30 Attachment 15.2

Channel Erosion Mat

(1053)

Wisconsin Department of Natural Resources
Conservation Practice Standard

To differentiate applications WisDOT organizes erosion mats into three classes of mats, which are further broken down into various Types.

A. **Class I**: A short-term duration (minimum of 6 months), light duty, organic ECRM with plastic or biodegradable netting.

   1. **Type A** – Only suitable for slope applications, not channel applications.

   2. **Type B** – Double netted product for use in channels where the calculated (design) shear stress is 1.5 lbs/ft^2 or less.

B. **Class II**: A long-term duration (three years or greater), organic ECRM.

   1. **Type A** – Jute fiber only for use in channels to reinforce sod.

   2. **Type B** – For use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Made with plastic or biodegradable mat.

   3. **Type C** – A woven mat of 100% organic material for use in channels where the calculated (design) shear stress is 2.0 lbs/ft^2 or less. Applicable for use in environmentally sensitive areas where plastic netting is inappropriate.

C. **Class III**: A permanent 100% synthetic ECRM or TRM. Class I, Type B erosion mat or Class II, Type B or C erosion mat must be placed over a soil filled TRM.

   1. **Type A** – An ECRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

   2. **Type B** – A TRM for use in channels where the calculated (design) shear stress of 2.0 lbs/ft^2 or less.

   3. **Type C** – A TRM for use in channels where the calculated (design) shear stress of 3.5 lbs/ft^2 or less.

   4. **Type D** – A TRM for use in channels where the calculated (design) shear stress of 5.0 lbs/ft^2 or less.

Rock Chute Sizing

SCS ENGINEERS

		Sheet No:	1 of 5
		Calc. No.	
		Rev. No.	
Job No. 25224034.00	Job: Interim Stormwater Conveyance Features	By: RAR	Date: 2/03/25
Client: WPL	Subject: Rock Chute Sizing & Riprap Size	Chk'd: RJG	Date: 2/4/25

Purpose:

To size the rock chutes to accommodate the 25-year, 24-hour storm event.

References:

1. Rock Chute Design Data spreadsheet Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998.
2. HydroCAD Report: 250203_HydroCAD Report
3. Figure 1 - Storm Water
4. Stable 25.1 Typical Particle Sizes of Native Sands at 75 Percent Passing (D75) from WisDOT Facilities. Development Manual (FDM).

Approach:

1. Enter Inlet Channel data based on culvert apron or swale geometry Reference #2 and #3.
2. Enter Chute data based on slope from Reference #3, start the width, Bw equal to inlet channel Bw.
3. Enter Outlet Channel data based on Reference #3, start the width, Bw equal to inlet channel Bw.
4. Enter drainage area, apron elevations, flow (Q), and rainfall.
5. Adjust Bw for Chute and Outlet Channel until spreadsheet shows the rock chute "will" function adequately.
6. Determine rip rap classification based on D50 weight per Reference #4.

Assumptions:

1. Assume side slopes of chute and outlet channel are 2:1.
2. Assume Factor of Safey is 1.2.
3. n-value is based on proposed conditions at the channel.
4. Assume Outlet apron depth, d is 1.0 ft.
5. Freeboard is 1.0 ft.
6. Use 25-year, 24-hour storm event flow (Reference #2) for Q_{high} and Q_{low}.
7. Classification of riprap is based on weight (Reference #4).

Calculations:

See attached spreadsheet calcs for each rock chute.

Results:

The rock chutes are adequately designed to accommodate the flows from the 25-year, 24-hour storm event.

Rock Chute	Width (ft)	Thickness (in)	Apron Width (ft)	Apron Length (ft)	Calculated D_{50} (in)	Design D_{50} (in)	WisDOT Rip Rap Classification
TRC1	6	4	6	2	1.9	2.2	Select Crushed Material, Type R
TRC2	6	5	6	3	2.4	10	Light Riprap Type R
TRC3	6	4	6	2	1.6	2.2	Select Crushed Material, Type R
TRC4	4	9	4	5	4.2	10	Light Riprap Type R

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Interim Cover TRC1 **County:** Columbia
Designer: RAR **Checked by:** RJG
Date: February 3, 2025 **Date:** 02/04/25

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	3.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.030	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0200 ft./ft.	Bed slope =	0.1500 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 824.0 ft. ------ Outlet 810.0 ft. --- (H_{drop} = 13 ft.)

Degree of angularity = 1

1 --> 50% angular, 50% rounded

2 --> 100 % rounded

Q_{high} = Runoff from design storm

Q_5 = Runoff from a 5-year,24-hour storm

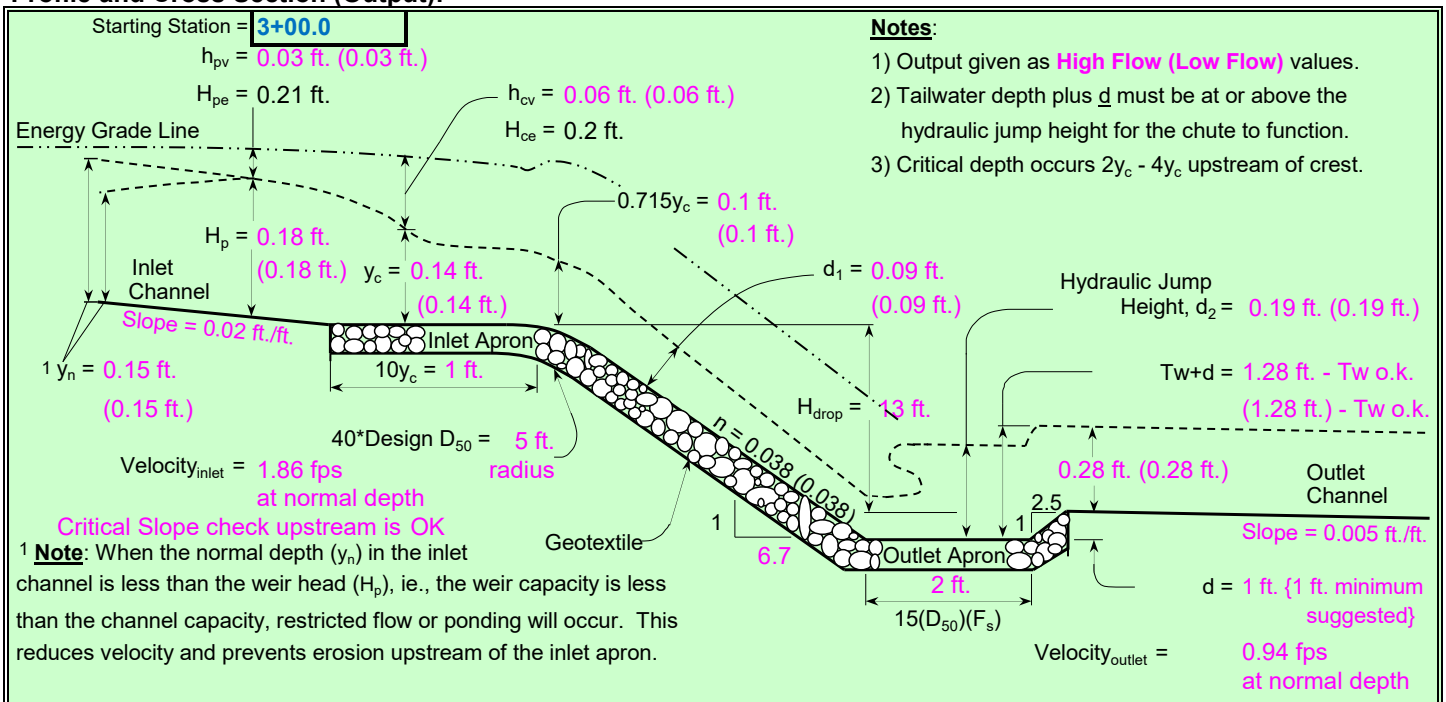
Q_{high} = 1.8 cfs High flow storm through chute → Tw (ft.) = **Program**

Q_{low} = 1.8 cfs Low flow storm through chute → Tw (ft.) = **Program**

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.15 1.20

Profile and Cross Section (Output):

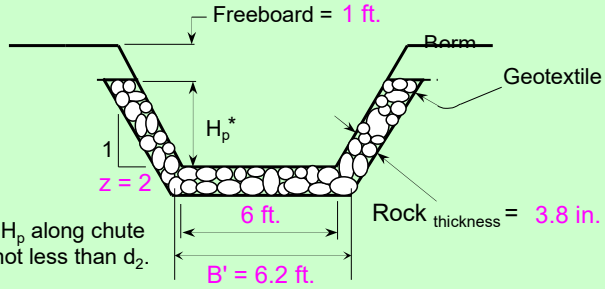


Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	0.28 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.09 ft.	Normal depth in chute
n-value =	0.038	Manning's roughness coefficient
D_{50}(SF) =	1.9 in.	Minimum Design D_{50}*
2(D_{50})(SF) =	3.8 in.	Rock chute thickness
Tw + d =	1.28 ft.	Tailwater above outlet apron
d_2 =	0.19 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Interim Cover TRC2 **County:** Columbia
Designer: RAR **Checked by:** RJG
Date: February 3, 2025 **Date:** 02/04/25

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	4.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.030	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0575 ft./ft.	Bed slope =	0.1300 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 869.0 ft. ------ Outlet 816.0 ft. --- (H_{drop} = 52 ft.)

Degree of angularity = 1

1 --> 50% angular, 50% rounded
2 --> 100 % rounded

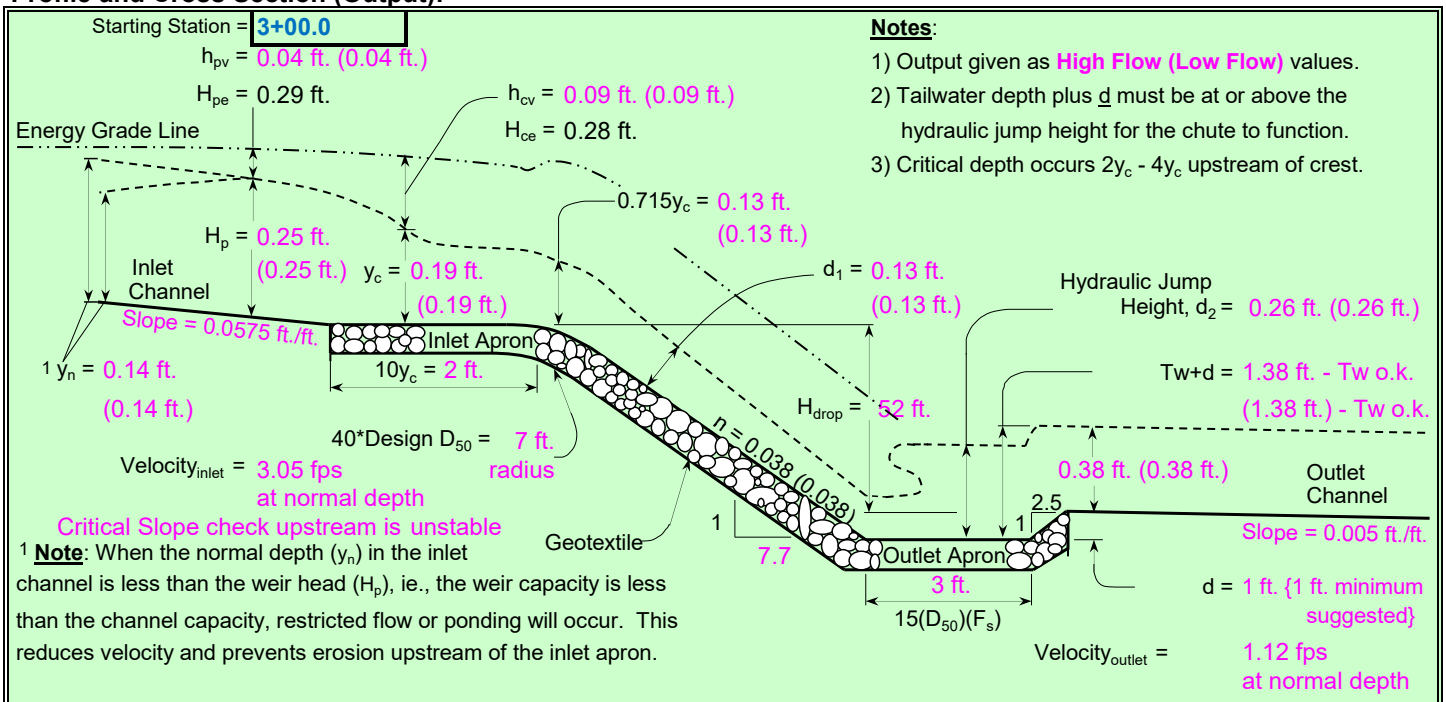
Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

Q_{high} = 2.8 cfs — High flow storm through chute → Tw (ft.) = Program
Q_{low} = 2.8 cfs — Low flow storm through chute → Tw (ft.) = Program

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.13 1.20

Profile and Cross Section (Output):

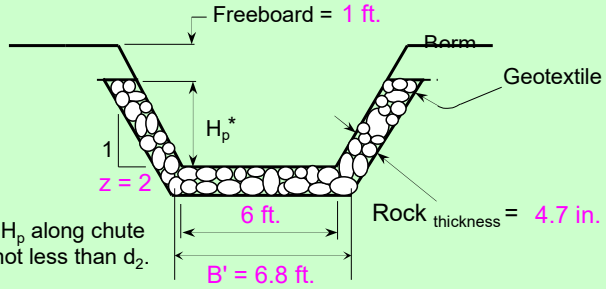


Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	0.46 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.13 ft.	Normal depth in chute
n-value =	0.038	Manning's roughness coefficient
D_{50}(SF) =	2.4 in.	Minimum Design D_{50}*
$2(D_{50})(SF)$ =	4.7 in.	Rock chute thickness
Tw + d =	1.38 ft.	Tailwater above outlet apron
d_2 =	0.26 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Interim Cover TRC3 | **County:** Columbia
Designer: RAR | **Checked by:** RJG
Date: February 3, 2025 | **Date:** 02/04/25

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	6.0 ft.	Bottom Width =	6.0 ft.		Bottom Width =	6.0 ft.
Side slopes =	3.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.030	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0100 ft./ft.	Bed slope =	0.1300 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 828.0 ft. ------ Outlet 810.0 ft. --- (H_{drop} = 17 ft.)

Degree of angularity = 1

1 --> 50% angular, 50% rounded
2 --> 100 % rounded

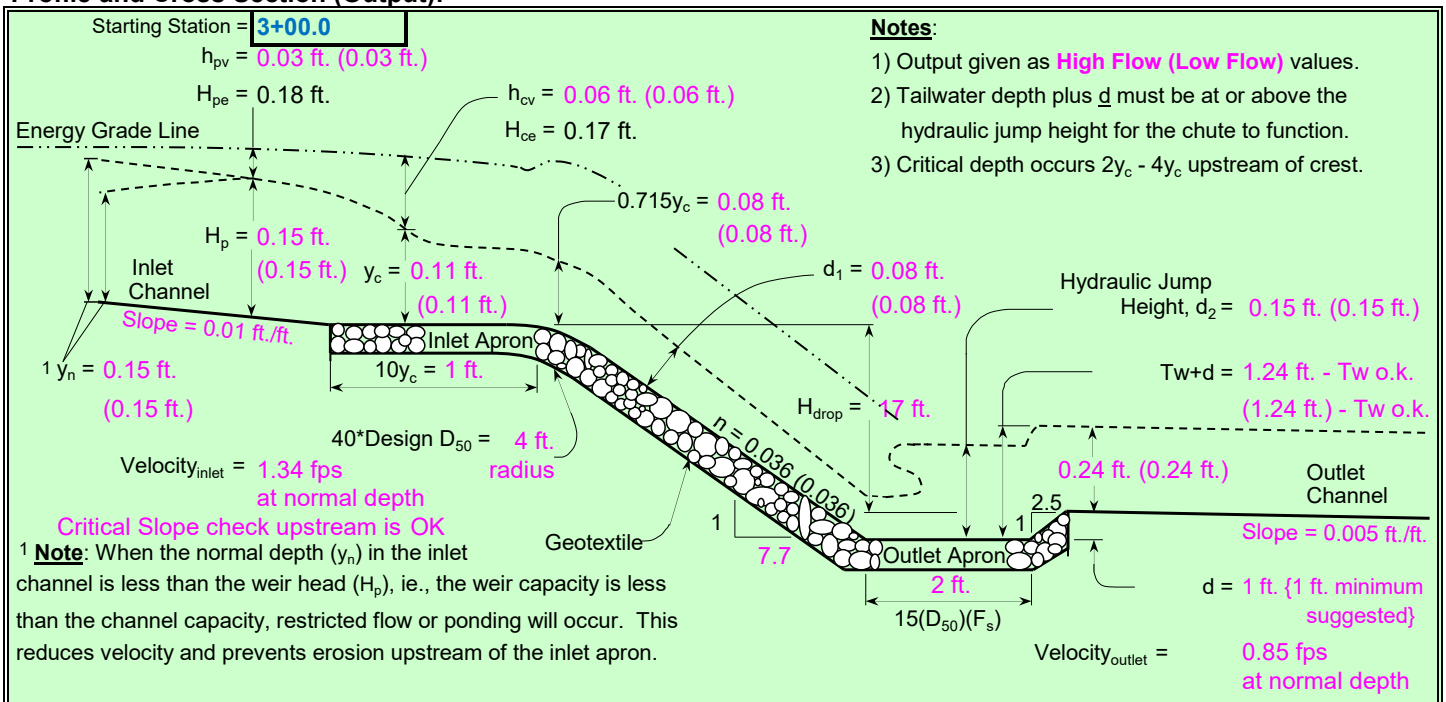
Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm

Q_{high} = 1.3 cfs — High flow storm through chute → Tw (ft.) = Program
Q_{low} = 1.3 cfs — Low flow storm through chute → Tw (ft.) = Program

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.13 1.20

Profile and Cross Section (Output):

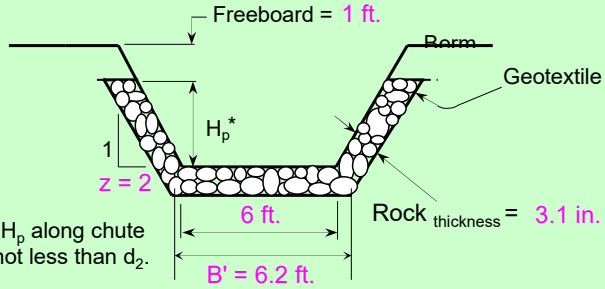


Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	0.21 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.08 ft.	Normal depth in chute
n-value =	0.036	Manning's roughness coefficient
D_{50}(SF) =	1.6 in.	Minimum Design D_{50}*
2(D_{50})(SF) =	3.1 in.	Rock chute thickness
Tw + d =	1.24 ft.	Tailwater above outlet apron
d_2 =	0.15 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information

Rock Chute Design Data

(Version WI-April-2005, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)
Revised for WisDOT 9/2010

Project: COL - Interim Cover TRC4 **County:** Columbia
Designer: RJG **Checked by:** RAR
Date: February 4, 2025 **Date:** February 4, 2025

Input Geometry:

Upstream Channel		Chute			Downstream Channel	
Bottom Width =	4.0 ft.	Bottom Width =	4.0 ft.		Bottom Width =	4.0 ft.
Side slopes =	3.0 (m:1)	Factor of safety =	1.20 (SF)	1.2 Min	Side slopes =	2.0 (m:1)
Mannings n value =	0.030	Side slopes =	2.0 (z:1)	2.0:1 max.	Mannings n value =	0.045
Bed slope =	0.0050 ft./ft.	Bed slope =	0.1800 ft./ft	3.0:1 max.	Bed slope =	0.0050 ft./ft.
Note: Use procedures 13-30-15 or 13-30-25 for upstream and downstream Mannings n		Freeboard =	1.0 ft.			
		Outlet apron depth, d =	1.0 ft.		Base flow =	0.0 cfs

Flow and Elevation Data:

Apron elev. --- Inlet = 818.0 ft. ------ Outlet 811.0 ft. --- (H_{drop} = 6 ft.)

Degree of angularity = 1

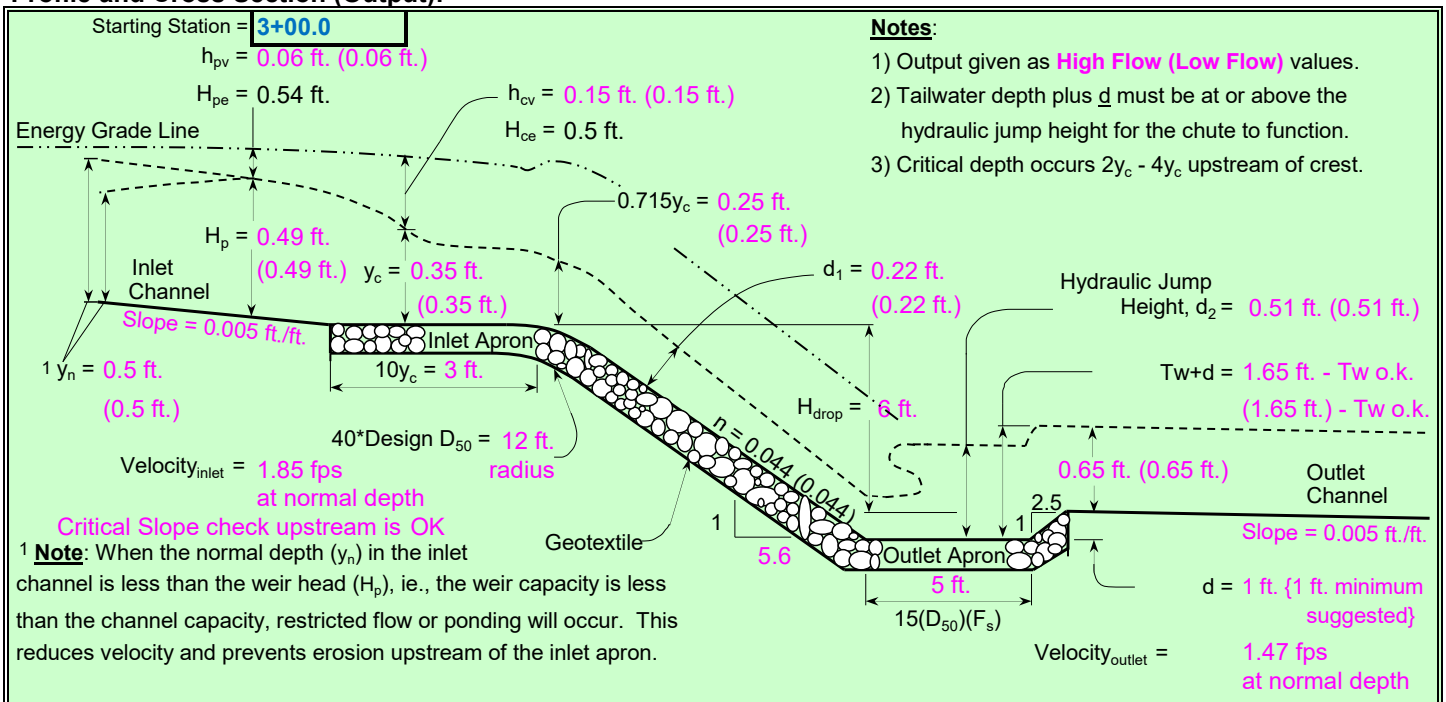
Q_{high} = Runoff from design storm
Q_5 = Runoff from a 5-year,24-hour storm
1 --> 50% angular, 50% rounded
2 --> 100 % rounded

Q_{high} = 5.0 cfs High flow storm through chute → Tw (ft.) = Program
Q_{low} = 5.0 cfs Low flow storm through chute → Tw (ft.) = Program

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Input tailwater (Tw): 0.18 1.20

Profile and Cross Section (Output):

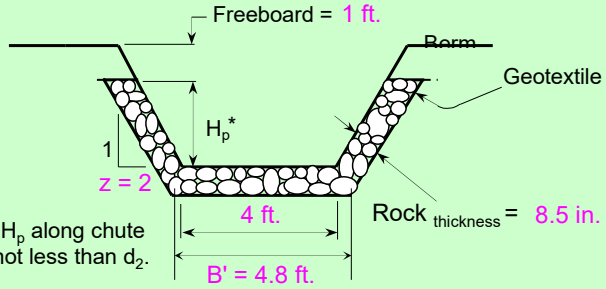


Notes:
1) Output given as **High Flow (Low Flow)** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section



* Use H_p along chute but not less than d_2.

	1.15 cfs/ft.	Equivalent unit discharge
SF =	1.20	Factor of safety (multiplier)
d_1 =	0.22 ft.	Normal depth in chute
n-value =	0.044	Manning's roughness coefficient
D_{50}(SF) =	4.2 in.	Minimum Design D_{50}*
2(D_{50})(SF) =	8.5 in.	Rock chute thickness
Tw + d =	1.65 ft.	Tailwater above outlet apron
d_2 =	0.51 ft.	Hydraulic jump height
*** The outlet	will	function adequately

High Flow Storm Information