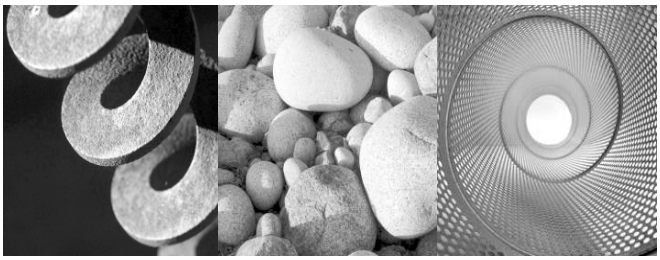


GEI Consultants

Consulting
Engineers and
Scientists

**Regulation Compliance Report**

# Run-on and Run-off Control Plan

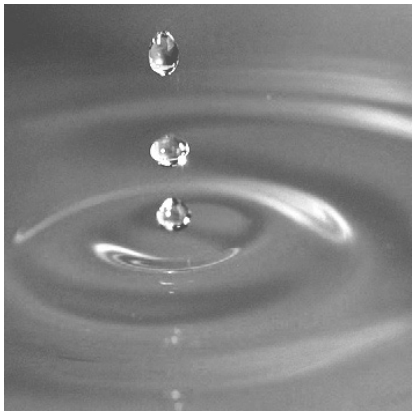
Weston Disposal Site No. 3
Town of Knowlton, Marathon County, Wisconsin

**Submitted to:**
Wisconsin Public Service Corporation
700 North Adams Street
Green Bay, Wisconsin 54301

**Submitted by:**
GEI Consultants, Inc.
3159 Voyager Drive
Green Bay, Wisconsin 54313
920.455.8200

October 2016, Revision 0

Project 1600630



John M. Trast, P.E.
Senior Consultant

Casey E. Fritsch, P.E.
Project Professional

# Table of Contents



## Tables



## Appendices

# 1. Introduction

Wisconsin Public Service Corporation (WPSC) owns and operates the Weston Disposal Site No. 3 Landfill, located in the E 1/2 of the NW 1/4 and W 1/2 of the NE 1/4, Section 23, Township 26 North, Range 7 East, Town of Knowlton, Marathon County, Wisconsin. The WPSC Weston Disposal Site No. 3 Landfill is regulated as an industrial waste landfill by the Wisconsin Department of Natural Resources (WDNR) under the provisions of Chapter 289 Wisconsin State Statues, and all applicable requirements of Chapters NR 500 of the Wisconsin Administrative Code. The design, construction, operation, closure, and post-closure care requirements are specified in the WDNR conditionally approved Plan of Operations, License No. 3067, FID No. 737025120. The construction of Cells 1 and 2 commenced in May 2015. Cell 2 of the landfill was placed into operation in 2016. Cell 1 has not been placed into operation.

In addition to the state regulations, the landfill is also required to comply with 40 CFR Part 257 Subpart D – *Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.* Weston Disposal Site No. 3 landfill, Cells 1 and 2 are defined as a CCR units and existing CCR landfills in accordance with § 257.53 since construction commenced prior to October 14, 2015. Future landfill cells are permitted by the WDNR in the approved Plan of Operation and defined as lateral expansions under § 257.53 when constructed.

This report fulfills the requirements of § 257.81 - *Run-on and run-off controls for CCR landfills* for the Weston Disposal Site No. 3, Cell 2. This report will be revised when Cell 1 opens for receipt of CCR in accordance with § 257.81. In accordance with § 257.81(c)(1) this report describes how the run-on and run-off control systems have been designed and constructed to meet the applicable requirements and supported by appropriate engineering calculations.

This run-off and run-on system control plan includes the following sections:

Section 1 – Introduction

Section 2 – Storm and Stormwater Volume Determination

Section 3 – Run-on Control System

Section 4 – Run-off Control System

Section 5 – Conclusion and Certification

Section 6 – References

# 2. Storm and Stormwater Volume Determination

§ 257.81 *Run-on and run-off controls for CCR landfills* requires that 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 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; and 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.

Cell 2 of the Weston Disposal Site No. 3 is approximately 8.6 acres in size. All precipitation that falls into the permitted limits of waste is contained within the cell and handled as leachate. Any precipitation that fall outside the limits of waste is directed away from the active landfill. Drawing C-1 – Weston Disposal Site No. 3 Cell 2 located in Appendix A shows the proposed operational filling grades for Cell 2 of the Weston Disposal Site No. 3. Stormwater in Cell 1 is treated as clean water and a run-on source until placed in operation. The Run-on and Run-off plan will be revised in accordance with § 257.81 when Cell 1 is opened for CCR disposal.

The rainfall depth estimate for a 24-hour, 25-year storm for the Weston Disposal Site No. 3 was determined following the procedures outlined in Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 8, Version 2: Wisconsin. For the Weston Disposal Site No. 3 a 24-hour, 25-year storm will result in 4.47 inches of rainfall. Calculations for determining the 24-hour, 25-year storm event are included in Appendix B: NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume.

Table 2-1 summarizes the storm recurrence interval, rainfall depth, lined area of the CCR landfill, and minimum stormwater volume required to be managed within Cell 2.

**Table 2-1 Summary of Rainfall Precipitation and Run-off Volume Data**

| Storm Recurrence Interval | Rainfall Depth (inches) | Cell 2 Lined Area (acres) | Run-off Volume (acre-ft) |
|---|---|---|---|
| 24-hour, 25-year | 4.47 | 8.6 | 3.20 |

# 3. Run-on Control System

§ 257.81 (a)(1) requires a run-on control system to prevent flow onto the active portions of the CCR unit during the peak discharge from a 24-hour, 25-year storm. The federal rule defines "Run-on" as "*any rainwater, leachate, or other liquid that drains over land onto any part of a CCR landfill.*"

In order to control stormwater and prevent run-on into the active landfill, permanent perimeter berms have been established around the east and south sides of the landfill to direct stormwater run-on away from the landfill. Temporary intercell berms perform the same function on the north and west sides of Cell 2. On the east, west, and south, stormwater sheet flows away from landfill before being intercepted by stormwater ditches that route the water either to the sedimentation basins on the east and south sides of Cell 2 or to the woods south and north of the landfill. Cell 1 is constructed and immediately north of Cell 2. However the cell is not active. All stormwater that is collected in Cell 1 is being pumped and discharged as clean water to Stormwater Basins No. 1 or 2. The intercell berm between Cells 1 and 2 has a top elevation of El. 1210 and the water level in Cell 1 is monitored by the landfill operator and actively managed to be maintained below El. 1208.

Based on a review of current topography and stormwater calculations, Weston Disposal Site No. 3, Cell 2 has an acceptable run-on control system that follows current engineering standards and is in compliance with § 257.81(a)(1).

# 4. Run-off Control System

§ 257.81 (a)(2) requires 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. The federal rule defines "Run-off" as "*any rainwater, leachate, or other liquid that drains overland from any part of a CCR landfill.*"

During the operation and filling of Cell 2 precipitation within the landfill is handled as contact stormwater and treated as leachate in accordance with § 257.3-3. The contact stormwater is directed to the perimeter containment ditches on the inside of the perimeter berms and routed to a stormwater surge area along the Cell 2-3 intercell berm area, where it is allowed to infiltrate into the leachate collection system. The water is then managed as leachate in accordance with the landfill's Plan of Operations.

A stormwater run-off model was completed to confirm the current run-off control system for the operation of Cell 2 at the Weston Disposal Site No. 3 landfill can adequately manage a 24-hour, 25-year precipitation event. Stormwater flow was modeled using HydroCAD 10.0 to model the maximum operation filling condition. This condition will have the steepest and longest slopes directing stormwater to the temporary containment ditches. The stormwater run-off calculations for Cell 2 of the landfill are included in Appendix C: Stormwater Run-off Calculations.

In general, stormwater is conveyed off the slopes of Cell 2 as sheet flow until it is intercepted by temporary containment ditches. The temporary containment ditches at the perimeter of the landfill cell are a minimum of 2-feet-deep and have a 3H:1V exterior slope and 2H:1V interior side slope. The exterior slope of the ditch is the top of the granular drainage layer of the leachate collection system. The interior slope is cut into the CCR disposed of in the landfill. Upon closure of the landfill, the temporary stormwater containment ditch will be filled with soil or CCR prior to placement of the final cover system.

Along the north side of Cell 2 an intercell berm is present to separate the leachate in Cell 2 from the non-contact runoff in Cell 1. This intercell berm is between 1 to 3 feet higher than the drainage layer grades in Cell 2. Because the available storage capacity along the northern intercell berm is minimal, a terrace will be constructed along the toe of the ash slope as CCR is placed in this area to direct runoff to the west, where a culvert has been designed to convey the runoff beneath the access roadway to the western detention area. This terrace will consist of a 2-foot high, v-shaped ditch with 2:1 sides and a slope of 1.0%. The culvert was designed as a minimum 18-inch diameter corrugated HDPE (smooth interior) pipe culvert, with a minimum slope of 1.0%.

The results of the stormwater modeling calculations indicate that the perimeter ditches located along the north, south, and east sides of Cell 2 are able to contain and convey the flow of runoff resulting from the 25-year, 24-hour storm, and route it to the detention area located along the western side of Cell 2. Assuming a starting elevation of 1196.0 feet, the maximum ponding elevation in the western detention area is anticipated to be elevation 1202.63 feet. The top of the

Cell 2 western perimeter berm is at elevation 1208.0 feet, resulting in a freeboard of approximately 5.4 feet (224,000 cubic feet of storage) in the western detention area following the 25-year, 24-hour storm.

# 5. Conclusion and Certification

The Weston Disposal Site No. 3 is regulated under 40 CFR Part 257 Subpart D as an existing CCR landfill. The Rule specifies that existing CCR landfills must develop plans to meet certain operating criteria designated by October 17, 2016. This report documents the Weston Disposal Site No. 3 landfill has an established run-on and run-off control system design capable of controlling the peak discharge from a 25-year, 24-hour storm event and complies with § 257.81 *Run-on and run-off controls for CCR landfills*. All leachate that is collected at the Weston Disposal Site No. 3 either recycled for use as a dust control within the active landfill or hauled to the wastewater treatment facility at Weston Power Plant in accordance with the approved operating plan complying with § 257.3-3.

The rule specifies that the plan must be reviewed and updated every five (5) years maximum based on the completion date of this plan. In addition, the written plan must be amended whenever there is a change in conditions that would substantially affect the current written plan (lateral expansion or final cover construction). The revised plan must be placed in the facility's operating record as required by § 257.105(g). The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

The plan was completed under the direction of John M. Trast, P.E. I am a licensed professional engineer in the State of Wisconsin in accordance with the requirements of ch. A-E 4, Wisconsin Administrative Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wisconsin Administrative 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 40 CFR Part 257 Subpart D.

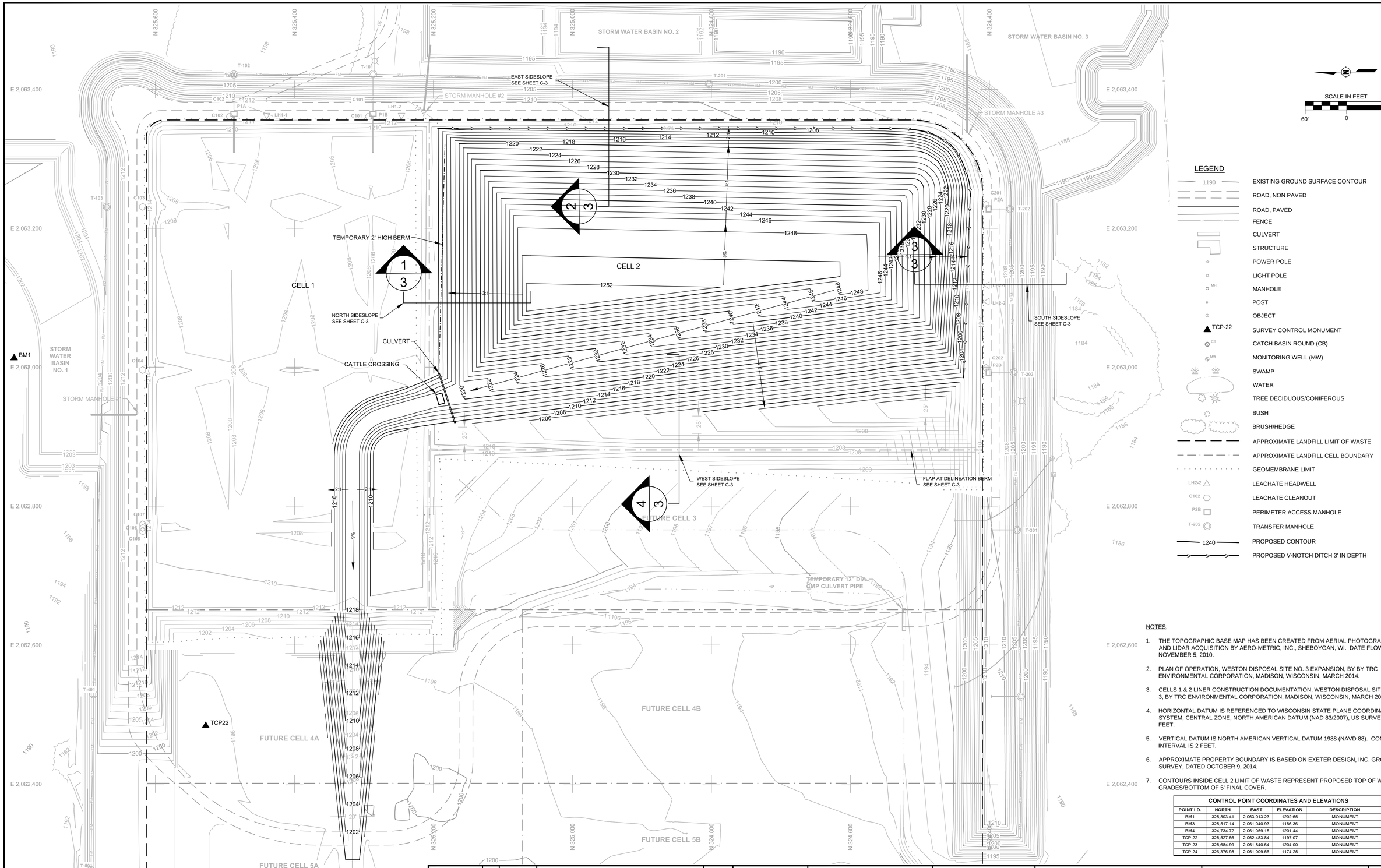
# 6. References

Perica, S., D. Martin, S. Pavlovic, I. Roy, M. St. Laurent, C. Trypaluk, D. Unruh, M. Yekta, G. Bonnin (2013). NOAA Atlas 14 Volume 8 Version 2.0, *Precipitation-Frequency Atlas of the United States, Midwestern States*. National Oceanic and Atmospheric Administration, National Weather Service, Silver Spring, Maryland.

US Department of Commerce. National Oceanic and Atmospheric Administration, National Weather Service. (2016). Precipitation Frequency Data Server (PFDS). http://hdsc.nws.noaa.gov/hdsc/pdfs/.

# Appendix A

## Drawings




NOTES:

1. THE TOPOGRAPHIC BASE MAP HAS BEEN CREATED FROM AERIAL PHOTOGRAPHY AND LIDAR ACQUISITION BY AERO-METRIC, INC., SHEBOYGAN, WI. DATE FLOWN: NOVEMBER 5, 2010.
2. PLAN OF OPERATION, WESTON DISPOSAL SITE NO. 3 EXPANSION, BY BY TRC ENVIRONMENTAL CORPORATION, MADISON, WISCONSIN, MARCH 2014.
3. CELLS 1 & 2 LINER CONSTRUCTION DOCUMENTATION, WESTON DISPOSAL SITE NO. 3, BY TRC ENVIRONMENTAL CORPORATION, MADISON, WISCONSIN, MARCH 2016.
4. HORIZONTAL DATUM IS REFERENCED TO WISCONSIN STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, NORTH AMERICAN DATUM (NAD 83/2007), US SURVEY FEET.
5. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88). CONTOUR INTERVAL IS 2 FEET.
6. APPROXIMATE PROPERTY BOUNDARY IS BASED ON EXETER DESIGN, INC. GROUND SURVEY, DATED OCTOBER 9, 2014.
7. CONTOURS INSIDE CELL 2 LIMIT OF WASTE REPRESENT PROPOSED TOP OF WASTE GRADES/BOTTOM OF 5' FINAL COVER.

**CONTROL POINT COORDINATES AND ELEVATIONS**

| POINT I.D. | NORTH | EAST | ELEVATION | DESCRIPTION |
|---|---|---|---|---|
| BM1 | 325,803.41 | 2,063,013.23 | 1202.65 | MONUMENT |
| BM3 | 325,517.14 | 2,061,040.93 | 1186.36 | MONUMENT |
| BM4 | 324,734.72 | 2,061,059.15 | 1201.44 | MONUMENT |
| TCP 22 | 325,527.66 | 2,062,483.84 | 1197.07 | MONUMENT |
| TCP 23 | 325,684.99 | 2,061,840.64 | 1204.00 | MONUMENT |
| TCP 24 | 326,376.98 | 2,061,009.56 | 1174.25 | MONUMENT |

Attention:

0 1"

If this scale bar does not measure 1" then drawing is not original scale.

| NO. | DATE | ISSUE/REVISION | APP |
|---|---|---|---|
| 0 | X | X | X |

*Designed:* JXT
*Checked:* JXT
*Drawn:* JLC
*Submittal Date:* 10/14/2016

GEI Consultants
3159 Voyager Drive
Green Bay, Wisconsin 54311
920-455-8200

WE ENERGIES
333 WEST EVERETT STREET
MILWAUKEE, WISCONSIN

GEI Project 1600630

REGULATION COMPLIANCE REPORT
RUN-ON AND RUN-OFF CONTROL PLAN

DWG. NO. C-1

WESTON DISPOSAL SITE NO. 3
CELLS 1 & 2

SHEET NO. 1

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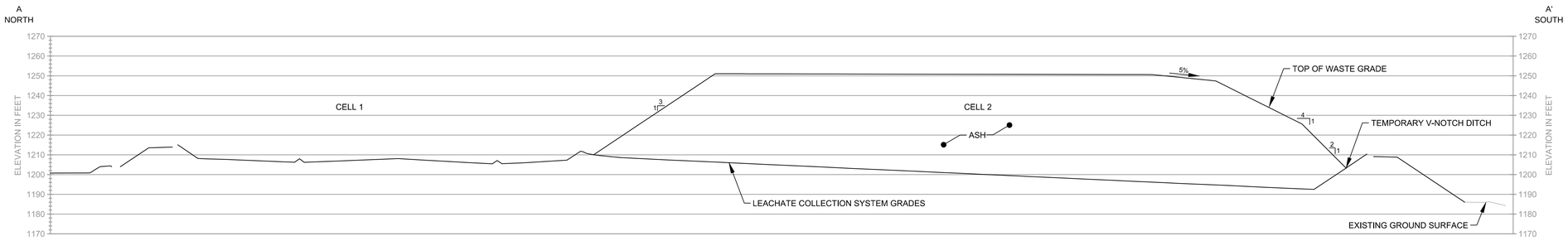


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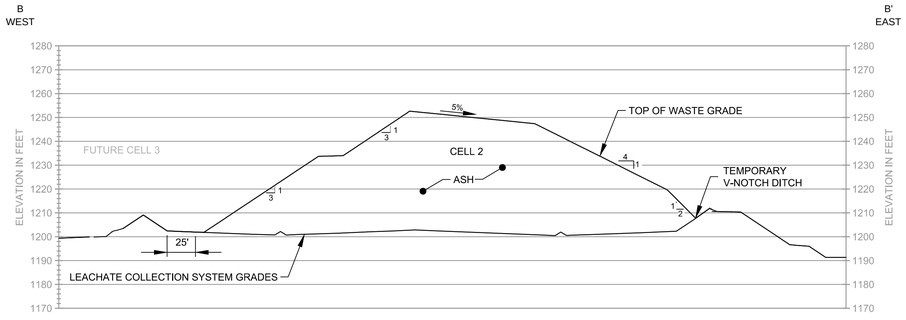
VERTICAL SCALE: 1"=30'




CROSS-SECTION B-B' @ N 324,890
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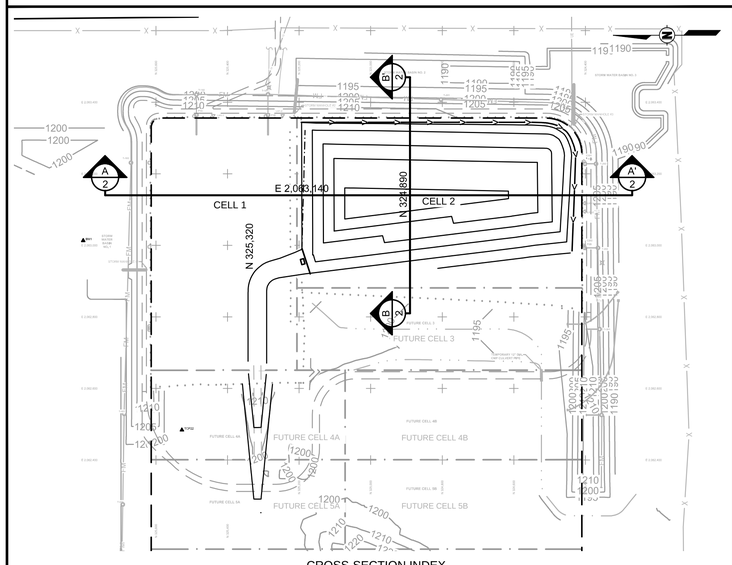
VERTICAL SCALE: 1"=30'




CROSS-SECTION INDEX
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*Designed:* JXT
*Checked:* JXT
*Drawn:* JLC
*Submittal Date:* 10/14/2016

GEI Consultants
3159 Voyager Drive
Green Bay, Wisconsin 54311
920-455-8200

WE ENERGIES
333 WEST EVERETT STREET
MILWAUKEE, WISCONSIN

GEI Project 1600630

REGULATION COMPLIANCE REPORT
RUN-ON AND RUN-OFF CONTROL PLAN

DWG. NO. C-2

WESTON DISPOSAL SITE NO. 3
CELLS 1 & 2 CROSS-SECTIONS

SHEET NO. 2

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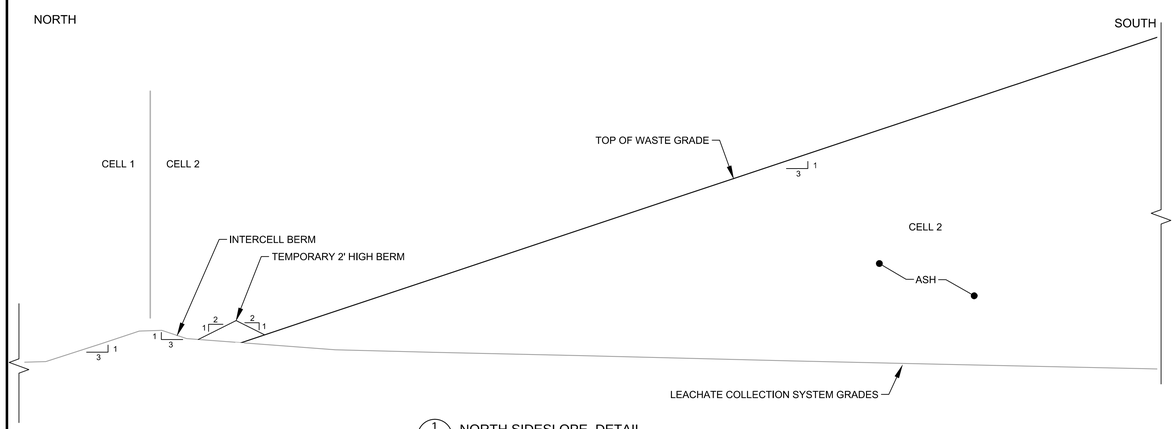


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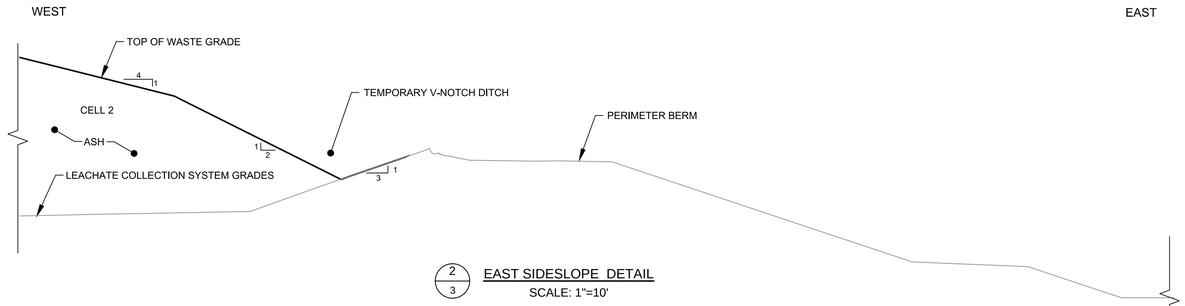


2/3 EAST SIDESLOPE DETAIL
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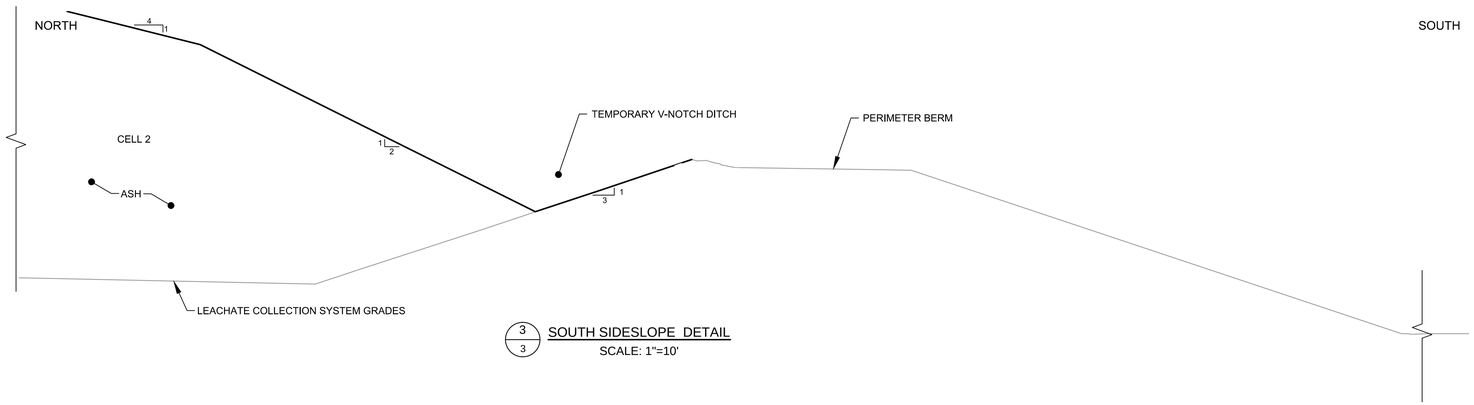


3/3 SOUTH SIDESLOPE DETAIL
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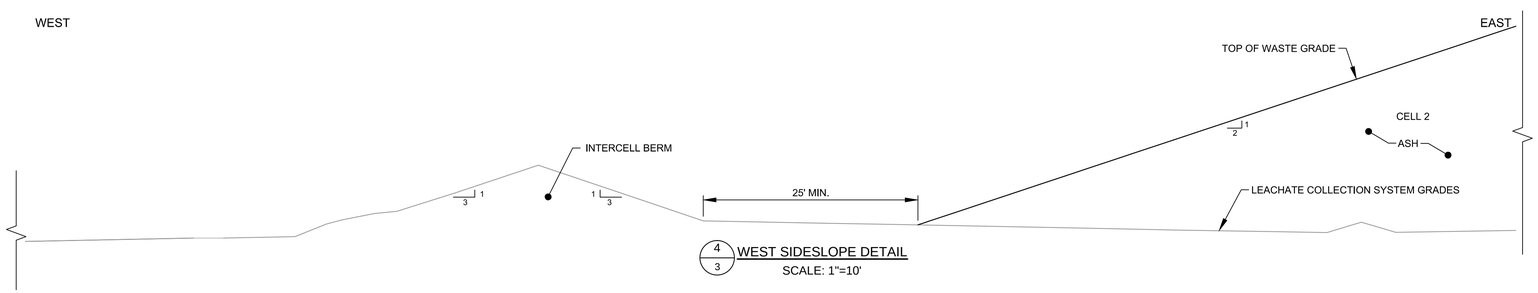


4/3 WEST SIDESLOPE DETAIL
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| NO. | DATE | ISSUE/REVISION | APP |
|---|---|---|---|
| 0 | X | X | X |

*Designed:* JXT
*Checked:* JXT
*Drawn:* JLC
*Submittal Date:* 10/14/2016

GEI Consultants
3159 Voyager Drive
Green Bay, Wisconsin 54311
920-455-8200

WE ENERGIES
333 WEST EVERETT STREET
MILWAUKEE, WISCONSIN

GEI Project 1600630

REGULATION COMPLIANCE REPORT
RUN-ON AND RUN-OFF CONTROL PLAN

DWG. NO. C-3

WESTON DISPOSAL SITE NO. 3
CELLS 1 & 2 DETAILS

SHEET NO. 3

Filename: J:\LANDFILLS\WE - WESTON DISPOSAL SITE NO 3\1600630_RUN-ON RUN-OFF CONTROL PLAN\DWG\1600630001.DWG Last saved by: JCALAWAY Last Plotted: 2016-10-14

# Appendix B

## NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume

| | | | | | | |
|---|---|---|---|---|---|---|
| GEI Consultants | **Client** | Wisconsin Public Service Corporation | | | **Page** | 1 of 4 |
| | **Project** | Weston Disposal Site No. 3 Run-on and Run-off Control Plan | | | **Pg. Rev.** | |
| | **By** | C. Fritsch | **Chk.** | J. Trast | **App.** | J. Trast |
| | **Date** | 10/10/2016 | **Date** | 10/13/2016 | **Date** | 10/13/2016 |
| **GEI Project No.** | 1600630 | **Document No.** | N/A | | | |
| **Subject** | NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume | | | | | |

## Purpose:

The purpose of this calculation is to estimate the 24-hr, 25-yr precipitation event at Weston Disposal Site No. 3. The 24-hr, 25-yr precipitation event is required for the run-on and run-off control system plan for the landfill.

## Procedure:

The rainfall depth estimation follows the procedures outlined in Precipitation-Frequency (PF) Atlas of the United States (Atlas 14, Volume 8, Version 2: Wisconsin).

As instructed in Atlas 14, the user is referred to the NOAA Precipitation Frequency Data Server (PFDS) http://hdsc.nws.noaa.gov/hdsc/pfds/index.html. The approximate center of the landfill was input into the PFDS and the PF estimates were returned.

**Landfill Centroid Coordinates**

| | |
|---|---|
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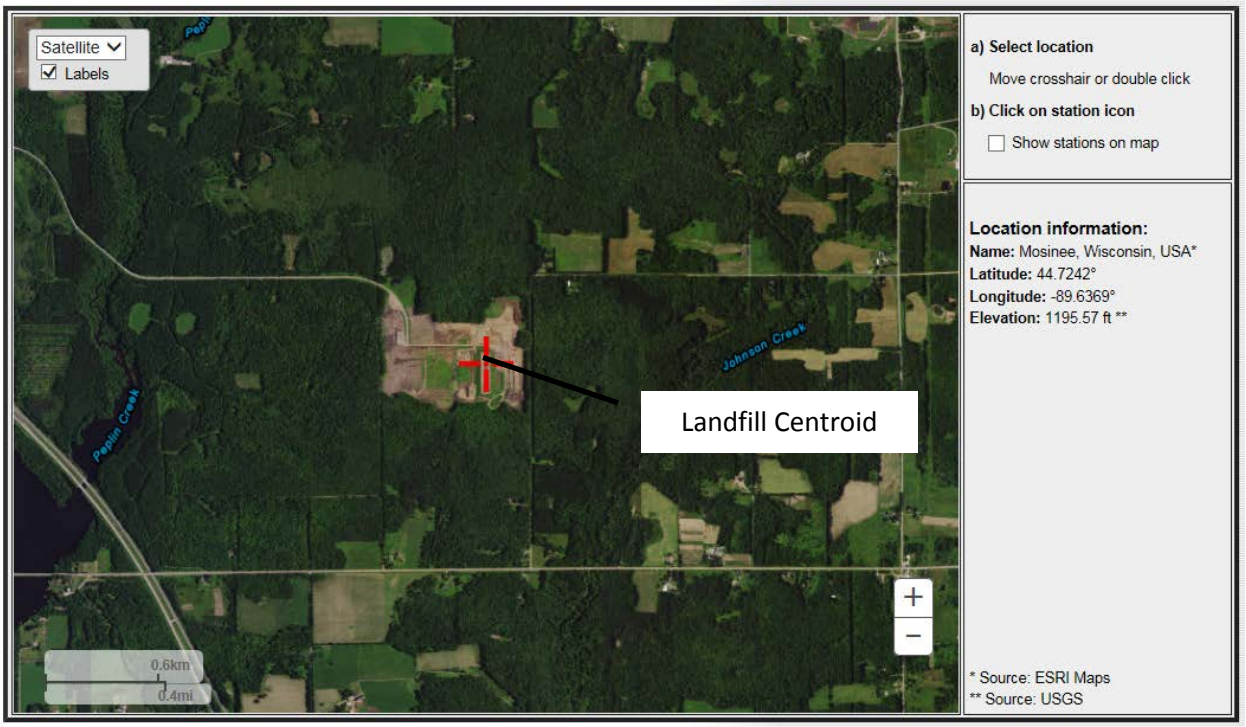
| 89°38'12.84"W | -89.6369° |



## Tabular Output from the PFDS:

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

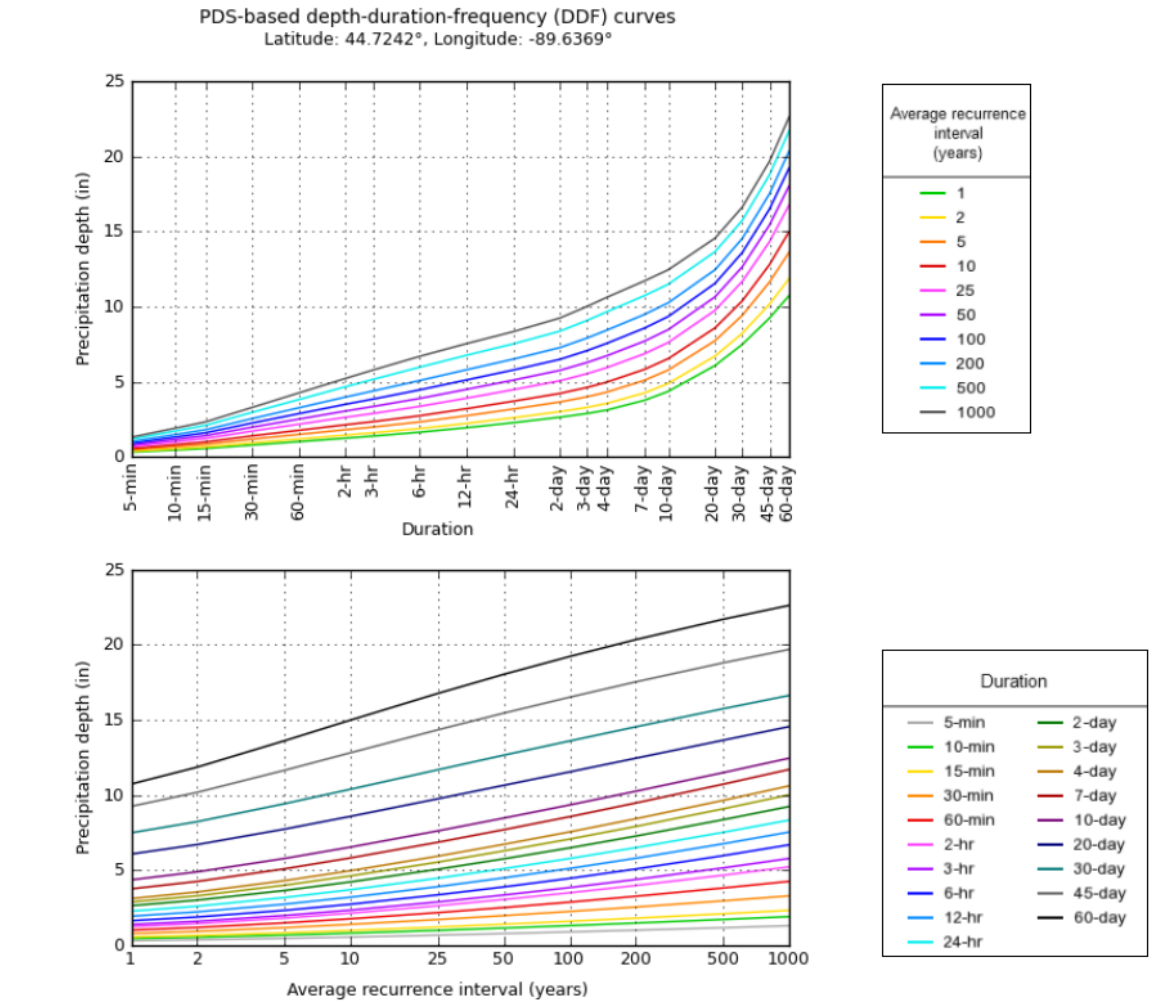
| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.315 (0.260–0.386) | 0.372 (0.306–0.456) | 0.470 (0.386–0.577) | 0.557 (0.454–0.685) | 0.684 (0.542–0.869) | 0.788 (0.608–1.01) | 0.897 (0.669–1.17) | 1.01 (0.724–1.34) | 1.18 (0.807–1.58) | 1.31 (0.869–1.77) |
| 10-min | 0.462 (0.381–0.566) | 0.545 (0.448–0.668) | 0.688 (0.565–0.845) | 0.815 (0.665–1.00) | 1.00 (0.793–1.27) | 1.15 (0.891–1.48) | 1.31 (0.979–1.71) | 1.49 (1.06–1.96) | 1.72 (1.18–2.32) | 1.91 (1.27–2.59) |
| 15-min | 0.563 (0.464–0.690) | 0.664 (0.547–0.814) | 0.839 (0.689–1.03) | 0.994 (0.811–1.22) | 1.22 (0.968–1.55) | 1.41 (1.09–1.80) | 1.60 (1.19–2.08) | 1.81 (1.29–2.39) | 2.10 (1.44–2.83) | 2.33 (1.55–3.16) |
| 30-min | 0.793 (0.654–0.971) | 0.934 (0.769–1.15) | 1.18 (0.968–1.45) | 1.40 (1.14–1.72) | 1.72 (1.36–2.18) | 1.98 (1.53–2.53) | 2.26 (1.68–2.93) | 2.55 (1.82–3.38) | 2.96 (2.03–3.99) | 3.29 (2.19–4.46) |
| 60-min | 1.02 (0.840–1.25) | 1.19 (0.981–1.46) | 1.50 (1.23–1.84) | 1.77 (1.44–2.18) | 2.18 (1.73–2.78) | 2.52 (1.95–3.23) | 2.88 (2.15–3.75) | 3.27 (2.34–4.33) | 3.82 (2.62–5.15) | 4.26 (2.83–5.77) |
| 2-hr | 1.25 (1.03–1.51) | 1.45 (1.20–1.76) | 1.81 (1.50–2.20) | 2.14 (1.76–2.61) | 2.64 (2.12–3.34) | 3.05 (2.38–3.88) | 3.50 (2.64–4.52) | 3.98 (2.88–5.24) | 4.67 (3.24–6.25) | 5.22 (3.52–7.01) |
| 3-hr | 1.38 (1.15–1.67) | 1.60 (1.33–1.93) | 1.99 (1.65–2.40) | 2.35 (1.94–2.85) | 2.89 (2.33–3.64) | 3.35 (2.63–4.24) | 3.85 (2.92–4.95) | 4.39 (3.19–5.74) | 5.16 (3.60–6.87) | 5.78 (3.91–7.72) |
| 6-hr | 1.64 (1.38–1.96) | 1.89 (1.58–2.26) | 2.33 (1.95–2.79) | 2.74 (2.28–3.29) | 3.36 (2.73–4.20) | 3.89 (3.08–4.88) | 4.46 (3.41–5.69) | 5.08 (3.73–6.60) | 5.97 (4.22–7.89) | 6.69 (4.58–8.86) |
| 12-hr | 1.94 (1.64–2.30) | 2.23 (1.88–2.64) | 2.74 (2.31–3.25) | 3.21 (2.69–3.82) | 3.91 (3.20–4.82) | 4.49 (3.58–5.57) | 5.12 (3.95–6.46) | 5.80 (4.30–7.45) | 6.76 (4.82–8.84) | 7.54 (5.22–9.90) |
| 24-hr | 2.28 (1.94–2.67) | 2.61 (2.22–3.06) | 3.18 (2.70–3.74) | 3.70 (3.13–4.37) | 4.47 (3.68–5.45) | 5.11 (4.11–6.26) | 5.78 (4.50–7.21) | 6.50 (4.86–8.26) | 7.52 (5.42–9.74) | 8.33 (5.84–10.8) |
| 2-day | 2.64 (2.27–3.07) | 3.01 (2.58–3.50) | 3.65 (3.12–4.25) | 4.22 (3.59–4.93) | 5.07 (4.20–6.10) | 5.76 (4.67–6.99) | 6.49 (5.10–8.01) | 7.27 (5.49–9.15) | 8.36 (6.09–10.7) | 9.24 (6.55–11.9) |
| 3-day | 2.89 (2.49–3.34) | 3.30 (2.84–3.81) | 4.00 (3.44–4.63) | 4.62 (3.95–5.37) | 5.54 (4.62–6.63) | 6.29 (5.12–7.59) | 7.08 (5.58–8.69) | 7.91 (6.01–9.90) | 9.08 (6.66–11.6) | 10.0 (7.15–12.9) |
| 4-day | 3.12 (2.69–3.58) | 3.55 (3.07–4.09) | 4.31 (3.71–4.97) | 4.97 (4.26–5.75) | 5.94 (4.96–7.07) | 6.72 (5.50–8.08) | 7.55 (5.98–9.23) | 8.43 (6.43–10.5) | 9.65 (7.10–12.2) | 10.6 (7.61–13.6) |
| 7-day | 3.76 (3.27–4.29) | 4.25 (3.70–4.86) | 5.09 (4.42–5.83) | 5.82 (5.02–6.68) | 6.86 (5.77–8.09) | 7.70 (6.33–9.15) | 8.56 (6.83–10.4) | 9.47 (7.28–11.7) | 10.7 (7.96–13.5) | 11.7 (8.47–14.9) |
| 10-day | 4.36 (3.81–4.95) | 4.89 (4.27–5.56) | 5.78 (5.03–6.58) | 6.54 (5.66–7.47) | 7.62 (6.42–8.91) | 8.47 (6.99–10.0) | 9.35 (7.49–11.2) | 10.3 (7.92–12.6) | 11.5 (8.58–14.4) | 12.5 (9.07–15.7) |
| 20-day | 6.08 (5.35–6.83) | 6.71 (5.90–7.54) | 7.73 (6.79–8.71) | 8.58 (7.50–9.70) | 9.75 (8.27–11.2) | 10.7 (8.86–12.4) | 11.5 (9.33–13.7) | 12.5 (9.71–15.1) | 13.7 (10.3–16.9) | 14.6 (10.7–18.2) |
| 30-day | 7.49 (6.63–8.37) | 8.23 (7.28–9.20) | 9.42 (8.31–10.6) | 10.4 (9.11–11.7) | 11.7 (9.95–13.4) | 12.7 (10.6–14.6) | 13.6 (11.0–16.0) | 14.5 (11.4–17.5) | 15.7 (11.9–19.3) | 16.6 (12.3–20.7) |
| 45-day | 9.25 (8.22–10.3) | 10.2 (9.04–11.3) | 11.7 (10.3–13.0) | 12.8 (11.3–14.3) | 14.3 (12.2–16.3) | 15.5 (13.0–17.7) | 16.5 (13.5–19.3) | 17.5 (13.8–20.9) | 18.8 (14.3–22.9) | 19.7 (14.7–24.4) |
| 60-day | 10.7 (9.57–11.9) | 11.9 (10.6–13.1) | 13.6 (12.1–15.1) | 15.0 (13.3–16.7) | 16.8 (14.3–18.9) | 18.0 (15.2–20.6) | 19.2 (15.7–22.3) | 20.3 (16.1–24.1) | 21.7 (16.6–26.3) | 22.6 (17.0–27.9) |

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

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

Please refer to NOAA Atlas 14 document for more information.

## Graphical Output from the PFDS:



| | | | | | | |
|---|---|---|---|---|---|---|
| GEI Consultants | **Client** | Wisconsin Public Service Corporation | | | **Page** | 4 of 4 |
| | **Project** | Weston Disposal Site No. 3 Run-on and Run-off Control Plan | | | **Pg. Rev.** | |
| | **By** | C. Fritsch | **Chk.** | J. Trast | **App.** | J. Trast |
| | **Date** | 10/10/2016 | **Date** | 10/13/2016 | **Date** | 10/13/2016 |
| **GEI Project No.** | 1600630 | **Document No.** | N/A | | | |
| **Subject** | NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume | | | | | |

## Regulations:

The Weston Disposal Site No. 3 is regulated under 40 CFR Part 257 Subpart D – Standards for Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments as an existing landfill. The regulations specify that landfill must have the following plans in place:

- 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.
- 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.

## Conclusion:

The 24-hour, 25-year storm for the Weston Disposal Site No. 3 is 4.47 inches. This value will be utilized in the stormwater run-off model (under a separate calculation package).

# Appendix C

## Stormwater Run-off Calculations

# Memo

To: John Trast, P.E.

From: Mark Vannieuwenhoven, P.E.

Date: April 6, 2016

Re: Stormwater Management, Weston Disposal Site No. 3

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This Memo has been prepared to summarize the evaluation of the existing stormwater management system at the Wisconsin Public Service (WPS) Weston Disposal Site No. 3, Wisconsin Department of Natural Resources (WDNR) License No. 3067.

Development of the landfill will proceed with ash disposal operations in Cell 2. During operations, stormwater runoff from the active area will be collected and contained within perimeter ditches on the north, south, and east sides of the cell, with a more prominent stormwater detention area located within the limits of waste along the western side of the cell. Stormwater modeling calculations were performed to verify the sizing of the stormwater ditches and detention area in order to prevent the release of contact stormwater from the cell.

The performance of the stormwater management system was analyzed for the 25-year, 24-hour storm of 4.47 inches (NOAA Atlas 14, Volume 8, Version 2 for Mosinee, WI). Checks were also performed for the 2-yr, 24-hour, the 25-year, 6-hour, and the 100-year, 24-hour storms. The system was modeled using HydroCAD, Version 10.00, and was completed using the following assumptions:

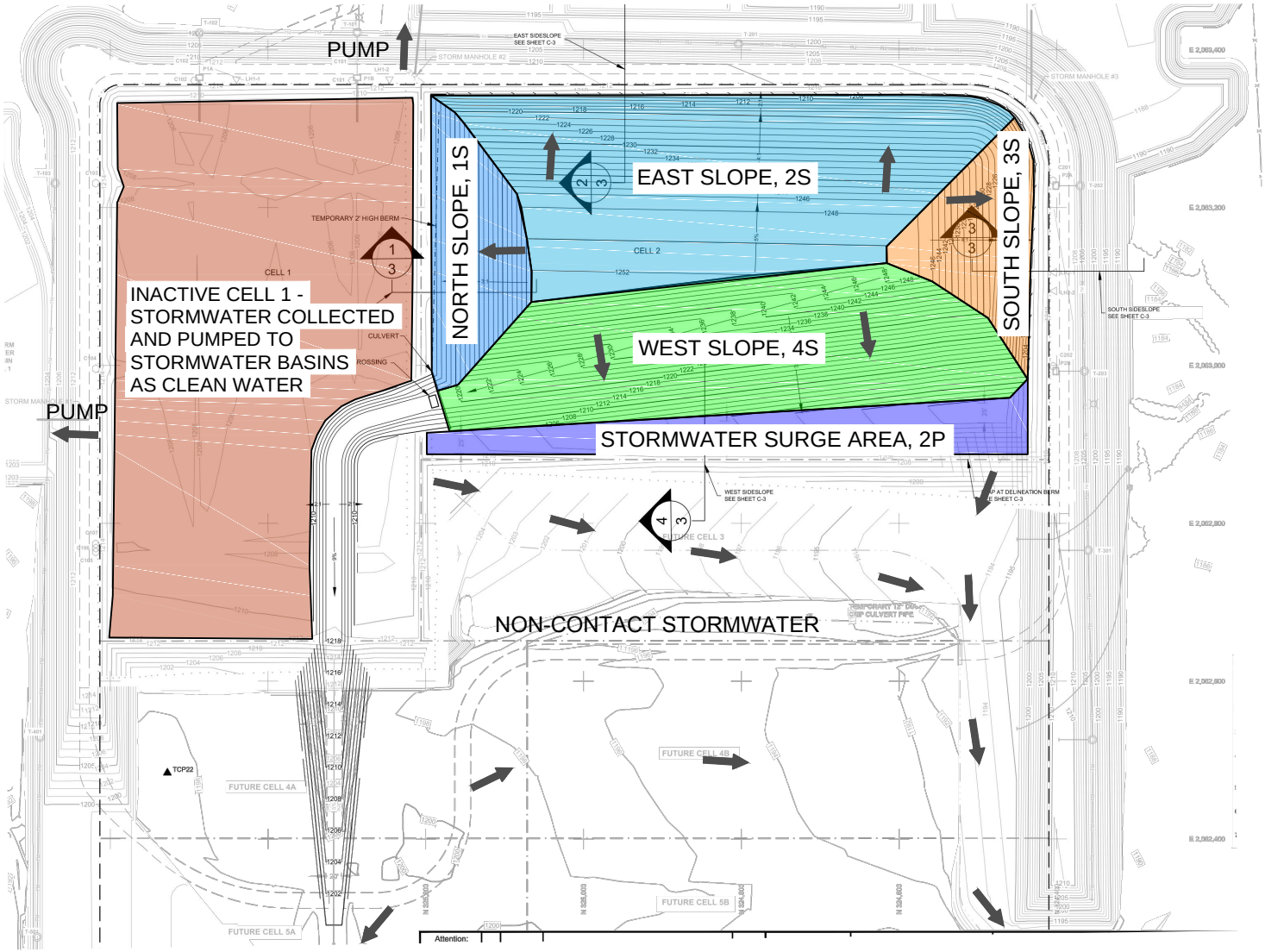
- Rainfall event = 4.47 inches to represent the 25-year, 24-hour storm for Mosinee, Wisconsin.
- Cell 2 Area = 8.63 acres.
- Future phases will be addressed at a later date, and may include separate collection points within each area.
- The landfill surface was modeled as bare ash, assuming hydrologic soil group C and a Runoff Curve Number (CN) of 91.
- Perimeter ditches were modeled as 3-foot deep V-shaped channels with sides of 2H:1V on one side and 3H:1V on the other side. Perimeter ditch slopes ranged from 0.5% to 1%.
- The size and geometry of the Cell 2 ash slopes were obtained from Sheet C-2, “Cell 2 Waste Grades”, from the Cell Development drawings created by GEI, dated April 4, 2016.

**Results**

The results of the stormwater modeling calculations indicate that the perimeter ditches located along the north, south, and east sides of Cell 2 are able to contain and convey the flow of runoff resulting from the 25-year, 24-hour storm, and route it to the detention area located along the western side of Cell 2. Assuming a starting elevation of 1196.0 feet, the maximum ponding elevation in the western detention area is anticipated to be approximately elevation 1202.63 feet. The top of the Cell 2 western perimeter berm is at elevation 1208.0 feet, resulting in a freeboard of approximately 5.4 feet (224,000 cubic feet of storage) in the western detention area following the 25-year, 24-hour storm.

www.geiconsultants.com

3159 Voyager Drive
Green Bay, Wisconsin 54311
920.455.8200 - fax 920.455.8225




***SOURCE:***

1. PLAN BASED ON DWG. C-1, WESTON DISPOSAL SITE No. 3.

Run-on and Run-off Control Plan
Weston Disposal Site No. 3
Marathon County, Wisconsin

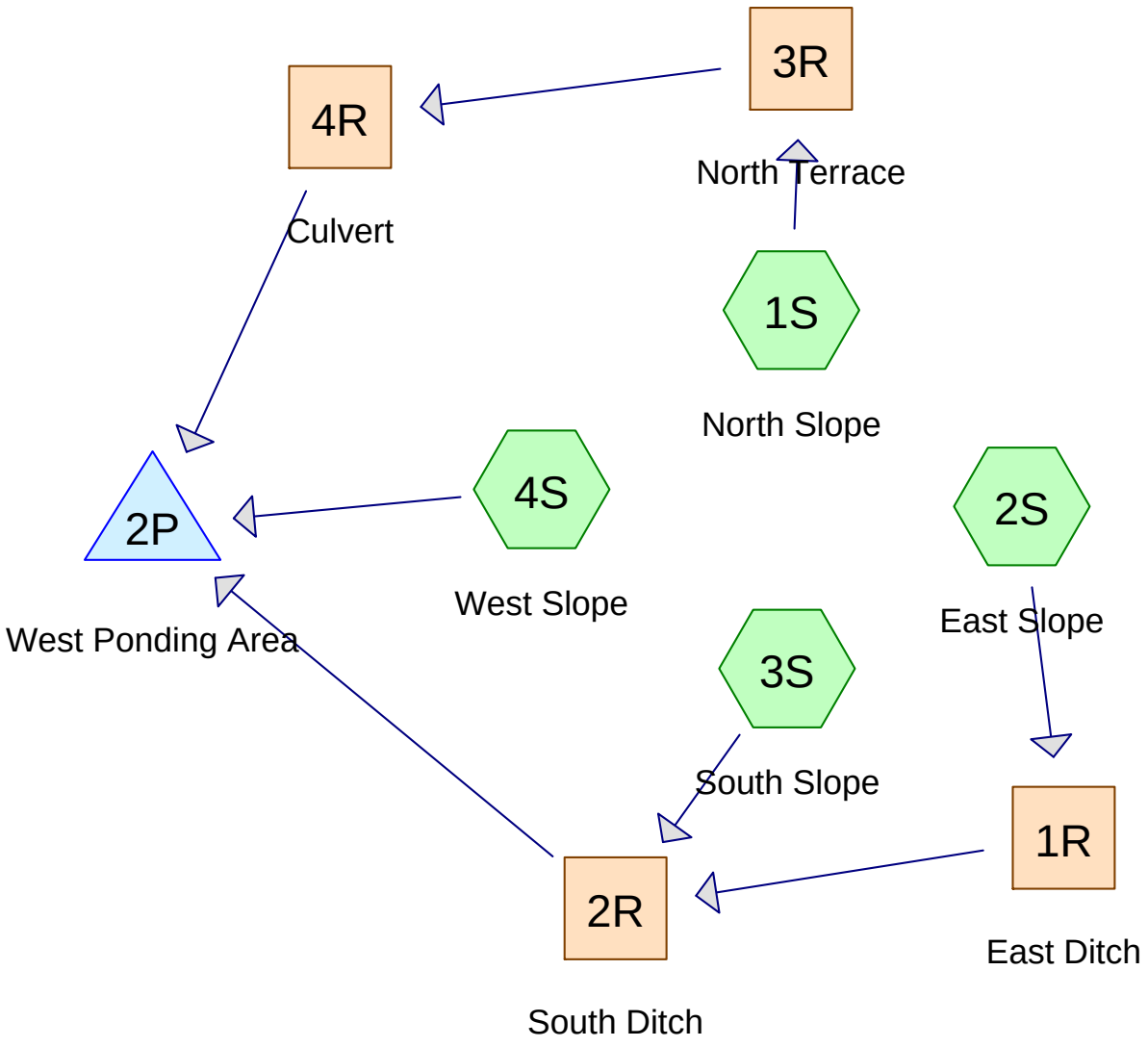
We Energies
Milwaukee, Wisconsin

GEI Consultants

Stormwater Flow Diagram

Project 1600630 | October 2016 | Fig. 1

---- J:\Landfills\WE - Weston Disposal Site No 3\1600630_run-on run-off control plan\dwg\1600630001_SW_Figures JRL.dwg - 10/14/2016




Subcat Reach Pond Link

**Routing Diagram for Cell 2 Runoff**

Prepared by {enter your company name here}, Printed 4/7/2016

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

**Subcatchment 1S: North Slope** Runoff Area=38,059 sf 0.00% Impervious Runoff Depth=3.47"
Flow Length=135' Slope=0.3300 '/' Tc=0.6 min CN=91 Runoff=5.68 cfs 0.253 af

**Subcatchment 2S: East Slope** Runoff Area=142,082 sf 0.00% Impervious Runoff Depth=3.47"
Flow Length=268' Tc=1.6 min CN=91 Runoff=20.31 cfs 0.943 af

**Subcatchment 3S: South Slope** Runoff Area=36,852 sf 0.00% Impervious Runoff Depth=3.47"
Flow Length=193' Tc=1.0 min CN=91 Runoff=5.42 cfs 0.245 af

**Subcatchment 4S: West Slope** Runoff Area=159,081 sf 0.00% Impervious Runoff Depth=3.47"
Flow Length=162' Slope=0.3300 '/' Tc=0.6 min CN=91 Runoff=23.73 cfs 1.056 af

**Reach 1R: East Ditch** Avg. Flow Depth=1.42' Max Vel=3.61 fps Inflow=20.31 cfs 0.943 af
n=0.022 L=760.0' S=0.0050 '/' Capacity=133.80 cfs Outflow=17.75 cfs 0.943 af

**Reach 2R: South Ditch** Avg. Flow Depth=1.28' Max Vel=4.77 fps Inflow=19.75 cfs 1.188 af
n=0.022 L=327.0' S=0.0100 '/' Capacity=189.23 cfs Outflow=19.24 cfs 1.188 af

**Reach 3R: North Terrace** Avg. Flow Depth=0.78' Max Vel=3.43 fps Inflow=5.68 cfs 0.253 af
n=0.022 L=325.0' S=0.0100 '/' Capacity=64.18 cfs Outflow=5.07 cfs 0.253 af

**Reach 4R: Culvert** Avg. Flow Depth=0.73' Max Vel=5.88 fps Inflow=5.07 cfs 0.253 af
18.0" Round Pipe n=0.013 L=75.0' S=0.0100 '/' Capacity=10.50 cfs Outflow=5.01 cfs 0.253 af

**Pond 2P: West Ponding Area** Peak Elev=1,202.63' Storage=117,645 cf Inflow=42.09 cfs 2.496 af
Outflow=0.00 cfs 0.000 af

**Total Runoff Area = 8.633 ac Runoff Volume = 2.496 af Average Runoff Depth = 3.47"**
**100.00% Pervious = 8.633 ac 0.00% Impervious = 0.000 ac**

## Summary for Subcatchment 1S: North Slope

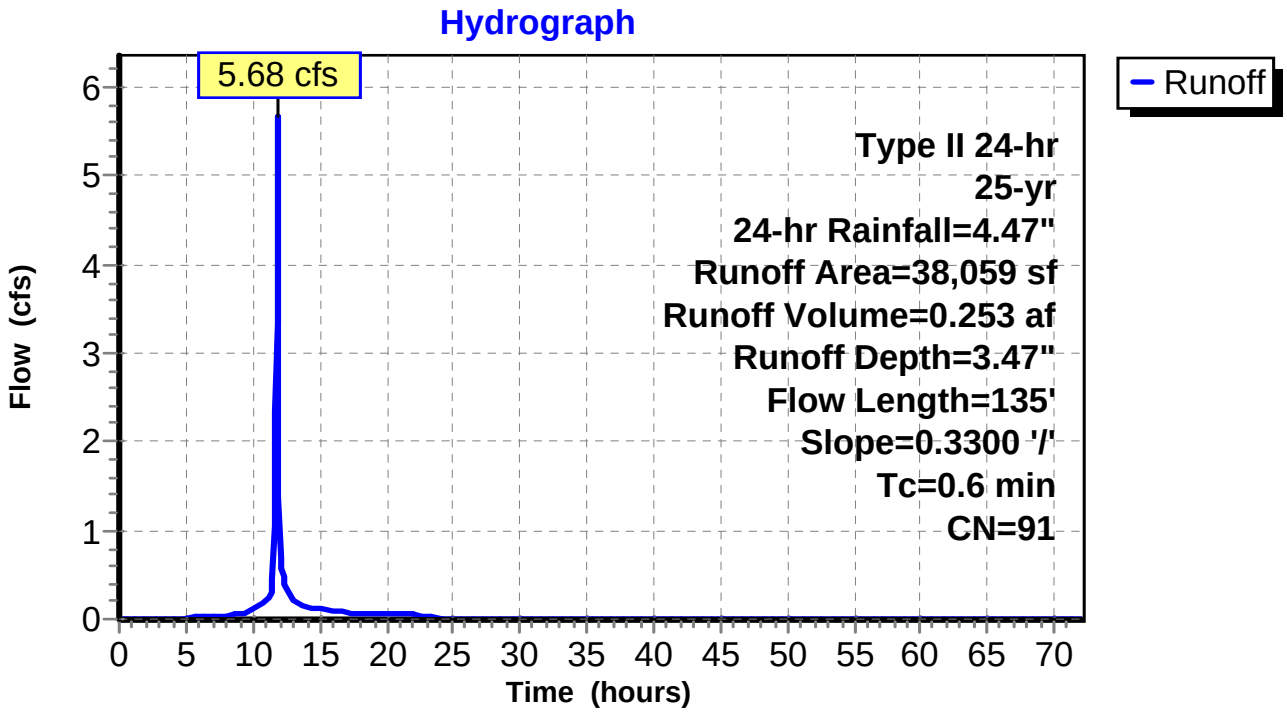
Runoff = 5.68 cfs @ 11.89 hrs, Volume= 0.253 af, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=4.47"

| Area (sf) | CN | Description |
|---|---|---|
| 38,059 | 91 | Newly graded area, HSG C |
| 38,059 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.6 | 135 | 0.3300 | 4.05 | | **Sheet Flow, North Slope** Smooth surfaces n= 0.011 P2= 2.61" |

### Subcatchment 1S: North Slope



## Summary for Subcatchment 2S: East Slope

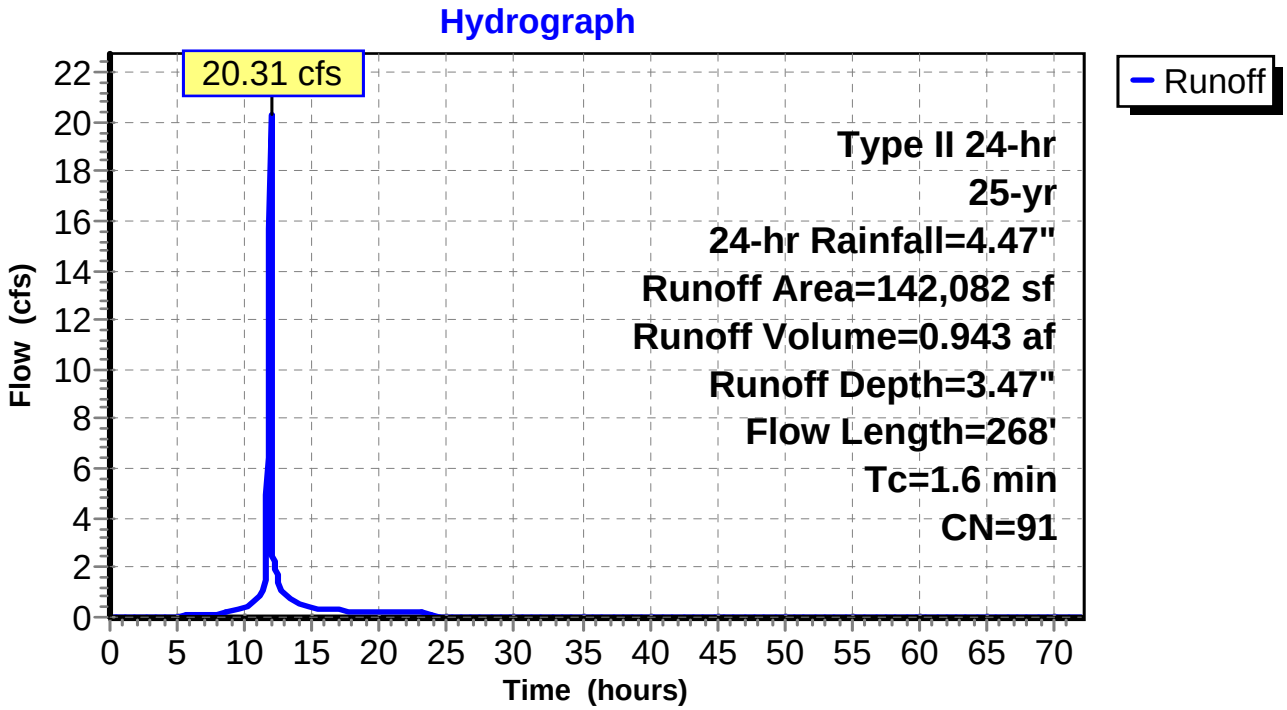
Runoff = 20.31 cfs @ 11.91 hrs, Volume= 0.943 af, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=4.47"

| Area (sf) | CN | Description |
|---|---|---|
| 142,082 | 91 | Newly graded area, HSG C |
| 142,082 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.1 | 125 | 0.0500 | 1.87 | | **Sheet Flow, Upper Slopes** Smooth surfaces n= 0.011 P2= 2.61" |
| 0.4 | 110 | 0.2500 | 5.00 | | **Shallow Concentrated Flow, 4:1 Sideslopes** Nearly Bare & Untilled Kv= 10.0 fps |
| 0.1 | 33 | 0.5000 | 7.07 | | **Shallow Concentrated Flow, 2:1 Slopes** Nearly Bare & Untilled Kv= 10.0 fps |
| 1.6 | 268 | Total | | | |

### Subcatchment 2S: East Slope



## Summary for Subcatchment 3S: South Slope

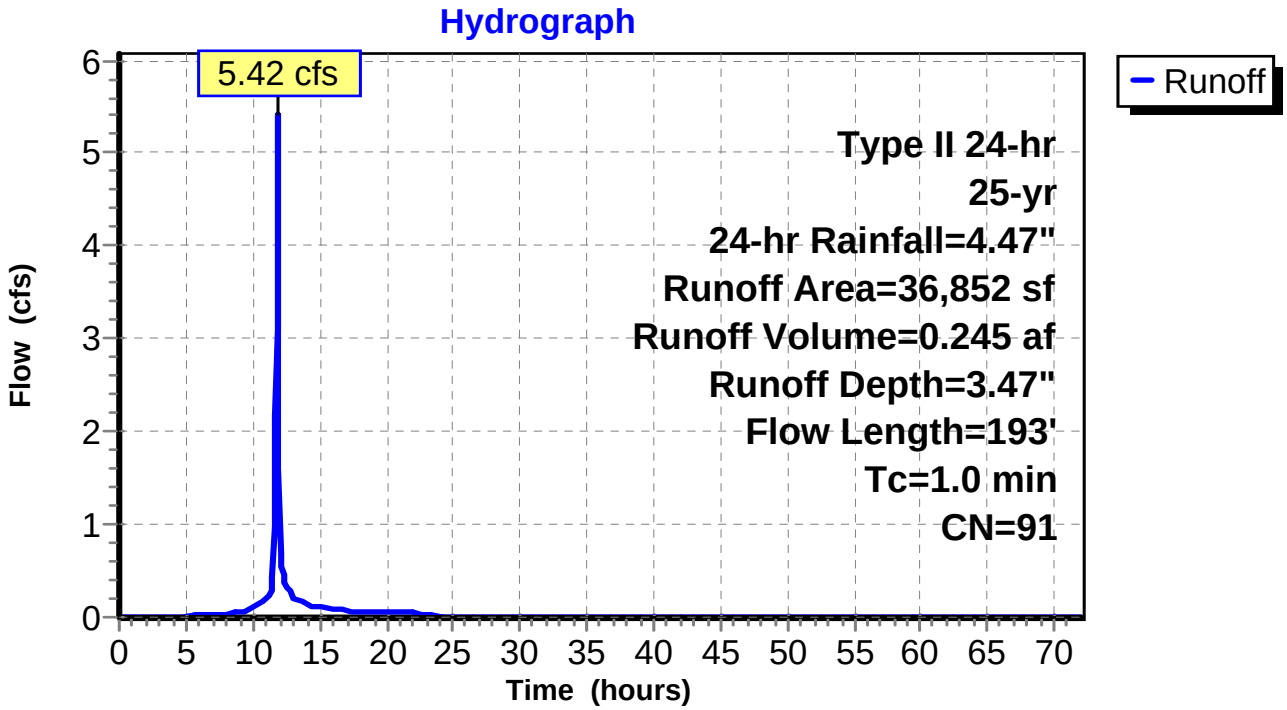
Runoff = 5.42 cfs @ 11.90 hrs, Volume= 0.245 af, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=4.47"

| Area (sf) | CN | Description |
|---|---|---|
| 36,852 | 91 | Newly graded area, HSG C |
| 36,852 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.6 | 59 | 0.0500 | 1.61 | | **Sheet Flow, Upper Slopes** Smooth surfaces n= 0.011 P2= 2.61" |
| 0.3 | 86 | 0.2500 | 5.00 | | **Shallow Concentrated Flow, 4:1 Sideslopes** Nearly Bare & Untilled Kv= 10.0 fps |
| 0.1 | 48 | 0.5000 | 7.07 | | **Shallow Concentrated Flow, 2:1 Slopes** Nearly Bare & Untilled Kv= 10.0 fps |
| 1.0 | 193 | Total | | | |

### Subcatchment 3S: South Slope



## Summary for Subcatchment 4S: West Slope

Runoff = 23.73 cfs @ 11.89 hrs, Volume= 1.056 af, Depth= 3.47"

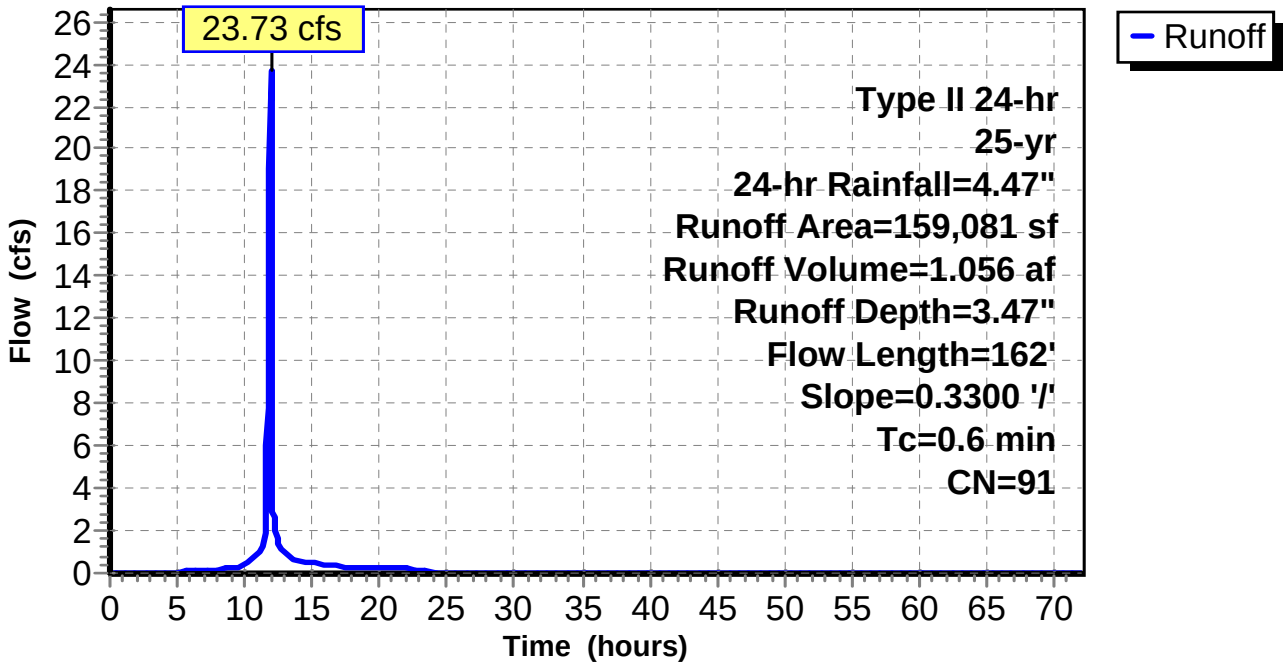
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=4.47"

| Area (sf) | CN | Description |
|---|---|---|
| 159,081 | 91 | Newly graded area, HSG C |
| 159,081 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.6 | 162 | 0.3300 | 4.20 | | **Sheet Flow, West Slope** Smooth surfaces n= 0.011 P2= 2.61" |

## Subcatchment 4S: West Slope

### Hydrograph



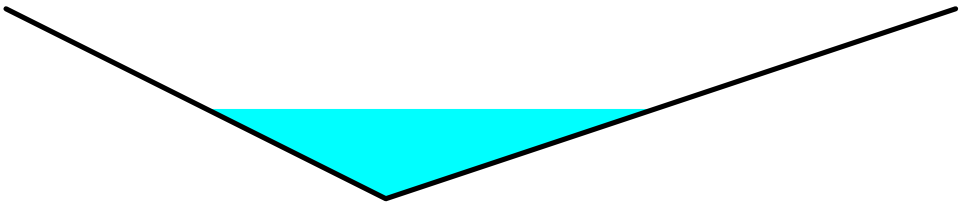
## Summary for Reach 1R: East Ditch

Inflow Area = 3.262 ac, 0.00% Impervious, Inflow Depth = 3.47" for 25-yr, 24-hr event
Inflow = 20.31 cfs @ 11.91 hrs, Volume= 0.943 af
Outflow = 17.75 cfs @ 12.00 hrs, Volume= 0.943 af, Atten= 13%, Lag= 5.5 min

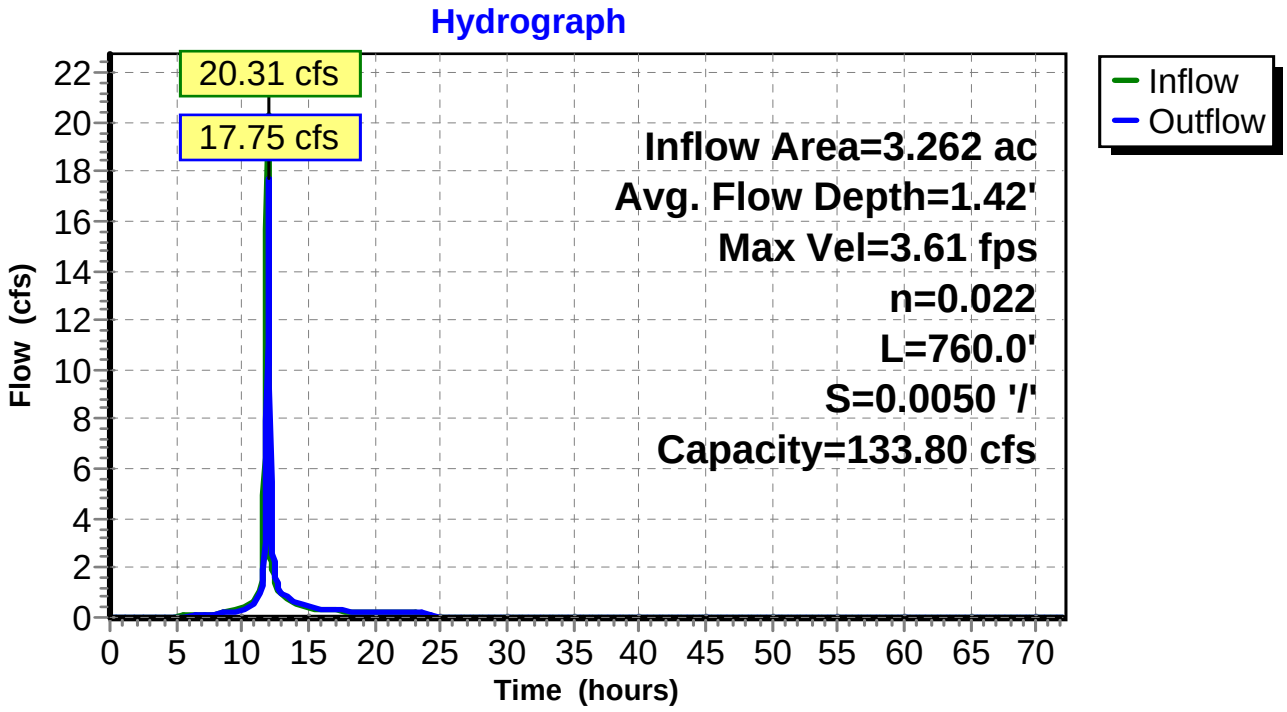
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.61 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 1.11 fps, Avg. Travel Time= 11.4 min

Peak Storage= 3,825 cf @ 11.94 hrs
Average Depth at Peak Storage= 1.42'
Bank-Full Depth= 3.00' Flow Area= 22.5 sf, Capacity= 133.80 cfs

0.00' x 3.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 2.0 3.0 '/' Top Width= 15.00'
Length= 760.0' Slope= 0.0050 '/'
Inlet Invert= 1,209.00', Outlet Invert= 1,205.20'



**Reach 1R: East Ditch**



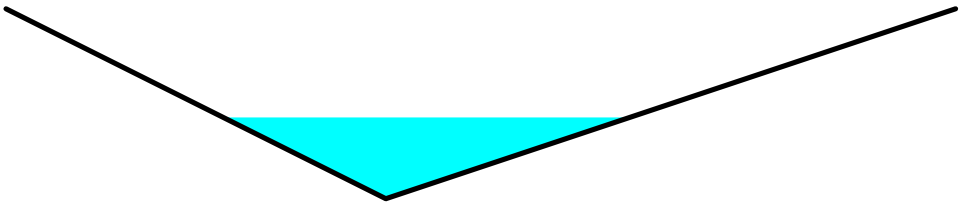
## Summary for Reach 2R: South Ditch

Inflow Area = 4.108 ac, 0.00% Impervious, Inflow Depth = 3.47" for 25-yr, 24-hr event
Inflow = 19.75 cfs @ 11.97 hrs, Volume= 1.188 af
Outflow = 19.24 cfs @ 12.00 hrs, Volume= 1.188 af, Atten= 3%, Lag= 1.9 min

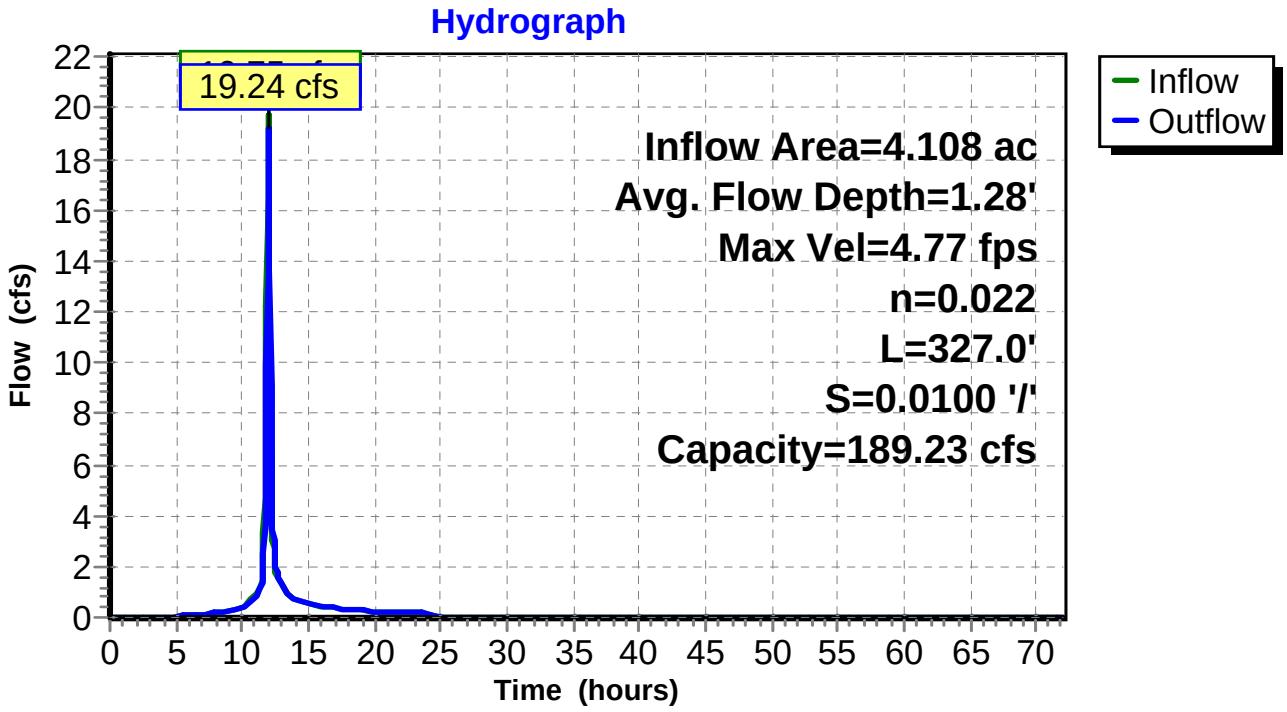
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.77 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.53 fps, Avg. Travel Time= 3.6 min

Peak Storage= 1,347 cf @ 11.99 hrs
Average Depth at Peak Storage= 1.28'
Bank-Full Depth= 3.00' Flow Area= 22.5 sf, Capacity= 189.23 cfs

0.00' x 3.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 2.0 3.0 '/' Top Width= 15.00'
Length= 327.0' Slope= 0.0100 '/'
Inlet Invert= 1,205.20', Outlet Invert= 1,201.93'



**Reach 2R: South Ditch**



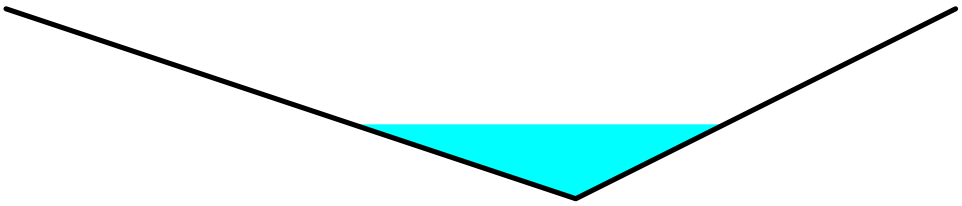
## Summary for Reach 3R: North Terrace

Inflow Area = 0.874 ac, 0.00% Impervious, Inflow Depth = 3.47" for 25-yr, 24-hr event
Inflow = 5.68 cfs @ 11.89 hrs, Volume= 0.253 af
Outflow = 5.07 cfs @ 11.94 hrs, Volume= 0.253 af, Atten= 11%, Lag= 2.6 min

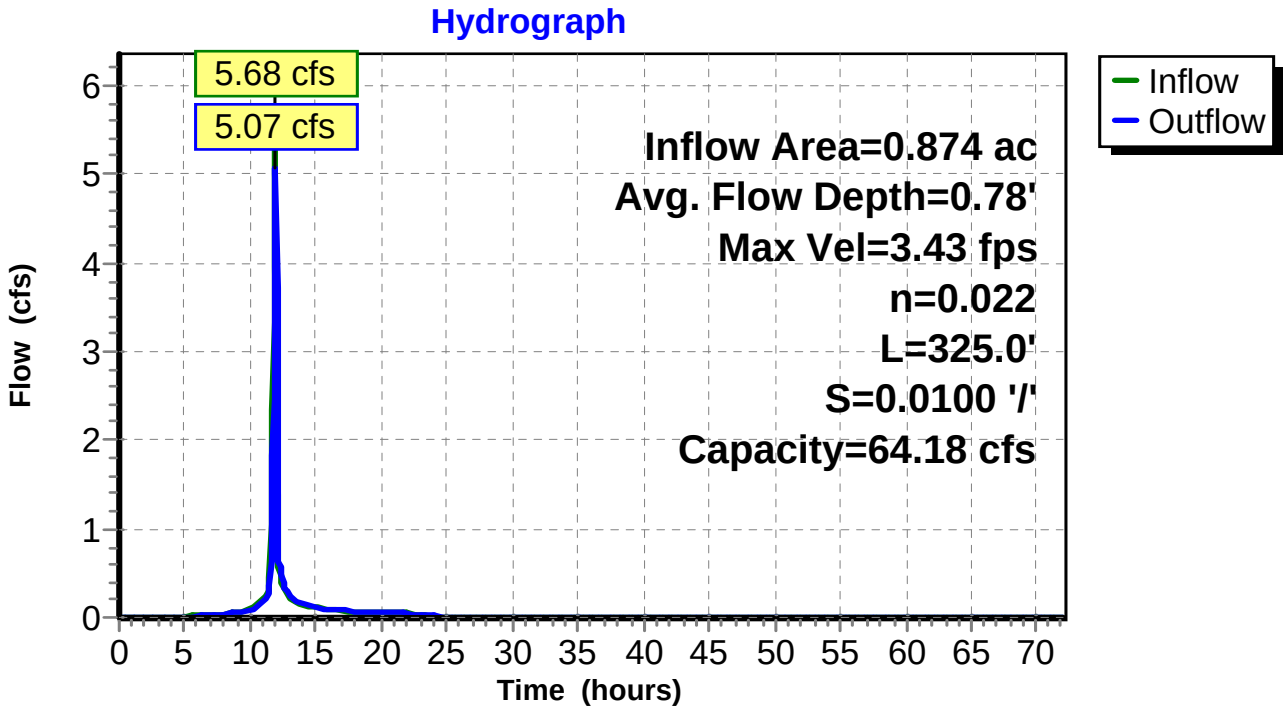
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.43 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.13 fps, Avg. Travel Time= 4.8 min

Peak Storage= 499 cf @ 11.91 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 2.00' Flow Area= 10.0 sf, Capacity= 64.18 cfs

0.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 2.0 '/' Top Width= 10.00'
Length= 325.0' Slope= 0.0100 '/'
Inlet Invert= 1,213.25', Outlet Invert= 1,210.00'



**Reach 3R: North Terrace**



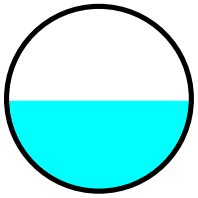
## Summary for Reach 4R: Culvert

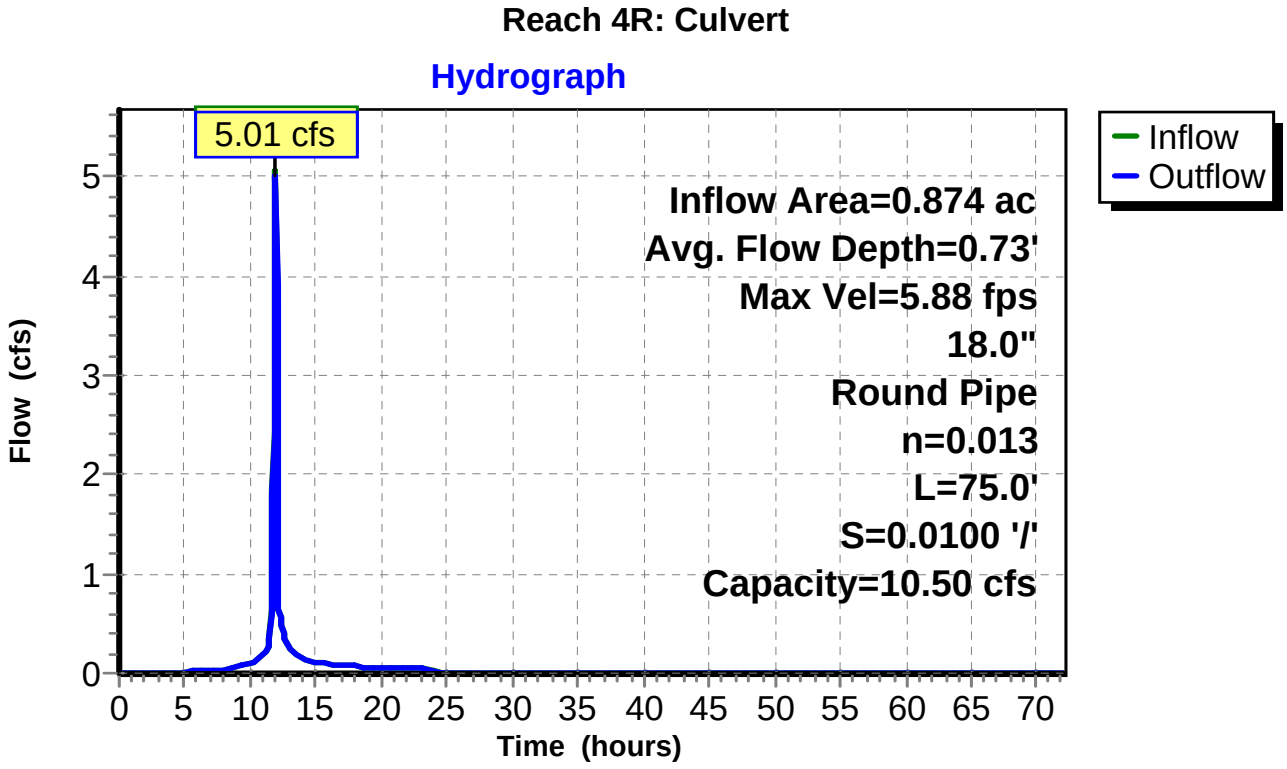
Inflow Area = 0.874 ac, 0.00% Impervious, Inflow Depth = 3.47" for 25-yr, 24-hr event
Inflow = 5.07 cfs @ 11.94 hrs, Volume= 0.253 af
Outflow = 5.01 cfs @ 11.94 hrs, Volume= 0.253 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.88 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 0.7 min

Peak Storage= 64 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.50 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 75.0' Slope= 0.0100 '/'
Inlet Invert= 1,210.00', Outlet Invert= 1,209.25'





## Summary for Pond 2P: West Ponding Area

Inflow Area = 8.633 ac, 0.00% Impervious, Inflow Depth = 3.47" for 25-yr, 24-hr event
Inflow = 42.09 cfs @ 11.91 hrs, Volume= 2.496 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min

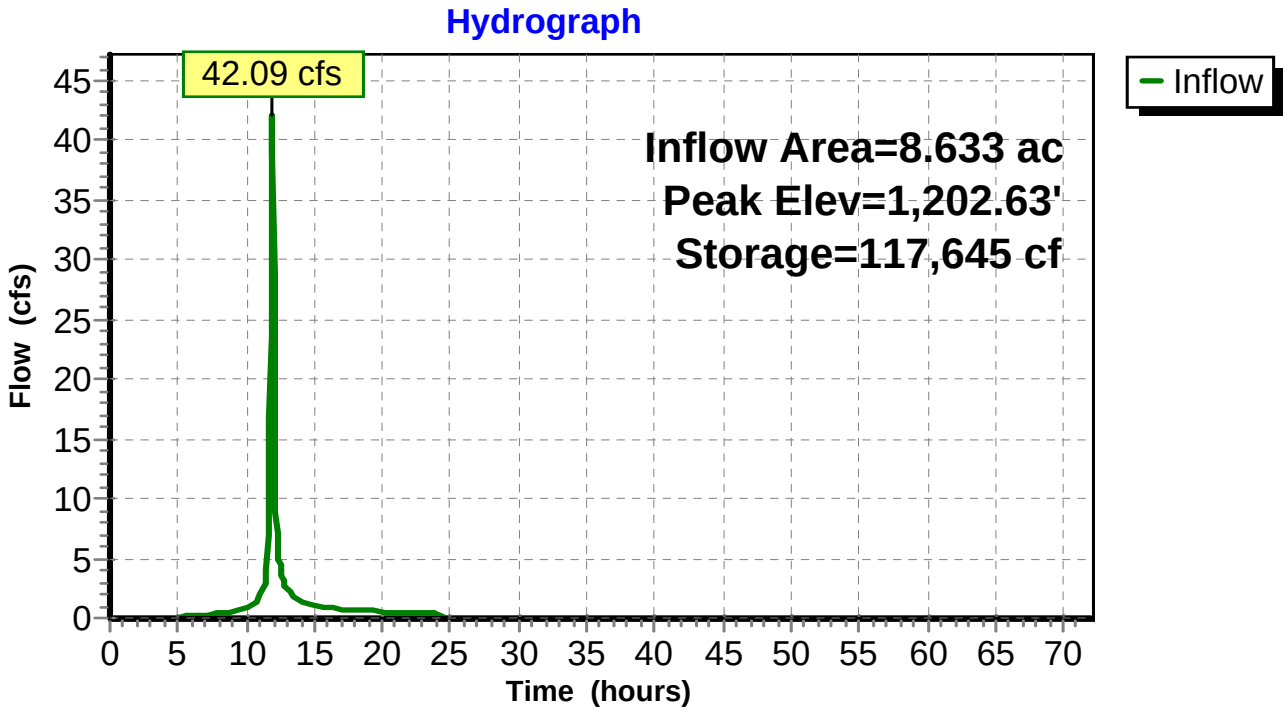
Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 1,196.00' Surf.Area= 6,415 sf Storage= 8,935 cf
Peak Elev= 1,202.63' @ 40.95 hrs Surf.Area= 28,733 sf Storage= 117,645 cf (108,710 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 1,194.00' | 342,222 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 1,194.00 | 2,520 | 0 | 0 |
| 1,196.00 | 6,415 | 8,935 | 8,935 |
| 1,198.00 | 11,611 | 18,026 | 26,961 |
| 1,200.00 | 18,014 | 29,625 | 56,586 |
| 1,202.00 | 25,896 | 43,910 | 100,496 |
| 1,204.00 | 34,935 | 60,831 | 161,327 |
| 1,206.00 | 44,960 | 79,895 | 241,222 |
| 1,208.00 | 56,040 | 101,000 | 342,222 |

### Pond 2P: West Ponding Area



**NOAA Atlas 14, Volume 8, Version 2**
**Location name: Mosinee, Wisconsin, US***
**Latitude: 44.7224°, Longitude: -89.6379°**
**Elevation: 1228 ft***
* source: Google Maps

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

## PF tabular

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

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.316 (0.261–0.386) | 0.372 (0.307–0.455) | 0.470 (0.387–0.576) | 0.557 (0.455–0.684) | 0.684 (0.543–0.867) | 0.788 (0.610–1.01) | 0.898 (0.670–1.16) | 1.01 (0.726–1.34) | 1.18 (0.809–1.58) | 1.31 (0.871–1.77) |
| 10-min | 0.462 (0.382–0.565) | 0.545 (0.450–0.666) | 0.689 (0.566–0.843) | 0.815 (0.667–1.00) | 1.00 (0.796–1.27) | 1.15 (0.893–1.47) | 1.31 (0.982–1.70) | 1.49 (1.06–1.96) | 1.72 (1.18–2.32) | 1.91 (1.28–2.59) |
| 15-min | 0.564 (0.466–0.688) | 0.665 (0.549–0.812) | 0.840 (0.691–1.03) | 0.994 (0.813–1.22) | 1.22 (0.970–1.55) | 1.41 (1.09–1.80) | 1.60 (1.20–2.08) | 1.81 (1.30–2.39) | 2.10 (1.44–2.83) | 2.33 (1.56–3.15) |
| 30-min | 0.794 (0.656–0.969) | 0.935 (0.772–1.14) | 1.18 (0.971–1.45) | 1.40 (1.14–1.72) | 1.72 (1.37–2.18) | 1.98 (1.53–2.53) | 2.26 (1.69–2.93) | 2.55 (1.83–3.37) | 2.96 (2.04–3.99) | 3.29 (2.20–4.45) |
| 60-min | 1.02 (0.843–1.25) | 1.19 (0.984–1.46) | 1.50 (1.23–1.83) | 1.77 (1.45–2.17) | 2.18 (1.74–2.77) | 2.52 (1.95–3.22) | 2.88 (2.15–3.74) | 3.27 (2.34–4.32) | 3.82 (2.63–5.14) | 4.26 (2.84–5.76) |
| 2-hr | 1.25 (1.04–1.51) | 1.45 (1.21–1.76) | 1.81 (1.50–2.20) | 2.14 (1.76–2.61) | 2.64 (2.12–3.33) | 3.06 (2.39–3.88) | 3.50 (2.65–4.52) | 3.99 (2.89–5.23) | 4.67 (3.25–6.24) | 5.22 (3.52–7.00) |
| 3-hr | 1.39 (1.16–1.67) | 1.60 (1.34–1.93) | 1.99 (1.65–2.40) | 2.35 (1.94–2.84) | 2.89 (2.34–3.63) | 3.35 (2.64–4.23) | 3.85 (2.92–4.94) | 4.39 (3.20–5.73) | 5.16 (3.61–6.86) | 5.78 (3.92–7.71) |
| 6-hr | 1.64 (1.38–1.96) | 1.89 (1.59–2.25) | 2.33 (1.95–2.79) | 2.74 (2.28–3.29) | 3.36 (2.74–4.19) | 3.89 (3.09–4.87) | 4.46 (3.42–5.68) | 5.08 (3.74–6.59) | 5.97 (4.23–7.88) | 6.69 (4.59–8.85) |
| 12-hr | 1.94 (1.65–2.30) | 2.23 (1.89–2.64) | 2.74 (2.31–3.25) | 3.21 (2.69–3.81) | 3.91 (3.21–4.81) | 4.49 (3.59–5.57) | 5.12 (3.96–6.45) | 5.80 (4.31–7.44) | 6.76 (4.83–8.84) | 7.54 (5.23–9.89) |
| 24-hr | 2.28 (1.94–2.67) | 2.61 (2.22–3.05) | 3.19 (2.71–3.74) | 3.70 (3.13–4.36) | 4.47 (3.69–5.44) | 5.11 (4.12–6.26) | 5.78 (4.51–7.21) | 6.51 (4.88–8.26) | 7.52 (5.43–9.73) | 8.34 (5.85–10.8) |
| 2-day | 2.64 (2.27–3.07) | 3.01 (2.59–3.49) | 3.65 (3.13–4.25) | 4.23 (3.60–4.93) | 5.07 (4.21–6.10) | 5.76 (4.68–6.99) | 6.49 (5.11–8.01) | 7.28 (5.51–9.15) | 8.37 (6.11–10.7) | 9.25 (6.56–11.9) |
| 3-day | 2.89 (2.50–3.33) | 3.30 (2.85–3.81) | 4.00 (3.44–4.63) | 4.63 (3.96–5.36) | 5.54 (4.63–6.63) | 6.29 (5.13–7.58) | 7.08 (5.60–8.68) | 7.92 (6.03–9.90) | 9.09 (6.67–11.6) | 10.0 (7.16–12.9) |
| 4-day | 3.12 (2.70–3.58) | 3.55 (3.08–4.08) | 4.31 (3.72–4.96) | 4.97 (4.27–5.74) | 5.94 (4.97–7.07) | 6.73 (5.51–8.07) | 7.55 (5.99–9.22) | 8.43 (6.44–10.5) | 9.65 (7.11–12.2) | 10.6 (7.62–13.6) |
| 7-day | 3.76 (3.28–4.29) | 4.26 (3.71–4.85) | 5.10 (4.42–5.82) | 5.82 (5.03–6.67) | 6.86 (5.78–8.08) | 7.70 (6.34–9.15) | 8.57 (6.84–10.4) | 9.48 (7.29–11.7) | 10.7 (7.97–13.5) | 11.7 (8.49–14.9) |
| 10-day | 4.36 (3.82–4.95) | 4.89 (4.28–5.55) | 5.78 (5.04–6.57) | 6.54 (5.67–7.46) | 7.62 (6.43–8.90) | 8.47 (7.00–10.0) | 9.35 (7.50–11.2) | 10.3 (7.93–12.6) | 11.5 (8.59–14.4) | 12.5 (9.08–15.7) |
| 20-day | 6.08 (5.36–6.83) | 6.71 (5.91–7.54) | 7.74 (6.79–8.71) | 8.59 (7.50–9.70) | 9.75 (8.28–11.2) | 10.7 (8.87–12.4) | 11.5 (9.34–13.7) | 12.5 (9.72–15.1) | 13.7 (10.3–16.9) | 14.6 (10.7–18.2) |
| 30-day | 7.49 (6.63–8.36) | 8.23 (7.29–9.20) | 9.43 (8.32–10.5) | 10.4 (9.12–11.7) | 11.7 (9.96–13.4) | 12.7 (10.6–14.6) | 13.6 (11.1–16.0) | 14.5 (11.4–17.5) | 15.7 (11.9–19.3) | 16.6 (12.4–20.7) |
| 45-day | 9.25 (8.23–10.3) | 10.2 (9.05–11.3) | 11.7 (10.3–13.0) | 12.8 (11.3–14.3) | 14.3 (12.3–16.3) | 15.5 (13.0–17.7) | 16.5 (13.5–19.3) | 17.5 (13.8–20.9) | 18.8 (14.3–22.9) | 19.7 (14.7–24.4) |
| 60-day | 10.7 (9.58–11.9) | 11.9 (10.6–13.1) | 13.6 (12.1–15.1) | 15.0 (13.3–16.7) | 16.8 (14.4–18.9) | 18.0 (15.2–20.6) | 19.2 (15.7–22.3) | 20.3 (16.1–24.1) | 21.7 (16.6–26.3) | 22.6 (17.0–27.9) |

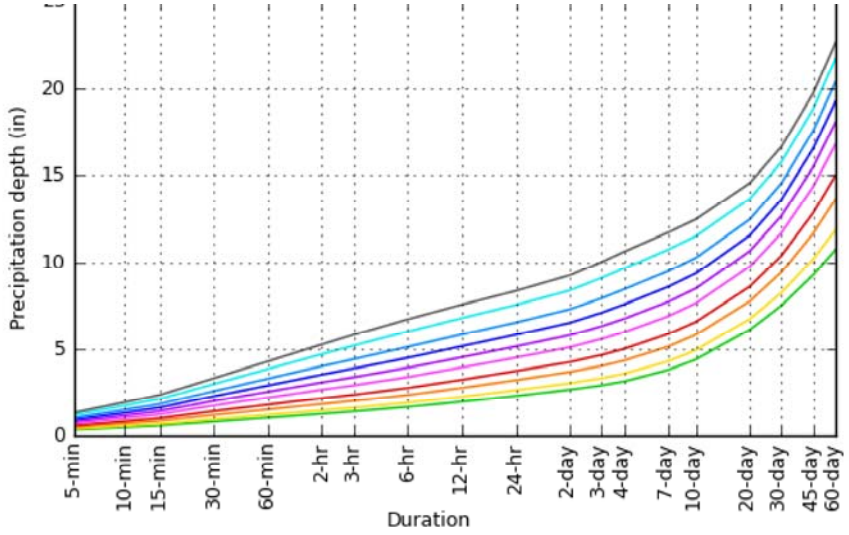
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

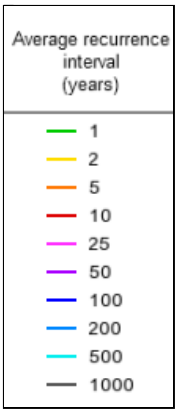
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

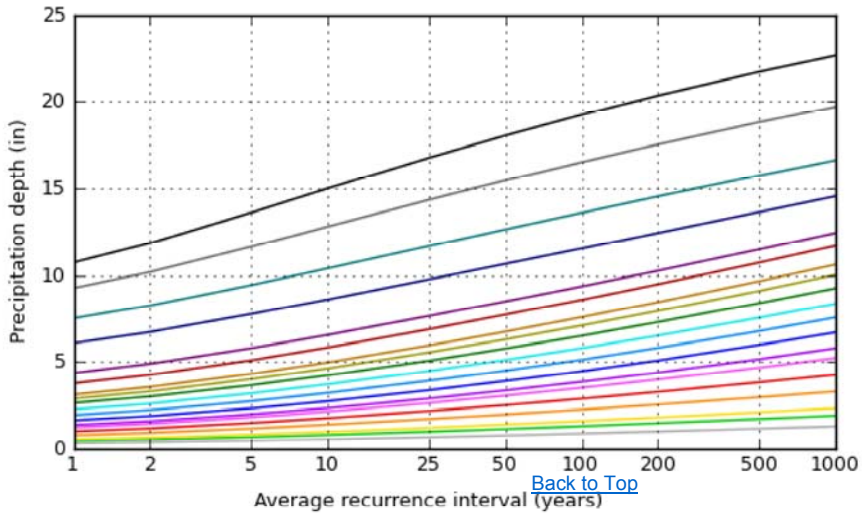
Please refer to NOAA Atlas 14 document for more information.

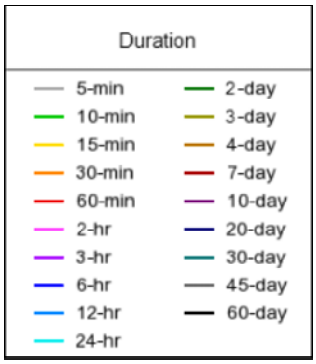
Back to Top

## PF graphical




Back to Top

## Maps & aerials

NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Thu Mar 17 21:06:06 2016

**Small scale terrain**

An intercell berm was constructed along the north side of Cell 2 in order to separate the leachate in Cell 2 from the non-contact runoff in Cell 1. This intercell berm is only 1 to 3 feet higher than the drainage layer grades in Cell 2. Because the available storage capacity along the northern intercell berm is minimal, a terrace should be constructed along the toe of the ash slope to direct runoff to the west, where a culvert has been designed to convey the runoff beneath the access roadway to the western detention area. This terrace should consist of a 2-foot high, v-shaped ditch with 2:1 sides and a slope of 1.0%. The culvert was designed as a minimum 18-inch diameter corrugated HDPE (smooth interior) pipe culvert, with a minimum slope of 1.0%.

**Table 1 – Peak Discharges to West Detention Area for Various Design Storms**

| Design Storm | Rainfall (in) | Peak Inflow (cfs) | Runoff Volume (cubic feet) | Assumed Starting Elevation (ft) | Total Storage Volume (cubic feet) | Peak Elevation (ft) |
|---|---|---|---|---|---|---|
| 2-yr, 24-hr | 2.61 | 20.45 | 53,610 | 1196.0 | 62,545 | 1200.32 |
| 25-yr, 6-hr | 3.36 | 55.67 | 75,480 | 1196.0 | 84,416 | 1201.35 |
| 25-yr, 24-hr | 4.47 | 42.09 | 108,710 | 1196.0 | 117,645 | 1202.63 |
| 100-yr, 24-hr | 5.78 | 57.52 | 148,603 | 1196.0 | 157,538 | 1203.89 |

Note: Design storms based on NOAA Atlas 14, Volume 8, Version 2 for Mosinee, WI.

Attachments:

HydroCAD Model Output