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Engineers and
Scientists

Regulation Compliance Report Run-on and Run-off Control Plan

Pleasant Prairie Power Plant Ash Landfill
Pleasant Prairie, Wisconsin

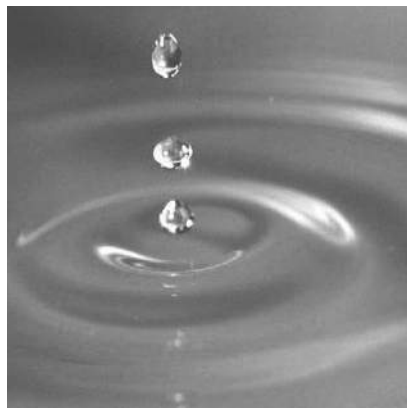
Submitted to:

WEC Energy Group – Business Services
333 W. Everett Street, A231
Milwaukee, Wisconsin 53203

Submitted by:

GEI Consultants, Inc.
3159 Voyager Drive
Green Bay, Wisconsin 54313
920.455.8200

October 2021, Revision 1
Project 1610534



John M. Trast, P.E., D.G.E.
Vice President

William S. Reybrock, P.E.
Project Professional

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Revision Schedule

Revision 0 October 2016

Revision 1 October 2021: This plan was updated in accordance with § 257.81(c)(4) which required the owner or operator of the CCR unit to prepare periodic run-on and run-off control system plans every five years. Updated the existing site conditions and engineering calculations.

WSR:cah

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1. Introduction

WEC Energy Group (WEC) owns and operates a solid waste disposal facility adjacent to the Pleasant Prairie Power Plant (PPPP) in Section 9, Township 1 North, Range 22 East, in the village of Pleasant Prairie, Kenosha County, Wisconsin. The landfill property is bounded on the north by State Highway 50 (75th Street), on the south by Bain Station Road, and on the east and west by active rail lines. The WEC PPPP Ash Landfill is regulated as an industrial waste landfill by the Wisconsin Department of Natural Resources (WDNR) under the provisions of Chapter 289 Wisconsin State Statutes, 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. 2786, FID# 230056310. PPPP consists of one cell that went into operation during the 4th Quarter of 2014. Under normal conditions and circumstances, nearly 100 percent of CCR generated at the PPPP was beneficially used. Disposal activities at the landfill are generally limited to CCR system cleanings during PPPP outages and other special events. PPPP ceased commercial operation in early 2018. Final cover was installed over the eastern 2.6 acres of Cell 1 in 2018. The middle 3.1 acres of final cover was installed in 2020 and the final western 1.2 acres of the landfill is active.

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* and is defined as a CCR unit and existing CCR landfill in accordance with § 257.53. Future landfill cells are permitted by the WDNR in the conditionally approved Plan of Operation and defined as lateral expansions under § 257.53 when developed.

This report fulfills the requirements of § 257.81 - *Run-on and run-off controls for CCR landfills* for the PPPP Ash Landfill, Cell 1, which specifies that the owner or operator must complete the assessments required by these sections every five years. 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 are 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 1 of the PPPP Ash Landfill is approximately 6.9 acres in size, while the active portion of the cell is approximately 1.2 acres in size. All precipitation that falls within the active portion of the cell is handled as leachate. Any precipitation that falls outside the limits of waste or within the closed portion of the cell is directed away from the active landfill. Drawing C-1 located in Appendix A – Existing Conditions Drawings, shows Cell 1 of the PPPP Ash Landfill.

The rainfall depth estimate for a 24-hour, 25-year storm for the PPPP Ash Landfill was determined following the procedures outlined in Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 8, Version 2: Wisconsin. For the PPPP Ash Landfill a 24-hour, 25-year storm will result in 4.52 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 1.

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

Storm Recurrence Interval	Rainfall Depth (inches)	Cell 1 Active Area (acres)	Run-off Volume (acre-ft)
24-hour, 25-year	4.52	1.2	0.45

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 to the landfill, perimeter berms have been established around the north, east, and west sides of the landfill to direct stormwater away from the active landfill. Run-on stormwater sheet flows away from the perimeter berms to the drainage ditches that bound the site. The perimeter berms also allow access around the north, east, and west sides of the landfill. The access road constructed on top of the perimeter berms is graded to direct stormwater to the exterior of the berm away from the active landfill.

Final cover was installed over the eastern 2.6 acres of Cell 1 in 2018. The middle 3.1 acres of final cover was installed in 2020 and the final western 1.2 acres of the landfill is active. Along the south side of the landfill, an intercell berm was constructed to prevent run-on from south of the landfill and to prevent run-off of contact water from the landfill. For the closed eastern 5.7 acres of the cell, the southern berm was graded to allow sheet flow into the field south of the cell. For the open western 1.2 acres of the cell, a perimeter ditch along the outboard edge of the intercell berm directs run-on stormwater to the west and southwest away from the active area as shown on Drawing C-1 in Appendix A. Stormwater drainage at the site is directed away from the landfill and eventually flows southward discharging to the unnamed tributaries of Jerome Creek.

A stormwater run-off model was completed to confirm that the current run-on control system on the south side of the intercell berm is sufficiently sized to manage a 24-hour, 25-year precipitation event. The rainfall depth estimate is 4.52 inches as previously discussed. HydroCAD 10.0 was used to model the stormwater on the south side of the Cell 1 intercell berm. The stormwater run-on calculations for the ditch south of the intercell berm are included in Appendix C: Stormwater Run-on Calculations. Based on stormwater run-on analysis the current run-on control system for Cell 1 of PPPP landfill will be able to handle the 24-hour, 25-year precipitation event without allowing any non-contact water to enter the limits of waste. The estimated peak water level in the channel on the west side is 0.5-feet and corresponds to an elevation of 686.5 feet. The minimum height of the intercell berm is 687 feet; thus, the berm is high enough to not allow stormwater to enter the active Cell 1 area. The conveyance channel south of the intercell berm is adequately sized to prevent run-on to Cell 1 associated with the 24-hour, 25-year precipitation event.

The south side of the landfill, including the area permitted by the state of Wisconsin for future lateral expansion, is protected from the 1-percent-annual-chance or greater flood hazard by a levee system that has been accredited by the Federal Emergency Management

Agency (FEMA), as shown in Appendix D: FEMA National Flood Insurance Rate Maps. The floodplain levee was constructed to protect a portion of the permitted landfill space from being within the 100-year floodplain of the Unnamed Tributary No. 2 and No. 3 to Jerome Creek. Based on a review of current topography and FEMA Flood Levee Certification (GEI, 2013) the PPPP Ash Landfill 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 over land from any part of a CCR landfill.*”

During the operation and filling of Cell 1, 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 temporary containment ditch along the perimeter edge of the cell, inside of the landfill. The contact water is then routed to a stormwater surge area. The stormwater surge area is located in the southwest corner of Cell 1 along the intercell berm. Contact water that collects in the surge area is allowed to infiltrate into the leachate collection system and disposed of in accordance with the landfill’s Plan of Operations.

In general, temporary containment ditches at the perimeter of the landfill cell are a minimum of 24 inches deep and have a 3H:1V exterior slope and 2H:1V maximum interior side slope. The exterior slope of the ditch is the top of the granular drainage layer of the leachate collection system. Therefore, although contact stormwater will infiltrate once it reaches the perimeter ditch, for the stormwater modeling and sizing purposes, we have conservatively assumed that no infiltration takes place in the ditch. The interior slope is cut into the CCR disposed of in the landfill. Along the access road, a cattle bridge or cattle guard is installed to function as a hydraulic break and prevent stormwater from running down the road and escaping the site. The cattle bridge also allows for the continuation of the containment ditch. 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.

A stormwater run-off model was completed to confirm that the current run-off control system for the operation of Cell 1 at the PPPP Ash Landfill can adequately manage a 24-hour, 25-year precipitation event. The rainfall depth estimate is 4.52 inches as previously discussed. The stormwater flow was modeled using HydroCAD 10.0 to model the maximum operation filling condition, just before closure of the cell. This condition will have the steepest and longest slopes directing stormwater to the temporary containment ditches. The stormwater run-off calculations for Cell 1 of the landfill are included in Appendix E: Stormwater Run-off Calculations.

Based on the analysis, the run-off control system for Cell 1 of the PPPP Ash Landfill is able to contain, manage, and control the run-off from a 24-hour, 25-year precipitation event without allowing any contact water to escape the permitted limits of waste. The estimated peak water level in the west conveyance channel is 0.95 feet. The minimum depth of the channel is 2 feet deep. The intercell stormwater surge area has a crest elevation of approximately El. 687 feet and the estimated water level associated with the 24-hour, 25-year

storm in Cell 1 is El. 684.89 feet. Both the temporary stormwater containment ditches and the stormwater surge area are designed to contain, manage, and control the run-off from Cell 1 associated with a 24-hour, 25-year storm event.

5. Conclusion and Certification

The PPPP Ash Landfill is regulated under 40 CFR Part 257 Subpart D as an existing CCR landfill. The rule specifies that an existing CCR landfill must develop plans to meet certain meet operating criteria designated by October 17, 2016, and that the owner or operator must also conduct and complete the assessments required by this section every five (5) years maximum based on the completion date of this plan. This report is the 5-year update to the original plan. 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).

This report documents the PPPP Ash 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 PPPP Landfill is either recycled for use as a dust control agent in the active landfill or hauled to the wastewater treatment facility at PPPP in accordance with the Plan of Operations; thus, it complies with § 257.3-3.

This 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.

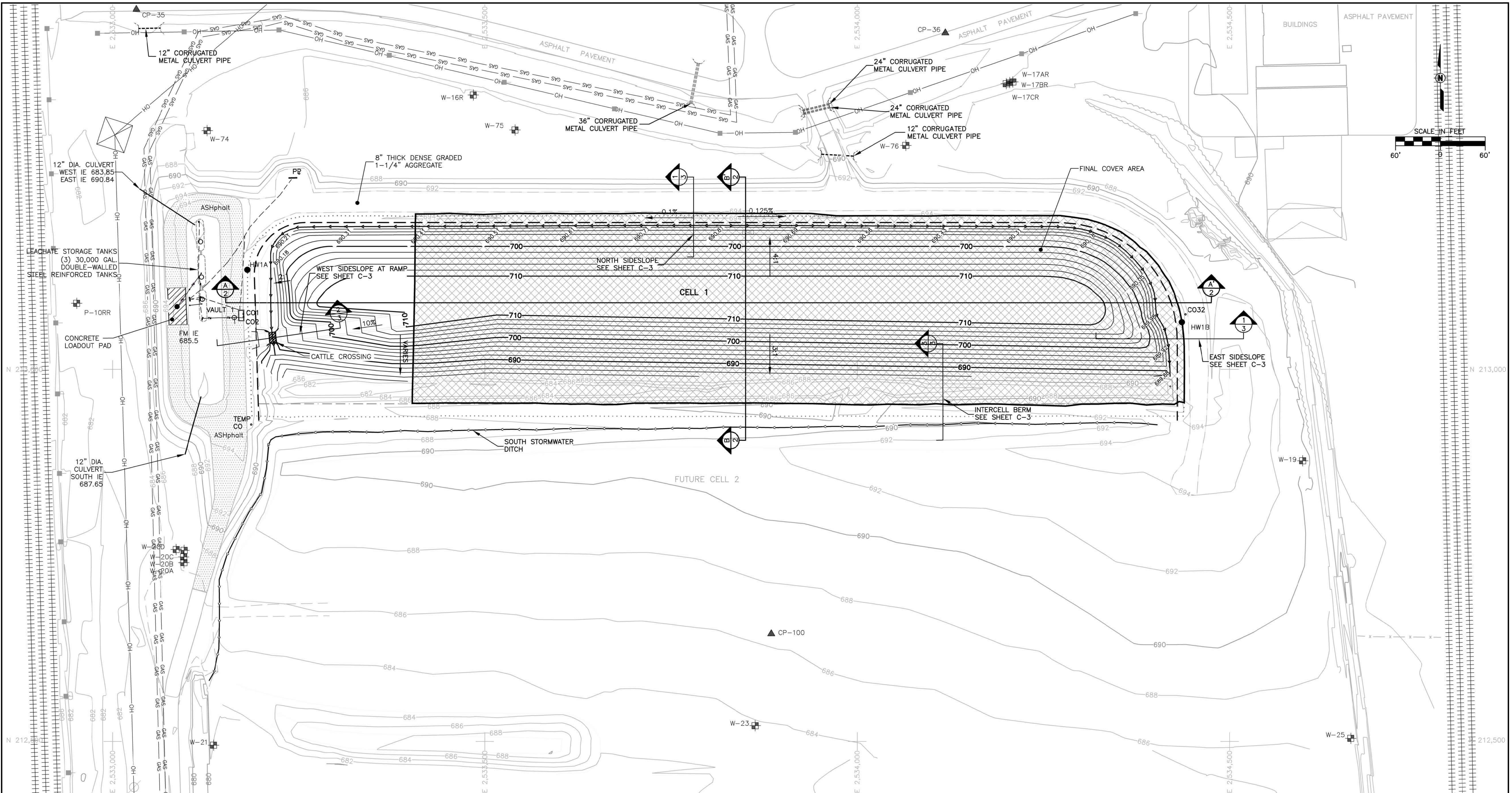


6. References

- AECOM (2012). Plan of Operation Modification, Pleasant Prairie Power Plant Ash Landfill, WDNR License #2786; FID # 230056310, Pleasant Prairie, Wisconsin. April 4, 2012.
- GEI (2013). FEMA Floodplain Levee Certification. We Energies Pleasant Prairie Ash Landfill Floodplain Levee Certification, Pleasant Prairie, Wisconsin. June 5, 2013.
- 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



LEGEND

690	EXISTING GROUND SURFACE CONTOUR	⊗	STEEL POLE ELECTRIC TRANSMISSION TOWER
---	ROAD, NON PAVED	⊕	RAILROAD TELEPHONE POLE
---	ROAD, PAVED	■	MONUMENT FOUND
-x-x-x-	FENCE	GEOMEMBRANE ANCHOR TRENCH
	TREES/BRUSH	• CO2	LEACHATE COLLECTION CLEANOUT
⊠	CULVERT	□ V1	LEACHATE COLLECTION VAULT
□	BUILDINGS	— HW1A	LEACHATE TRANSFER PIPE
— GAS	GAS PIPE	● HW1A	LEACHATE HEADWELL
— FIB	FIBER COMMUNICATIONS	▨	WISDOT E1 BITUMINOUS ASPHALT PAVEMENT
— OH	OVERHEAD ELECTRIC	— 690	ASH CONTOUR (10/30/2015)
⊠	ELECTRIC TOWER	— 710	PROPOSED INTERMEDIATE CONTOUR
	RAILROAD TRACKS	—	PROPOSED INTERIM FILLING DITCH
---	LANDFILL LIMIT OF WASTE		
---	LANDFILL CELL BOUNDARY		
⊕	MONITORING WELL		
▲	SURVEY CONTROL MONUMENT		

NOTES:

- HORIZONTAL DATUM BASED ON WISCONSIN STATE PLANE COORDINATES SOUTH ZONE, NAD 83.
- VERTICAL DATUM BASED ON REFERENCE MARK, WISCONSIN DIVISION OF HIGHWAYS. ALUMINUM CAP SET IN TOP OF EAST END OF CONCRETE BRIDGE WALL, 2.7' ABOVE GROUND, ELEVATION 715.42. CAP IS LOCATED 1.2' WEST OF TOP BEVEL. THE CONCRETE BRIDGE IS LOCATED WHERE STH "50" CROSSES THE CP RAILROAD TRACKS ON THE NORTHWEST SIDE OF THE SITE. ELEVATIONS REFERENCED TO NAVD 88.

CONTROL POINT DATA				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
10	213741.91	2532958.45	715.42	BM B-30-48-78: ALUMINUM CAP ON TOP OF CONCRETE WALL
30	211877.98	2533092.40	684.09	CUT CROSS
31	210593.02	2533131.43	683.92	CUT CROSS
32	208734.70	2533178.76	681.48	MAG NAIL
33	209470.52	2534928.84	683.53	IP1" W/CAP
34	211916.15	2534703.67	682.90	IP1" W/CAP
35	213483.71	2533032.15	686.41	MAG NAIL
36	213452.09	2534118.49	687.83	MAG NAIL
100	212644.65	2533884.50	691.25	RBR W/CAP

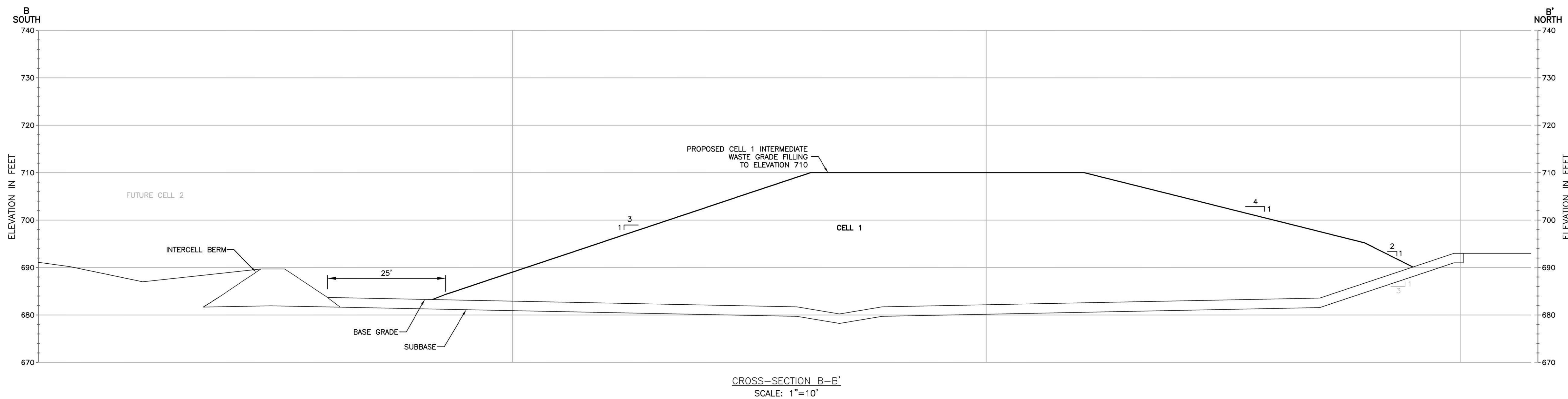
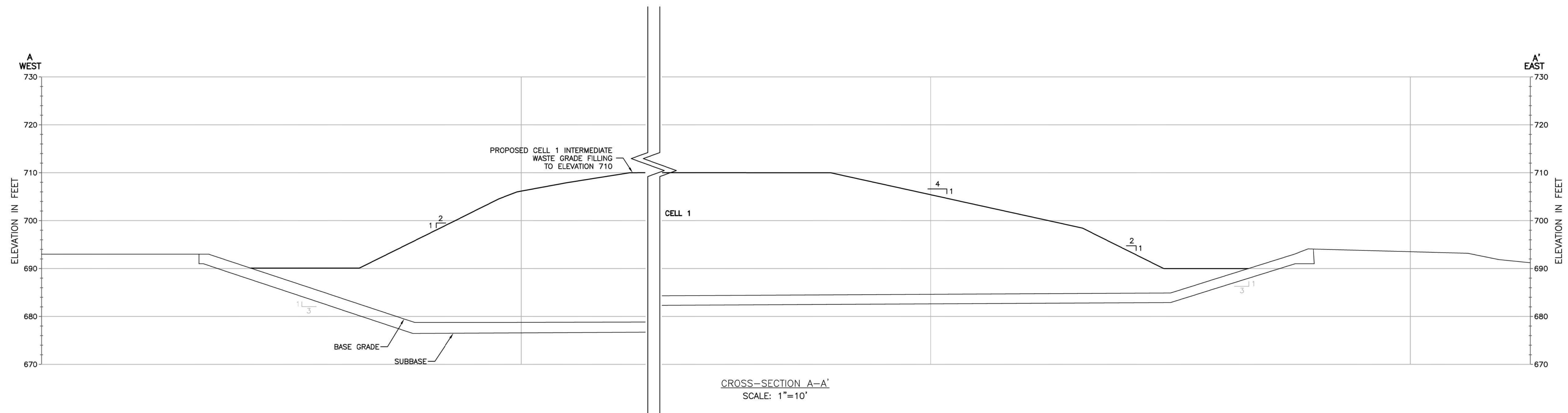
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NO.	DATE	ISSUE/REVISION	APP	

Designed: JXT
 Checked: JXT
 Drawn: JLC
 Submittal Date: 7/19/2021



WE ENERGIES
 333 WEST EVERETT STREET, A231
 MILWAUKEE, WISCONSIN 53203
 GEI Project 1610534

REGULATION COMPLIANCE REPORT RUN-ON AND RUN-OFF CONTROL PLAN	DWG. NO. C-1
PLEASANT PRAIRIE POWER PLANT ASH LANDFILL CELL 1	SHEET NO. 1



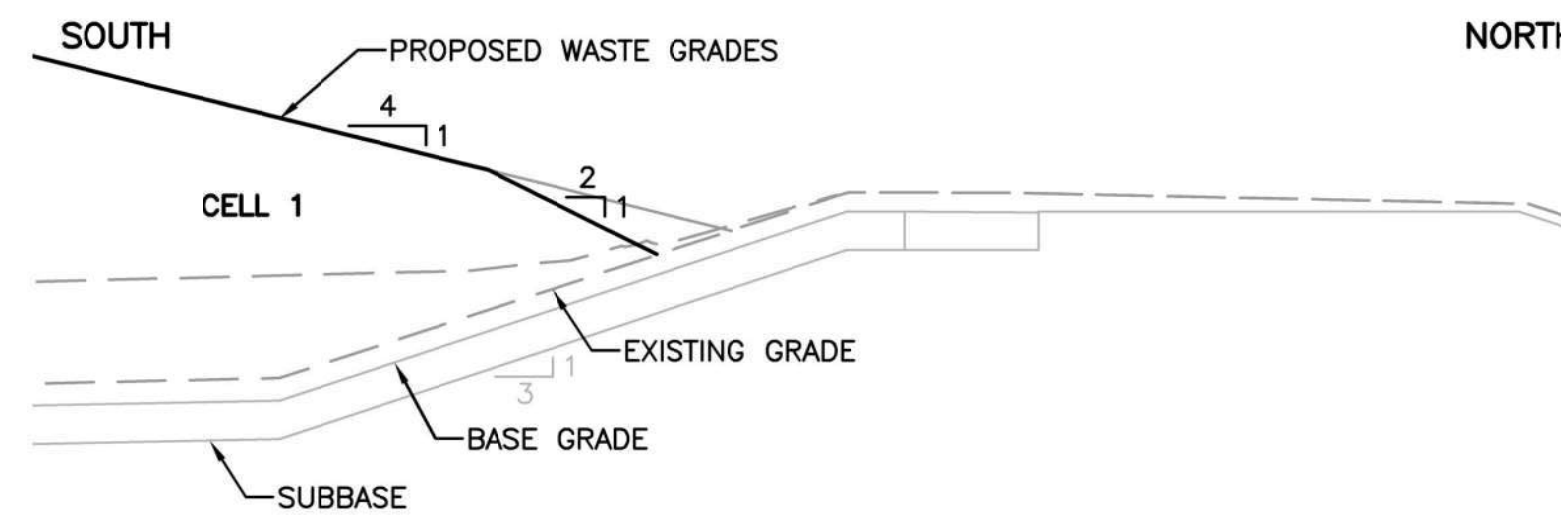
Attention:			
NO.	DATE	ISSUE/REVISION	APP
0	X	X	X

Designed: JXT
 Checked: JXT
 Drawn: JLC
 Submittal Date: 7/19/2021

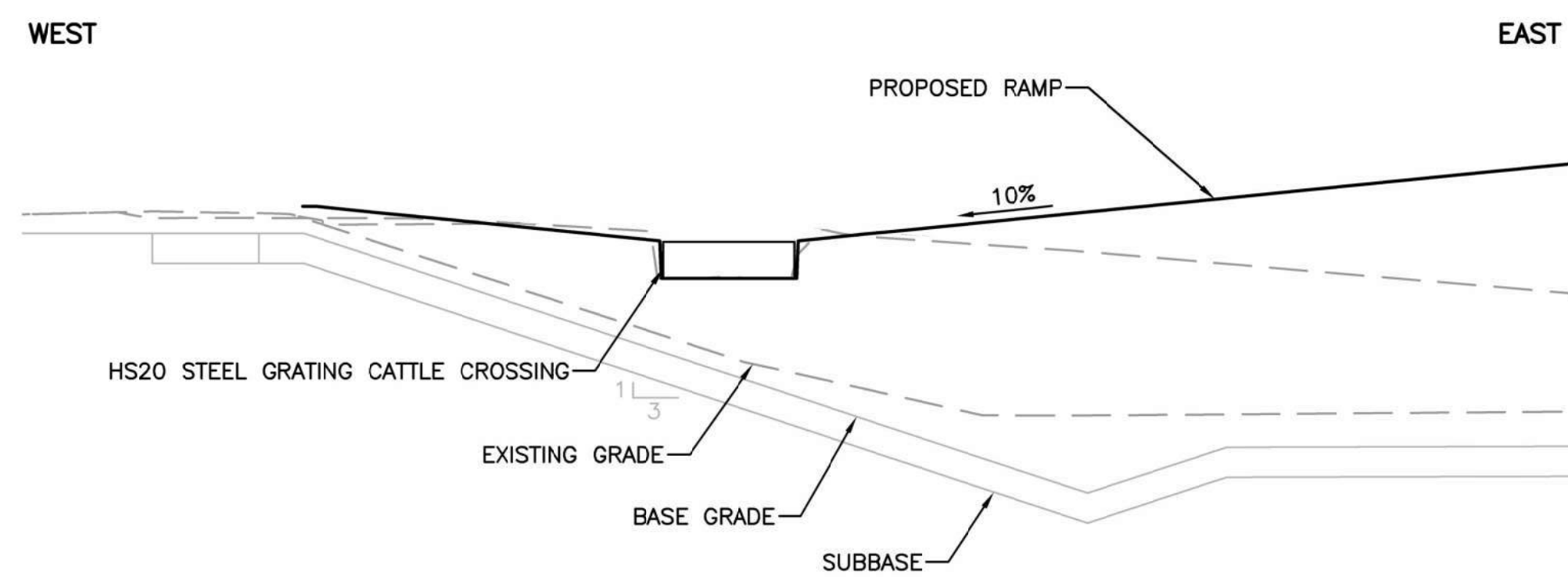


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 MILWAUKEE, WISCONSIN 53203
 GEI Project 1610534

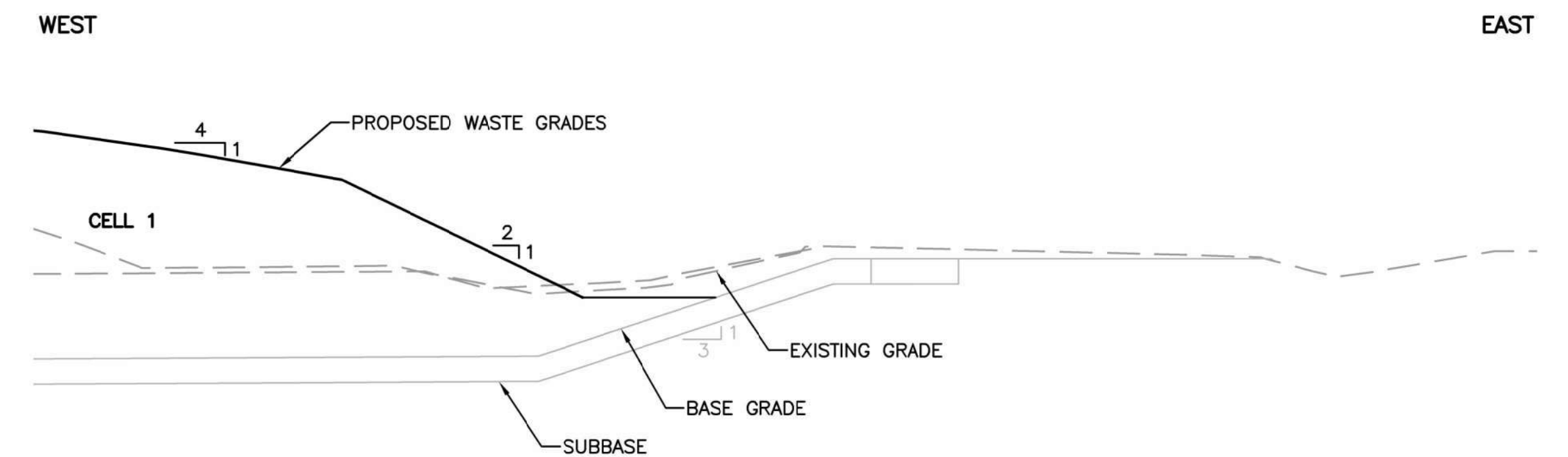
REGULATION COMPLIANCE REPORT RUN-ON AND RUN-OFF CONTROL PLAN	DWG. NO. C-2
PLEASANT PRAIRIE POWER PLANT ASH LANDFILL CELL 1 CROSS-SECTIONS	SHEET NO. 2



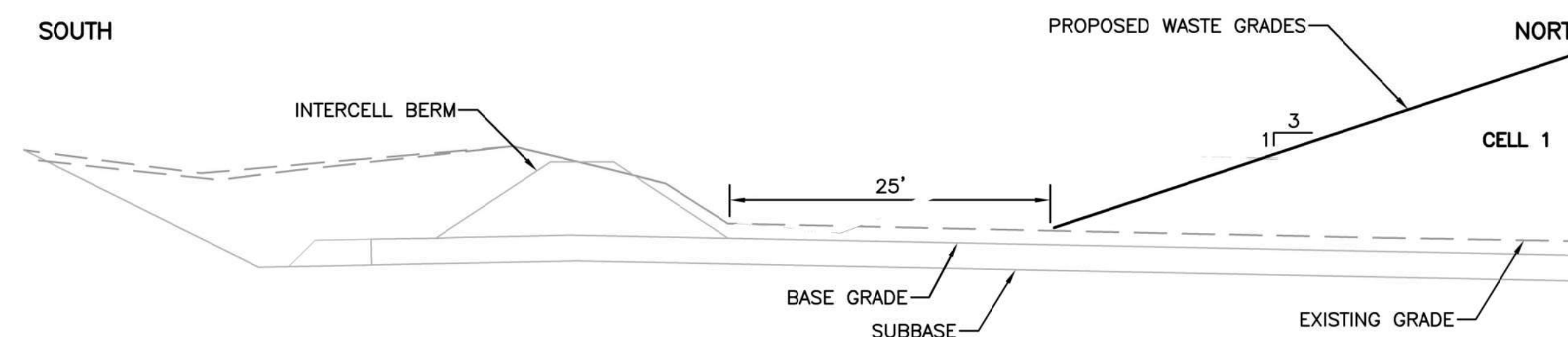
1 NORTH SIDESLOPE DETAIL
SCALE: 1"=10'



4 WEST SIDESLOPE AT RAMP DETAIL
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2 EAST SIDESLOPE DETAIL
SCALE: 1"=10'



3 SOUTH SIDESLOPE DETAIL
SCALE: 1"=10'

Attention:				
0	X	X	X	
NO.	DATE	ISSUE/REVISION	APP	

Designed: JXT
Checked: JXT
Drawn: JLC
Submittal Date: 7/19/2021



WE ENERGIES
333 WEST EVERETT STREET, A231
MILWAUKEE, WISCONSIN 53203
GEI Project 1610534

REGULATION COMPLIANCE REPORT
RUN-ON AND RUN-OFF CONTROL PLAN
PLEASANT PRAIRIE POWER PLANT
ASH LANDFILL CELL 1
DETAILS

DWG. NO.
C-3
SHEET NO.
3

Appendix B

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





Client	WEC Energy Group			Page	2 of 4
Project	PPPP LF Run-on and Run-off Control Plan			Rev.	0
By	W. Reybrock	Chk.	A. Schwoerer	App.	A. Schwoerer
Date	06/18/2021	Date	08/23/2021	Date	08/23/2021

GEI Project No.	1610534	Document No.	N/A
Subject	NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume		

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	0.333 (0.266-0.415)	0.392 (0.313-0.488)	0.491 (0.390-0.611)	0.573 (0.453-0.716)	0.690 (0.529-0.879)	0.782 (0.587-1.00)	0.875 (0.636-1.14)	0.971 (0.680-1.28)	1.10 (0.743-1.48)	1.20 (0.791-1.62)
10-min	0.488 (0.390-0.607)	0.575 (0.458-0.715)	0.718 (0.571-0.895)	0.840 (0.664-1.05)	1.01 (0.775-1.29)	1.14 (0.859-1.47)	1.28 (0.932-1.67)	1.42 (0.995-1.88)	1.61 (1.09-2.16)	1.76 (1.16-2.38)
15-min	0.595 (0.475-0.740)	0.701 (0.559-0.872)	0.876 (0.696-1.09)	1.02 (0.810-1.28)	1.23 (0.945-1.57)	1.40 (1.05-1.79)	1.56 (1.14-2.03)	1.73 (1.21-2.29)	1.97 (1.33-2.64)	2.14 (1.41-2.90)
30-min	0.831 (0.663-1.03)	0.982 (0.783-1.22)	1.23 (0.980-1.54)	1.44 (1.14-1.80)	1.74 (1.34-2.22)	1.97 (1.48-2.53)	2.21 (1.61-2.87)	2.45 (1.72-3.24)	2.78 (1.88-3.73)	3.03 (2.00-4.10)
60-min	1.04 (0.833-1.30)	1.26 (1.01-1.57)	1.63 (1.29-2.03)	1.93 (1.53-2.41)	2.36 (1.81-3.02)	2.70 (2.03-3.47)	3.05 (2.22-3.97)	3.41 (2.39-4.50)	3.89 (2.63-5.22)	4.26 (2.81-5.76)
2-hr	1.26 (1.02-1.55)	1.54 (1.24-1.90)	2.02 (1.62-2.49)	2.42 (1.94-2.99)	2.99 (2.32-3.77)	3.43 (2.61-4.36)	3.89 (2.87-5.01)	4.36 (3.10-5.70)	5.00 (3.42-6.64)	5.49 (3.67-7.35)
3-hr	1.38 (1.13-1.69)	1.71 (1.39-2.09)	2.26 (1.83-2.76)	2.73 (2.20-3.35)	3.39 (2.66-4.26)	3.92 (3.00-4.95)	4.46 (3.31-5.71)	5.02 (3.59-6.53)	5.78 (4.00-7.64)	6.37 (4.30-8.48)
6-hr	1.66 (1.37-2.00)	2.01 (1.66-2.43)	2.62 (2.15-3.17)	3.15 (2.57-3.82)	3.92 (3.11-4.88)	4.53 (3.53-5.68)	5.18 (3.91-6.58)	5.86 (4.26-7.56)	6.80 (4.78-8.92)	7.54 (5.16-9.94)
12-hr	2.03 (1.69-2.41)	2.34 (1.95-2.79)	2.91 (2.41-3.47)	3.41 (2.82-4.09)	4.18 (3.38-5.17)	4.81 (3.81-5.98)	5.49 (4.21-6.93)	6.22 (4.61-7.98)	7.26 (5.19-9.45)	8.09 (5.63-10.6)
24-hr	2.39 (2.01-2.81)	2.69 (2.27-3.17)	3.25 (2.72-3.83)	3.75 (3.13-4.44)	4.52 (3.71-5.53)	5.17 (4.14-6.35)	5.86 (4.57-7.32)	6.62 (4.97-8.40)	7.70 (5.59-9.93)	8.57 (6.06-11.1)
2-day	2.69 (2.30-3.13)	3.08 (2.62-3.58)	3.75 (3.19-4.36)	4.34 (3.67-5.07)	5.21 (4.31-6.26)	5.92 (4.80-7.17)	6.67 (5.25-8.20)	7.47 (5.68-9.34)	8.58 (6.32-10.9)	9.47 (6.80-12.1)
3-day	2.94 (2.53-3.40)	3.36 (2.88-3.88)	4.08 (3.49-4.71)	4.71 (4.01-5.46)	5.63 (4.69-6.72)	6.38 (5.21-7.67)	7.17 (5.69-8.75)	8.00 (6.14-9.94)	9.16 (6.80-11.6)	10.1 (7.31-12.8)
4-day	3.17 (2.74-3.63)	3.60 (3.11-4.13)	4.34 (3.74-4.99)	4.99 (4.28-5.76)	5.95 (4.99-7.06)	6.72 (5.52-8.04)	7.54 (6.02-9.16)	8.41 (6.49-10.4)	9.61 (7.18-12.1)	10.6 (7.71-13.4)
7-day	3.73 (3.26-4.24)	4.20 (3.66-4.78)	5.00 (4.35-5.70)	5.71 (4.94-6.52)	6.74 (5.71-7.91)	7.58 (6.29-8.97)	8.45 (6.83-10.2)	9.38 (7.33-11.5)	10.7 (8.08-13.3)	11.7 (8.65-14.7)
10-day	4.25 (3.74-4.80)	4.76 (4.17-5.37)	5.62 (4.92-6.35)	6.37 (5.55-7.22)	7.45 (6.36-8.68)	8.33 (6.97-9.79)	9.24 (7.52-11.0)	10.2 (8.04-12.4)	11.5 (8.81-14.3)	12.6 (9.39-15.8)
20-day	5.82 (5.18-6.49)	6.45 (5.74-7.20)	7.50 (6.66-8.38)	8.39 (7.41-9.39)	9.62 (8.29-11.0)	10.6 (8.96-12.2)	11.6 (9.53-13.6)	12.6 (10.0-15.1)	13.9 (10.8-17.0)	14.9 (11.3-18.5)
30-day	7.20 (6.46-7.96)	7.97 (7.14-8.82)	9.21 (8.23-10.2)	10.2 (9.10-11.4)	11.6 (10.0-13.1)	12.6 (10.7-14.4)	13.6 (11.3-15.9)	14.6 (11.8-17.4)	15.9 (12.4-19.3)	16.9 (12.9-20.8)
45-day	9.02 (8.15-9.89)	9.98 (9.02-11.0)	11.5 (10.4-12.7)	12.7 (11.4-14.0)	14.2 (12.4-15.9)	15.4 (13.2-17.4)	16.4 (13.7-18.9)	17.4 (14.1-20.5)	18.6 (14.6-22.4)	19.5 (15.0-23.8)
60-day	10.6 (9.64-11.6)	11.8 (10.7-12.8)	13.5 (12.3-14.8)	14.9 (13.4-16.4)	16.6 (14.5-18.4)	17.8 (15.3-20.0)	18.9 (15.9-21.6)	19.9 (16.2-23.2)	21.0 (16.6-25.0)	21.7 (16.9-26.4)

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.

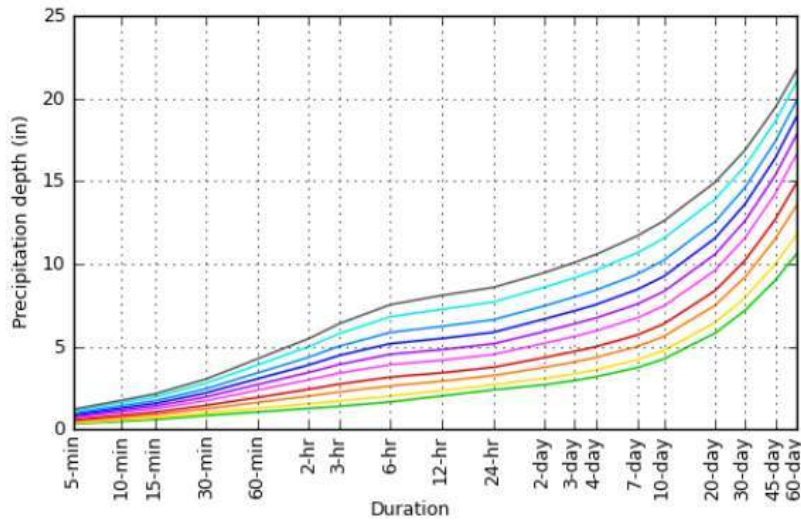


Client	WEC Energy Group			Page	3 of 4
Project	PPPP LF Run-on and Run-off Control Plan			Rev.	0
By	W. Reybrock	Chk.	A. Schwoerer	App.	A. Schwoerer
Date	06/18/2021	Date	08/23/2021	Date	08/23/2021

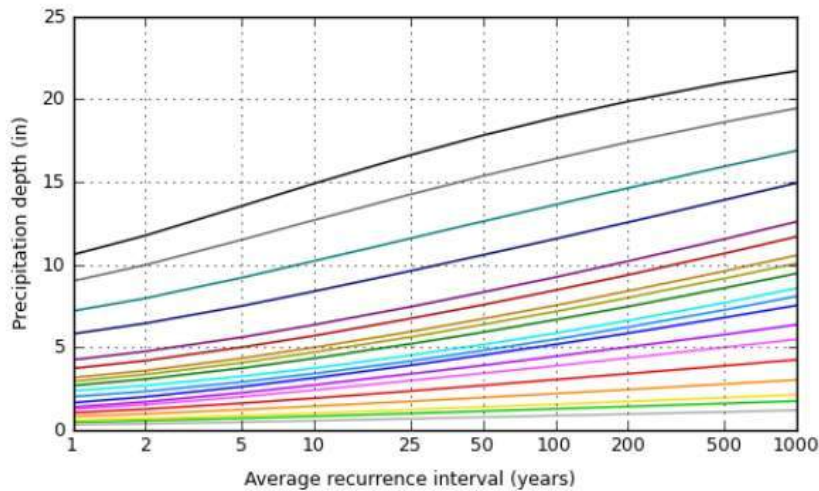
GEI Project No.	1610534	Document No.	N/A
Subject	NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume		

Graphical Output from the PFDS:

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.5649°, Longitude: -87.9019°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-day
20-day
30-day
45-day
60-day



Client	WEC Energy Group			Page	4 of 4
Project	PPPP LF Run-on and Run-off Control Plan			Rev.	0
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Date	06/18/2021	Date	08/23/2021	Date	08/23/2021

GEI Project No.	1610534	Document No.	N/A
Subject	NOAA 14, Vol. 8 Rainfall Analysis and Run-off Volume		

Background:

The active portion of Cell 1 covers approximately 1.2 acres.

Regulations:

The PPPP Landfill 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 following is a summary of the determined runoff volume from Cell 1 of the PPPP landfill. The volume was conservatively assumed to be the equal to the surface area * the rainfall depth and does not include losses related to infiltration, evaporation, or depression storage

	Precipitation	
	<i>inches</i>	<i>feet</i>
24-hr, 25-yr	4.52	0.377
25-yr Inflow Volume	0.45	<i>(acre-feet)</i>

Appendix C

Stormwater Run-on Calculations

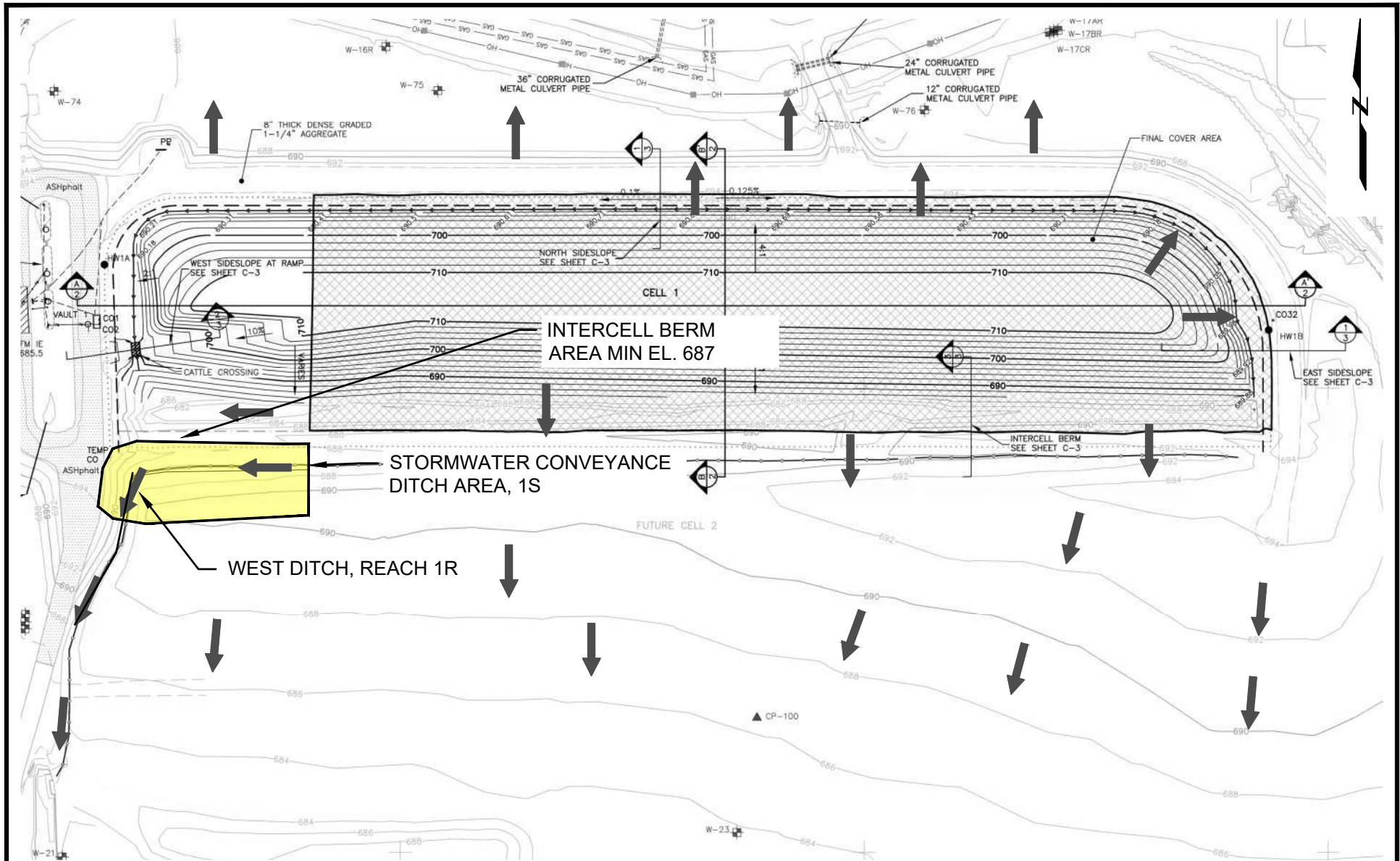
	Client	WEC Energy Group			Page	1 of 2
	Project	PPPP LF Run-on and Run-off Control Plan			Rev.	0
	By	W. Reybrock	Chk.	A. Schwoerer	App.	A. Schwoerer
	Date	06/18/2021	Date	08/23/2021	Date	08/23/2021
GEI Project No.	1610534	Document No.	N/A			
Subject	Stormwater Run-on Calculations					
<p>Purpose:</p> <p>The purpose of this calculation is to model the stormwater run-on associated with 24-hour, 25-year precipitation event at Pleasant Prairie Power Plant (PPPP) Landfill around Cell 1. In addition, this analysis was completed to confirm the current run-on control system for the construction of Cell 1 can adequately manage the 24-hour, 25-year precipitation event.</p> <p>Background:</p> <p>Perimeter berms have been established around the landfill to prevent run-on to the facility and direct run-off away from the active landfill. The perimeter berm allows access around the north, east, and west sides of the landfill. The access road constructed on top of the perimeter berms is graded to direct stormwater to the exterior of the berm away from the active landfill. Along the south side of the landfill, an intercell berm was constructed to prevent run-on from south of the landfill and to prevent run-off of contact water from the landfill. Final cover was installed over the eastern 2.6 acres of Cell 1 in 2018. The middle 3.1 acres of final cover was installed in 2020 and the final western 1.2 acres of the landfill is active. For the closed eastern 5.7 acres of the cell, the southern berm was graded to allow sheet flow into the field south of the cell. For the open western 1.2 acres of the cell, a perimeter ditch along the outboard edge of the intercell berm directs run-on stormwater to the west and southwest away from the active area. Stormwater drainage at the site is directed away from the landfill and eventually flows southward discharging to the unnamed tributaries of Jerome Creek.</p> <p>Design Criteria and Assumptions:</p> <ol style="list-style-type: none"> 1. The rainfall depth estimation for the 24-hour, 25-year event was determined to be 4.52 inches (included under a separated calculation package). The rainfall depth was determined by following procedures outlined in Precipitation-Frequency (PF) Atlas of the United States (Atlas 14, Volume 8, Version 2: Wisconsin). 2. Stormwater will be modeled to a temporary construction condition of Cell 1 prior to the commencement of Cell 2 construction. 3. HydroCAD 10.0 was used to model the stormwater on the south side of the Cell 1 intercell berm to confirm the current conveyance ditch is adequately sized to manage the 24-hour, 25-year precipitation event without allowing stormwater to enter Cell 1 of the landfill. 4. Subcatchment, and reach parameters are included in the attached HydroCAD Report. <p>Results:</p> <p>The attached HydroCAD report includes input and output for the stormwater run-off model developed for drainage swale on south of the intercell berm. Based on stormwater run-on analysis the current run-on control system for Cell 1 of PPPP landfill will be able to handle the 24-hour, 25-year precipitation event without allowing any non-contact water to enter the limits of waste. The estimated peak water level in the channel on the west side is 0.5-feet and corresponds to an elevation of 686.5 feet. The minimum height of the intercell berm is 687 feet; thus, the berm is high enough to not allow stormwater to enter the active Cell 1 area. The conveyance channel south of the intercell berm is adequately sized to prevent run-on to Cell 1 associated with the 24-hour, 25-year precipitation event.</p>						



	Client	WEC Energy Group			Page	2 of 2
	Project	PPPP LF Run-on and Run-off Control Plan			Rev.	0
	By	W. Reybrock	Chk.	A. Schwoerer	App.	A. Schwoerer
	Date	06/18/2021	Date	08/23/2021	Date	08/23/2021
GEI Project No.	1610534	Document No.	N/A			
Subject	Stormwater Run-on Calculations					

Attachments:

- Figure 1 –Stormwater Conveyance Diagram
- HydroCAD Summary Report



SOURCE:

1. PLAN BASED DWG C-1, PPPP
ASH LANDFILL CELL 1,
SUBMITTAL DATE 7/19/2021

Run-on and Run-off Control Plan
Pleasant Prairie Ash Landfill Cell #1
Pleasant Prairie, Wisconsin

We Energies
Milwaukee, Wisconsin

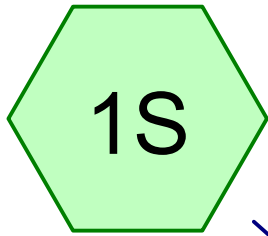


Project 1610534

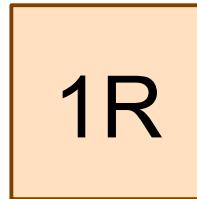
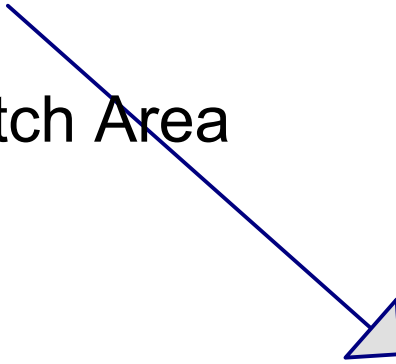
Run-On Stormwater Flow Diagram

August 2021

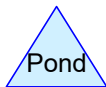
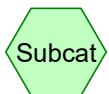
Fig. 1



Conveyance Ditch Area



West Ditch



C1610534_Cell1 Stormwater Runon_2021

Prepared by GEI Consultants

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Printed 7/21/2021

Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.419	86	Pasture/grassland/range, Poor, HSG C (1S)
0.419	86	TOTAL AREA

C1610534_Cell1 Stormwater Runon_2021

Prepared by GEI Consultants

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Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.419	HSG C	1S
0.000	HSG D	
0.000	Other	
0.419		TOTAL AREA

C1610534_Cell1 Stormwater Runon_2021

Prepared by GEI Consultants

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Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.419	0.000	0.000	0.419	Pasture/grassland/range, Poor	1S
0.000	0.000	0.419	0.000	0.000	0.419	TOTAL AREA	

C1610534_Cell1 Stormwater Runon_2021

Type II 24-hr 25-yr, 24-hr Rainfall=4.52"

Prepared by GEI Consultants

Printed 7/21/2021

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Page 5

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

Subcatchment 1S: Conveyance Ditch Area Runoff Area=18,273 sf 0.00% Impervious Runoff Depth=3.02"
Flow Length=269' Tc=5.1 min CN=86 Runoff=2.20 cfs 0.106 af

Reach 1R: West Ditch Avg. Flow Depth=0.48' Max Vel=1.44 fps Inflow=2.20 cfs 0.106 af
n=0.022 L=200.0' S=0.0025 '/' Capacity=377.56 cfs Outflow=1.99 cfs 0.106 af

Total Runoff Area = 0.419 ac Runoff Volume = 0.106 af Average Runoff Depth = 3.02"
100.00% Pervious = 0.419 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Conveyance Ditch Area

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 2.20 cfs @ 11.96 hrs, Volume= 0.106 af, Depth= 3.02"

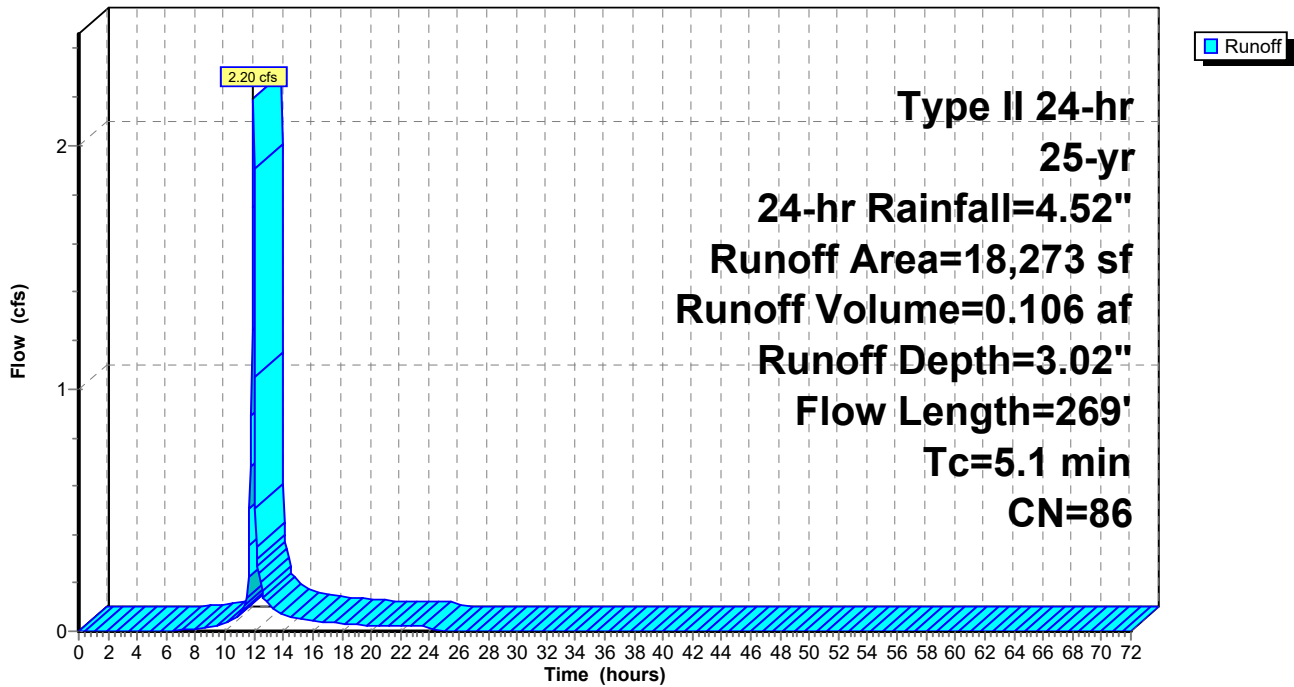
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-yr, 24-hr Rainfall=4.52"

Area (sf)	CN	Description
18,273	86	Pasture/grassland/range, Poor, HSG C
18,273		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	32	0.2500	0.34		Sheet Flow, Side Slopes Grass: Short n= 0.150 P2= 2.69"
3.5	237	0.0056	1.12		Shallow Concentrated Flow, drainage swale Grassed Waterway Kv= 15.0 fps
5.1	269	Total			

Subcatchment 1S: Conveyance Ditch Area

Hydrograph



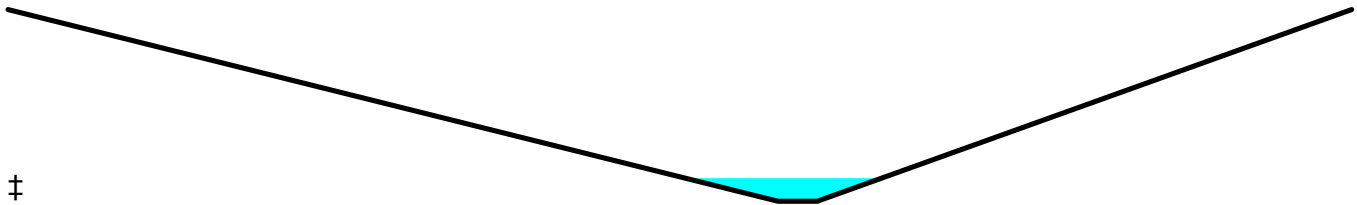
Summary for Reach 1R: West Ditch

Inflow Area = 0.419 ac, 0.00% Impervious, Inflow Depth = 3.02" for 25-yr, 24-hr event
 Inflow = 2.20 cfs @ 11.96 hrs, Volume= 0.106 af
 Outflow = 1.99 cfs @ 12.02 hrs, Volume= 0.106 af, Atten= 9%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Max. Velocity= 1.44 fps, Min. Travel Time= 2.3 min
 Avg. Velocity = 0.48 fps, Avg. Travel Time= 7.0 min

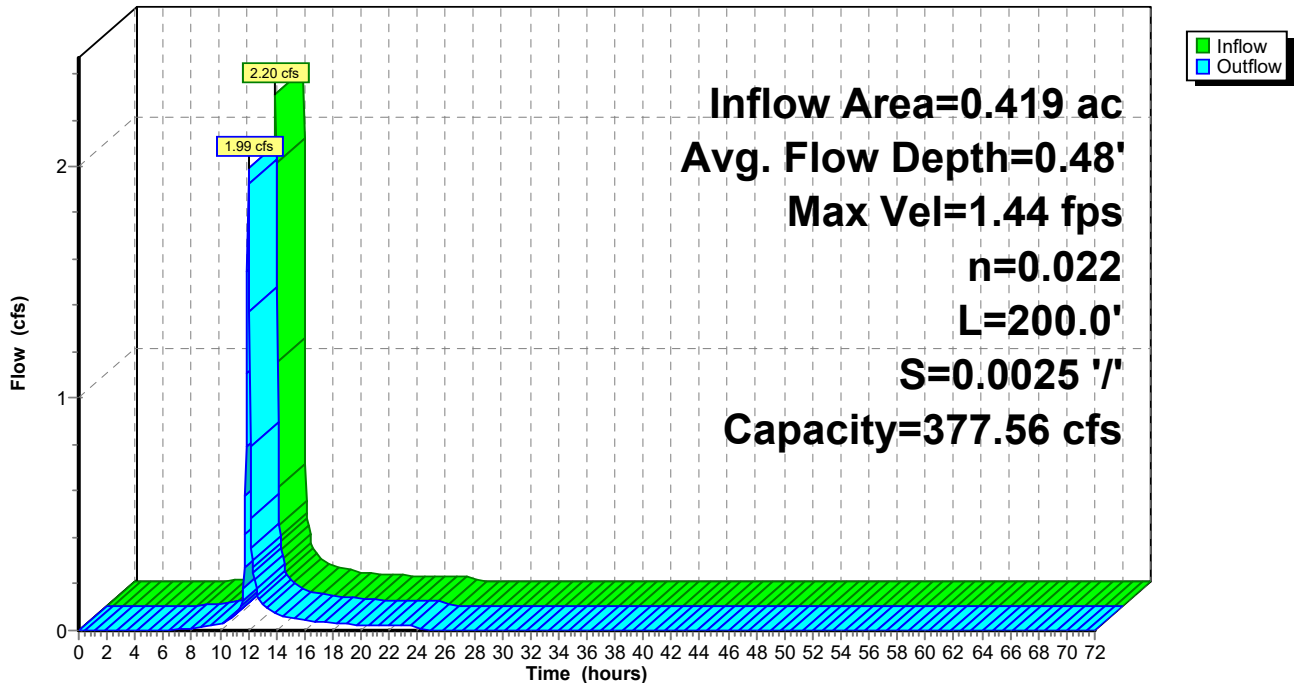
Peak Storage= 286 cf @ 11.98 hrs
 Average Depth at Peak Storage= 0.48'
 Bank-Full Depth= 4.00' Flow Area= 70.4 sf, Capacity= 377.56 cfs

1.00' x 4.00' deep channel, n= 0.022 Earth, clean & straight
 Side Slope Z-value= 4.9 3.4 '/' Top Width= 34.20'
 Length= 200.0' Slope= 0.0025 '/'
 Inlet Invert= 686.00', Outlet Invert= 685.50'



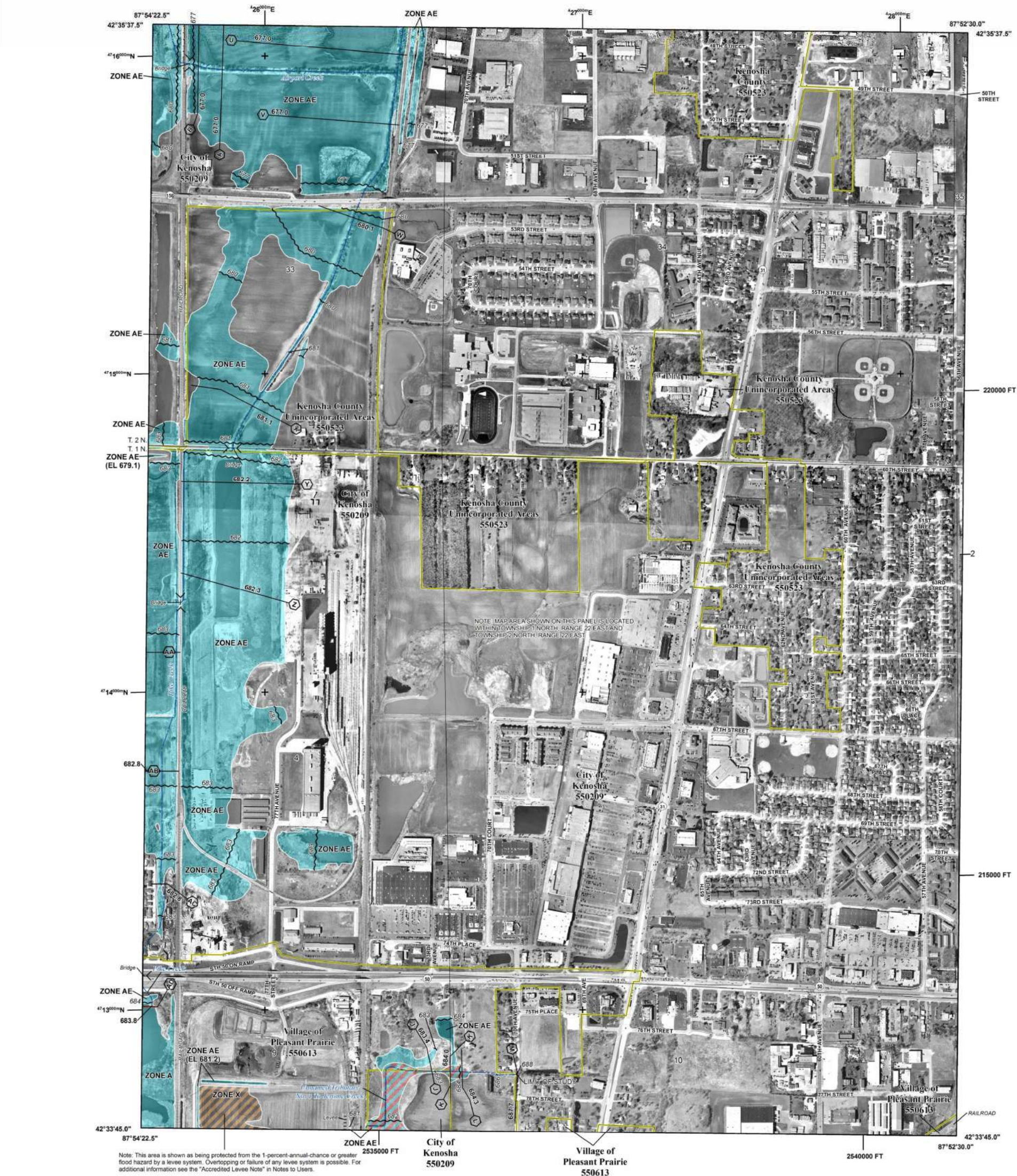
Reach 1R: West Ditch

Hydrograph



Appendix D

FEMA National Flood Insurance Rate Maps



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT [HTTP://MSC.FEMA.GOV](http://MSC.FEMA.GOV)

- SPECIAL FLOOD HAZARD AREAS**
 - Without Base Flood Elevation (BFE) Zone A, V, A99
 - With BFE or Depth, Zone AE, AO, AH, VE, AR
 - Regulatory Floodway
- OTHER AREAS OF FLOOD HAZARD**
 - 0.2 % Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
 - Future Conditions 1% Annual Chance Flood Hazard Zone X
 - Area with Reduced Flood Risk due to Levee See Notes, Zone X
- OTHER AREAS**
 - NO SCREEN Areas of Minimal Flood Hazard Zone X
 - Area of Undetermined Flood Hazard Zone D
- GENERAL STRUCTURES**
 - Channel, Culvert, or Storm Sewer
 - Levee, Dike, or Floodwall
- OTHER FEATURES**
 - Cross Sections with 1% Annual Chance Water Surface Elevation
 - Coastal Transect
 - Coastal Transect Baseline
 - Profile Baseline
 - Hydrographic Feature
 - Base Flood Elevation Line (BFE)
 - Limit of Study
 - Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with the FIRM including historic versions of this FIRM, how to order products of the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

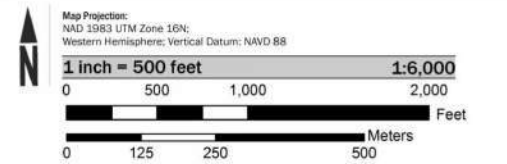
For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6623.

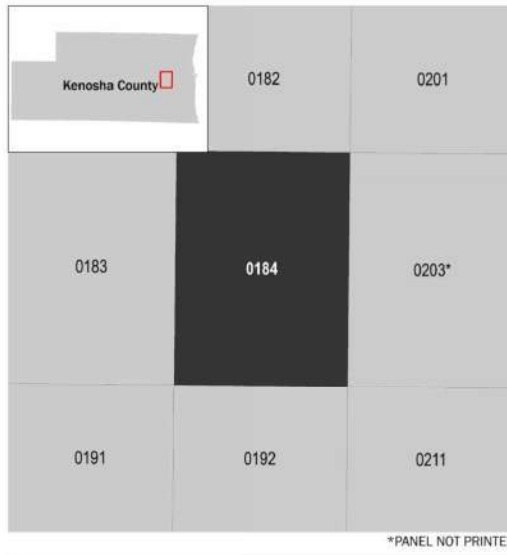
The base map information shown on this FIRM derived from digital orthophotography provided by Southeastern Wisconsin Regional Planning Commission (SEWRPC). The Orthophotography was collected in Spring of 2010 and produced at a resolution of three-inch pixel size.

ACCREDITED LEEVE NOTES TO USERS: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <http://www.fema.gov/business/nfp/index.stm>.

SCALE



PANEL LOCATOR



FEMA

National Flood Insurance Program

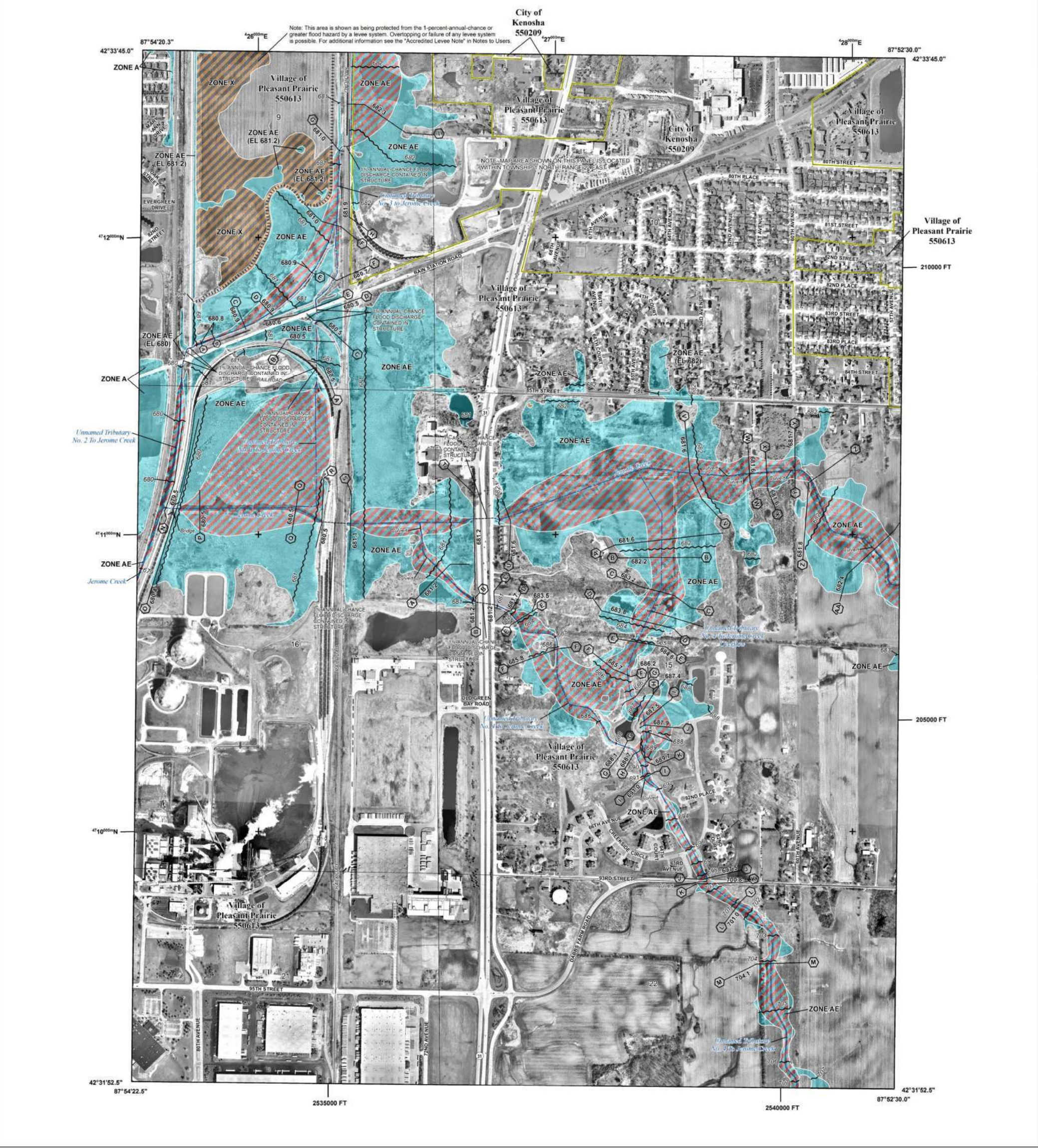
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

KENOSHA COUNTY, WI
 and Incorporated Areas

PANEL 184 of 331

COMMUNITY	NUMBER	PANEL	SUFFIX
KENOSHA COUNTY	550523	0184	E
KENOSHA, CITY OF	550209	0184	E
PLEASANT PRAIRIE, VILLAGE OF	550613	0184	E

VERSION NUMBER 2.3.3.0
 MAP NUMBER 55059C0184E
 MAP REVISED MARCH 7, 2017



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT
THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT [HTTP://MSC.FEMA.GOV](http://MSC.FEMA.GOV)

	Without Base Flood Elevation (BFE) Zone A, V, A99 With BFE or Depth, Zone AE, AO, AH, VE, AR
	Regulatory Floodway
	0.2 % Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee See Notes, Zone X
	NO SCREEN Areas of Minimal Flood Hazard Zone X
	Area of Undetermined Flood Hazard Zone D
	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	Cross Sections with 1% Annual Chance Water Surface Elevation
	Coastal Transect
	Profile Baseline
	Hydrographic Feature
	Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

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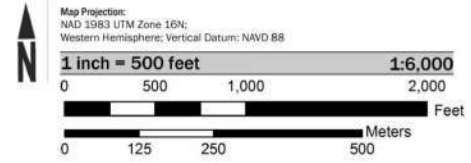
For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

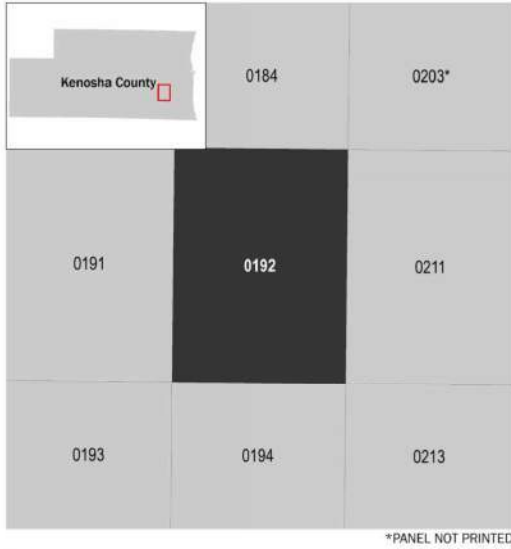
Base map information shown on this FIRM derived from digital orthophotography provided by Southeastern Wisconsin Regional Planning Commission (SEWRPC). The Orthophotography was collected in Spring of 2010 and produced at a resolution of three-inch pixel size.

ACCREDITED LEVEE NOTES TO USERS: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at <http://www.fema.gov/business/nfp/index.stm>.

SCALE



PANEL LOCATOR



National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

KENOSHA COUNTY, WI
 and Incorporated Areas

PANEL 192 of 331

COMMUNITY	NUMBER	PANEL	SUFFIX
KENOSHA COUNTY	550209	0192	E
PLEASANT PRAIRIE, VILLAGE OF	550613	0192	E

FEDERAL EMERGENCY MANAGEMENT AGENCY


VERSION NUMBER
2.3.3.0

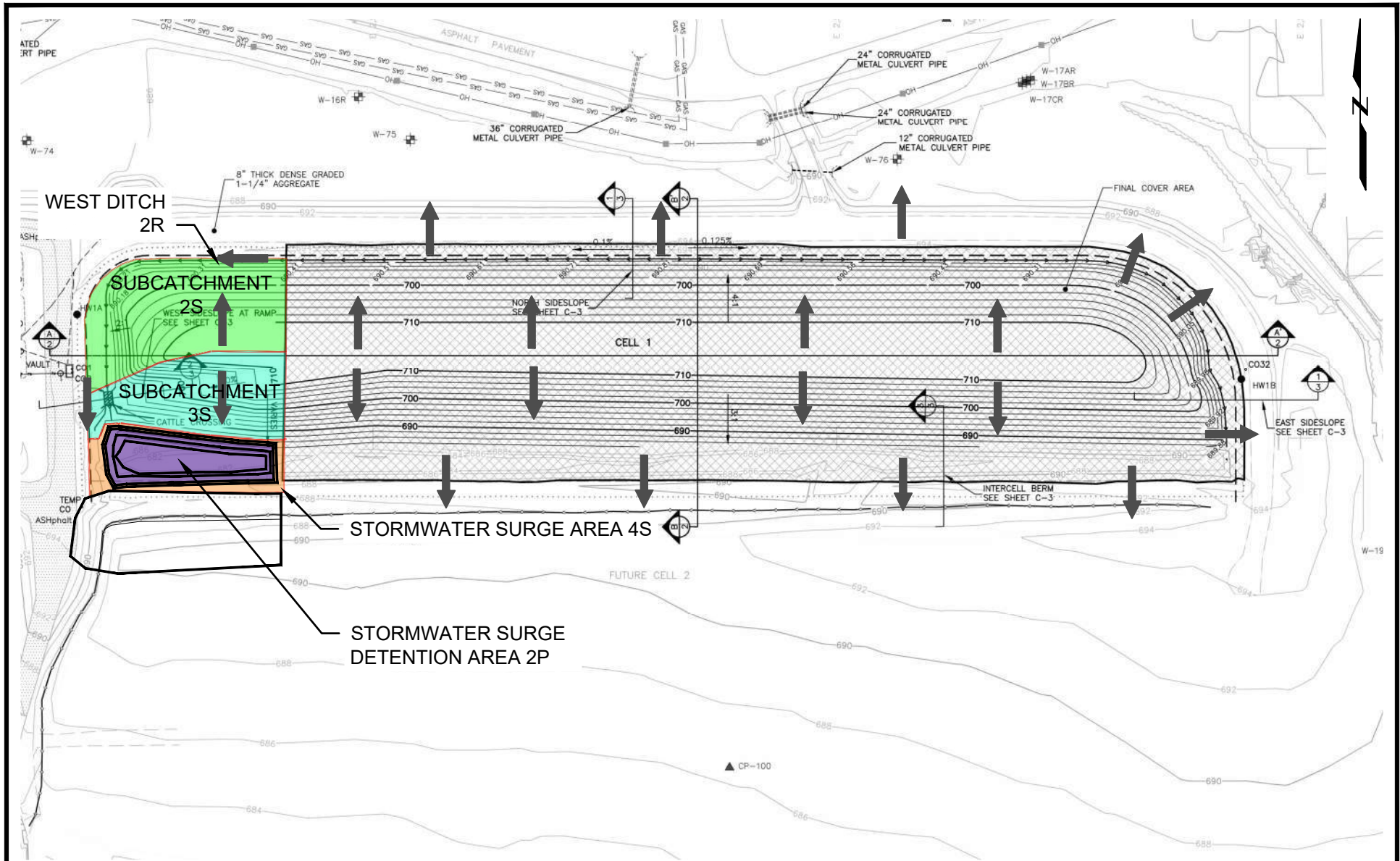
MAP NUMBER
55059C0192E

MAP REVISED
MARCH 7, 2017

Appendix E

Stormwater Run-off Calculations

	Client	WEC Energy Group			Page	1 of 1
	Project	PPPP LF Run-on and Run-off Control Plan			Rev.	0
	By	W. Reybrock	Chk.	A. Schwoerer	App.	A. Schwoerer
	Date	06/18/2021	Date	08/30/2021	Date	08/30/2021
GEI Project No.	1610534	Document No.	N/A			
Subject	Stormwater Run-off Calculations					
<p>Purpose:</p> <p>The purpose of this calculation is to model the stormwater run-off associated with 24-hour, 25-year precipitation event at Pleasant Prairie Power Plant (PPPP) Landfill from Cell 1. In addition, this analysis was completed to confirm the current run-off control system for the construction of Cell 1 can adequately manage the 24-hour, 25-year precipitation event.</p> <p>Design Criteria and Assumptions:</p> <ol style="list-style-type: none"> 1. The rainfall depth estimation for the 24-hour, 25-year event was determined to be 4.52 inches (included under a separated calculation package). The rainfall depth was determined by following procedures outlined in Precipitation-Frequency (PF) Atlas of the United States (Atlas 14, Volume 8, Version 2: Wisconsin). 2. Stormwater will be modeled to a temporary construction condition of Cell 1 prior to the commencement of Cell 2 construction. 3. The eastern 5.7 acres of the cell that has already been closed flows north, east, and south as shown in Figure 1 and is allowed to infiltrate into the ground. 4. Stormwater on the active portion of the Cell was divided into three subcatchments: north, south, and stormwater surge area, as shown on Figure 1. Flow from the north subcatchment will consist of sheet flow until it is collected by a conveyance channel at the toe of the slope. The stormwater is then transported in the conveyance channels into an intercell stormwater surge area. From the intercell stormwater surge area the water infiltrates into leachate collection granular drainage layer and is treated as leachate. The south subcatchment consists of sheet flow and is transported directly into the intercell stormwater surge area. Stormwater flowlines, subcatchments, and the intercell stormwater surge area are shown on Figure 1. 5. HydroCAD 10.0 was used to model the stormwater associated with Cell 1 of the PPPP landfill. 6. Subcatchment, reach, and detention parameters are included in the attached HydroCAD Report. <p>Results:</p> <p>The attached HydroCAD report includes input and output for the stormwater run-off model developed for Cell 1 of the PPPP landfill. Based on stormwater run-off analysis the current run-off control system for Cell 1 of PPPP landfill will be able to handle the 24-hour, 25-year precipitation event without allowing any contact water to escape the permitted limits of waste. The estimated peak water level in the west and conveyance channel is 0.95 feet. The minimum depth of the channel is 2 foot high. The intercell stormwater surge area has a minimum liner crest elevation of approximately El. 686.5 feet (berm height El. 687 feet), and the estimated water level associated with the stormwater from Cell 1 is El. 684.89 feet. Both the conveyance channels and the pond area are designed to handle the run-off from Cell 1 associated with the 24-hour, 25-year precipitation event.</p> <p>Attachments:</p> <ul style="list-style-type: none"> • Figure 1 –Stormwater Conveyance Diagram • HydroCAD Summary Report 						



SOURCE:

1. PLAN BASED DWG C-1, PPPP
ASH LANDFILL CELL 1,
SUBMITTAL DATE 7/19/2021

Run-on and Run-off Control Plan
Pleasant Prairie Ash Landfill Cell #1
Pleasant Prairie, Wisconsin

We Energies
Milwaukee, Wisconsin

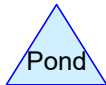
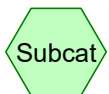
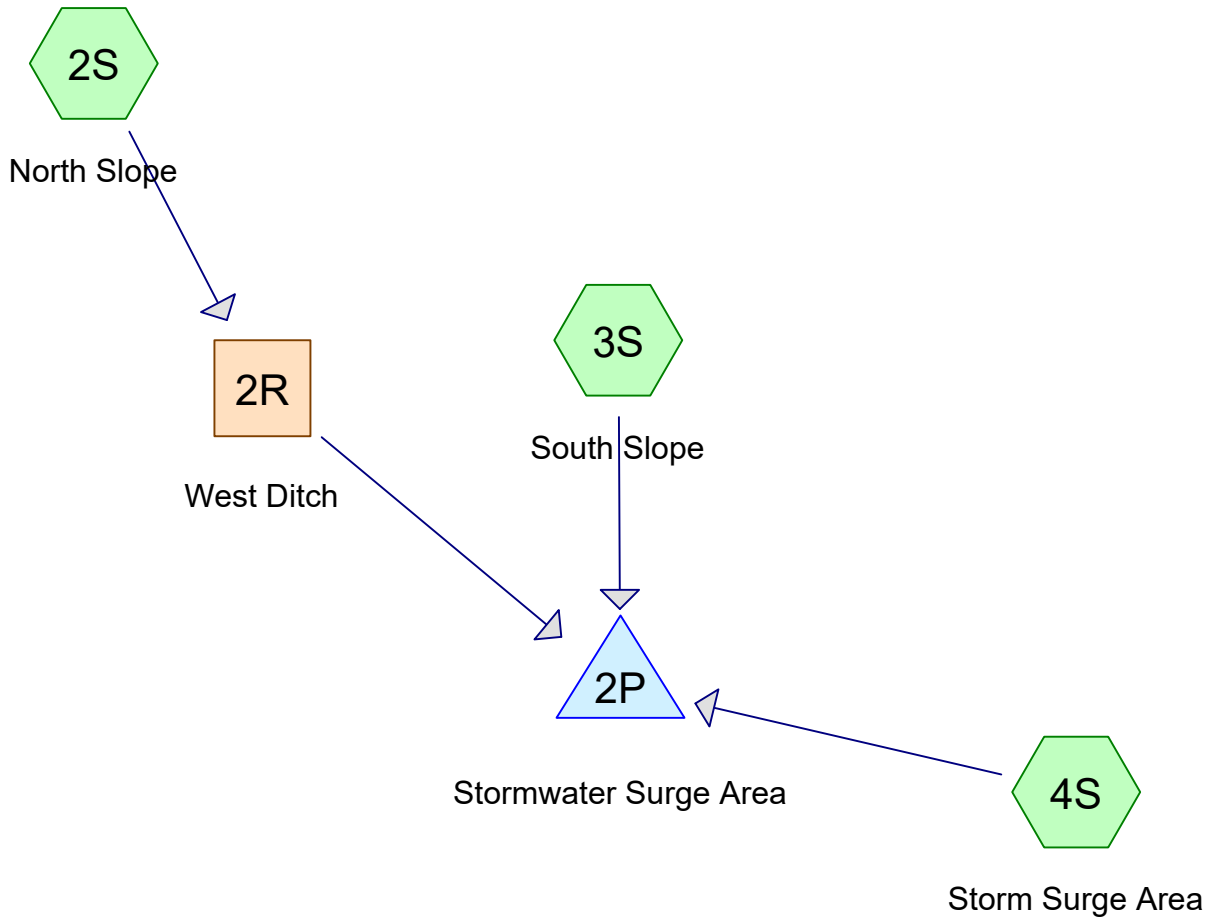


Project 1610534

Run-Off Stormwater Flow Diagram

August 2021

Fig. 1



Routing Diagram for C1610534_Cell1 Stormwater Runoff_2021
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C1610534_Cell1 Stormwater Runoff_2021

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.216	91	Newly graded area, HSG C (2S, 3S, 4S)
1.216	91	TOTAL AREA

C1610534_Cell1 Stormwater Runoff_2021

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
1.216	HSG C	2S, 3S, 4S
0.000	HSG D	
0.000	Other	
1.216		TOTAL AREA

C1610534_Cell1 Stormwater Runoff_2021

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.216	0.000	0.000	1.216	Newly graded area	2S, 3S, 4S
0.000	0.000	1.216	0.000	0.000	1.216	TOTAL AREA	

C1610534_Cell1 Stormwater Runoff_2021

Type II 24-hr 25-yr, 24-hr Rainfall=4.52"

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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

Subcatchment2S: North Slope

Runoff Area=23,440 sf 0.00% Impervious Runoff Depth=3.52"
Flow Length=100' Tc=1.3 min CN=91 Runoff=3.45 cfs 0.158 af

Subcatchment3S: South Slope

Runoff Area=16,111 sf 0.00% Impervious Runoff Depth=3.52"
Flow Length=92' Tc=1.1 min CN=91 Runoff=2.39 cfs 0.108 af

Subcatchment4S: Storm Surge Area

Runoff Area=13,397 sf 0.00% Impervious Runoff Depth=3.52"
Tc=0.0 min CN=91 Runoff=2.03 cfs 0.090 af

Reach 2R: West Ditch

Avg. Flow Depth=0.95' Max Vel=1.25 fps Inflow=3.45 cfs 0.158 af
n=0.022 L=400.0' S=0.0010 '/' Capacity=20.55 cfs Outflow=2.73 cfs 0.158 af

Pond 2P: Stormwater Surge Area

Peak Elev=684.89' Storage=15,519 cf Inflow=5.77 cfs 0.356 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.216 ac Runoff Volume = 0.356 af Average Runoff Depth = 3.52"
100.00% Pervious = 1.216 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 2S: North Slope

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 3.45 cfs @ 11.90 hrs, Volume= 0.158 af, Depth= 3.52"

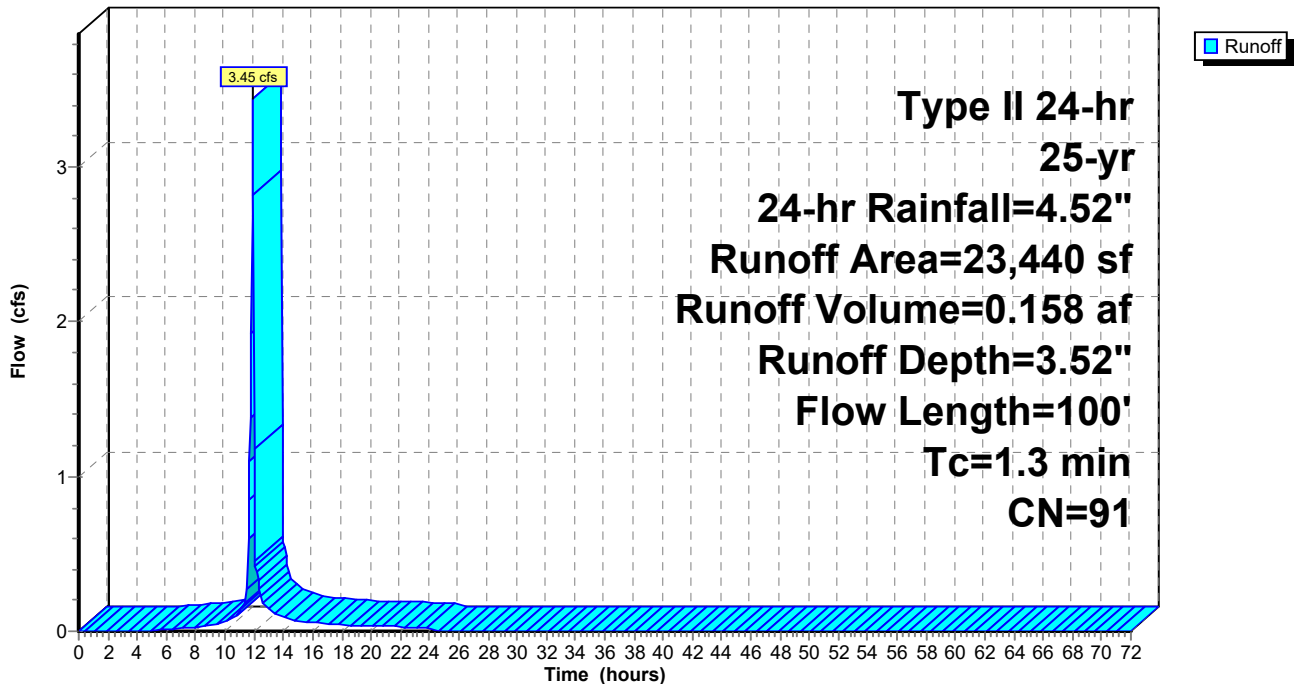
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-yr, 24-hr Rainfall=4.52"

Area (sf)	CN	Description
* 23,440	91	Newly graded area, HSG C
23,440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	32	0.0050	0.58		Sheet Flow, Top of slope Smooth surfaces n= 0.011 P2= 2.69"
0.4	68	0.2500	3.21		Sheet Flow, Side Slope Smooth surfaces n= 0.011 P2= 2.69"
1.3	100	Total			

Subcatchment 2S: North Slope

Hydrograph



Summary for Subcatchment 3S: South Slope

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 2.39 cfs @ 11.90 hrs, Volume= 0.108 af, Depth= 3.52"

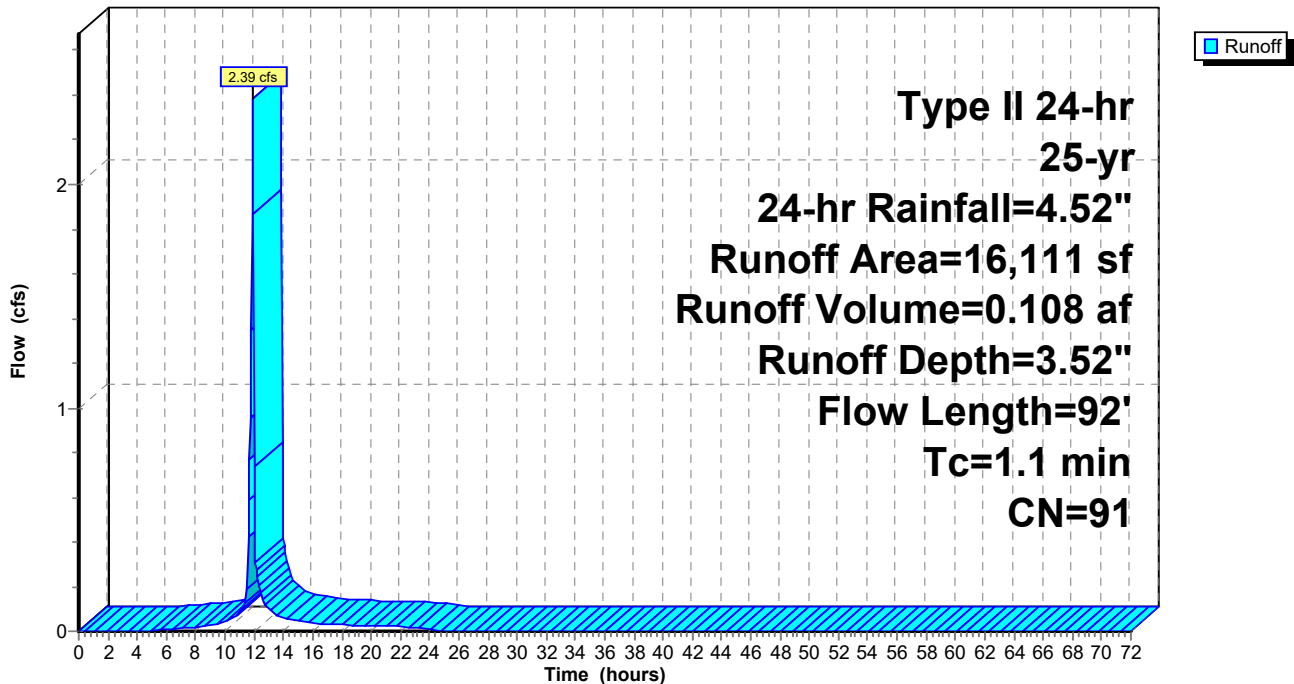
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-yr, 24-hr Rainfall=4.52"

Area (sf)	CN	Description
16,111	91	Newly graded area, HSG C
16,111		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	26	0.0050	0.55		Sheet Flow, Top of Slope Smooth surfaces n= 0.011 P2= 2.69"
0.3	66	0.3330	3.57		Sheet Flow, Side Slope Smooth surfaces n= 0.011 P2= 2.69"
1.1	92	Total			

Subcatchment 3S: South Slope

Hydrograph



Summary for Subcatchment 4S: Storm Surge Area

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

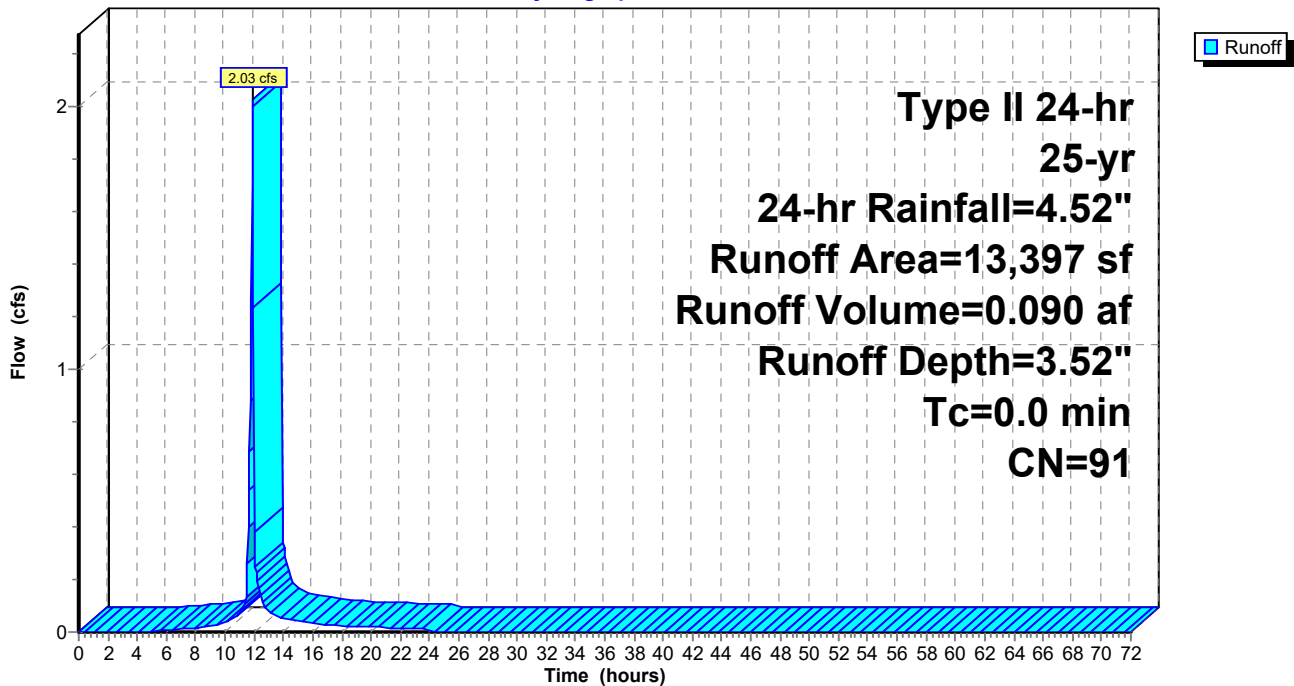
Runoff = 2.03 cfs @ 11.89 hrs, Volume= 0.090 af, Depth= 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-yr, 24-hr Rainfall=4.52"

Area (sf)	CN	Description
13,397	91	Newly graded area, HSG C
13,397		100.00% Pervious Area

Subcatchment 4S: Storm Surge Area

Hydrograph



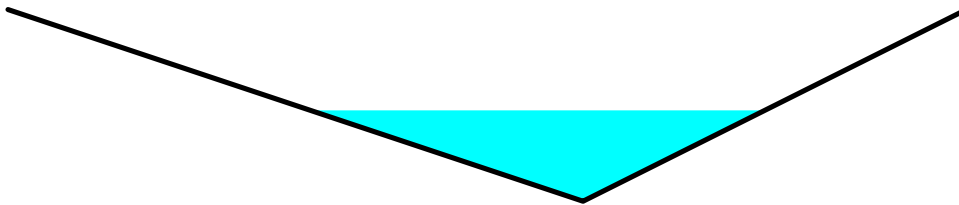
Summary for Reach 2R: West Ditch

Inflow Area = 0.538 ac, 0.00% Impervious, Inflow Depth = 3.52" for 25-yr, 24-hr event
 Inflow = 3.45 cfs @ 11.90 hrs, Volume= 0.158 af
 Outflow = 2.73 cfs @ 12.04 hrs, Volume= 0.158 af, Atten= 21%, Lag= 8.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Max. Velocity= 1.25 fps, Min. Travel Time= 5.3 min
 Avg. Velocity = 0.38 fps, Avg. Travel Time= 17.5 min

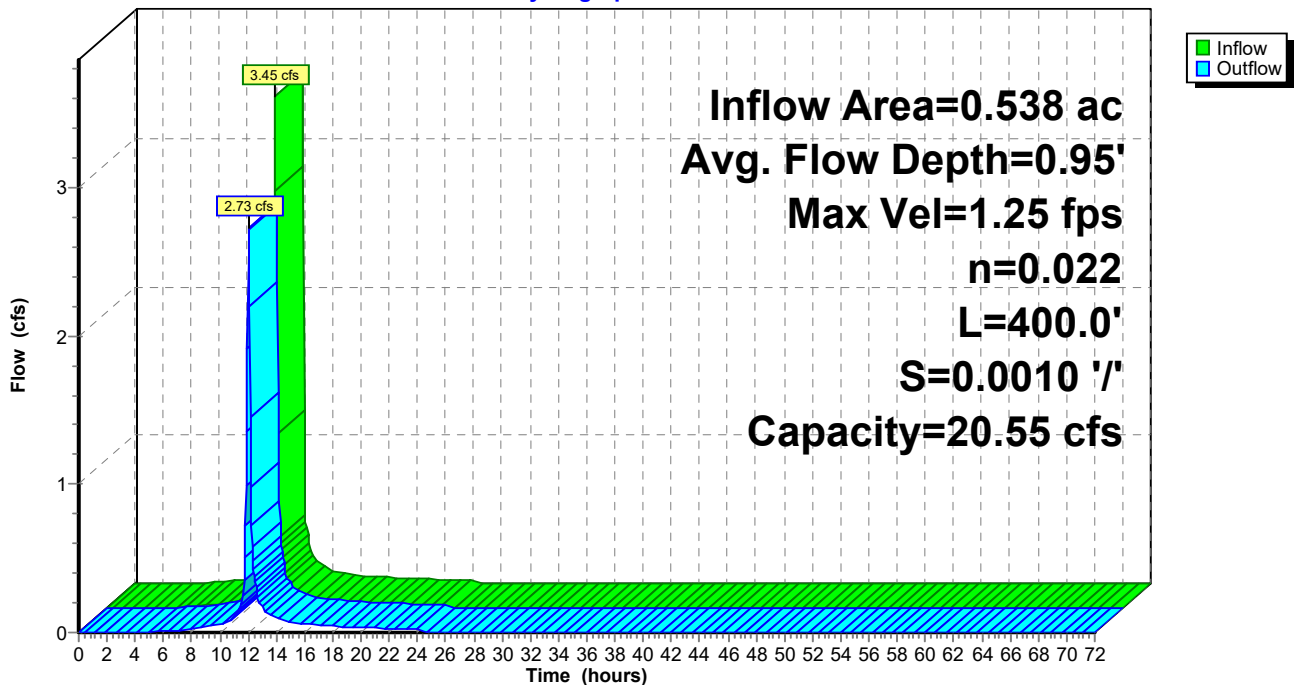
Peak Storage= 899 cf @ 11.95 hrs
 Average Depth at Peak Storage= 0.95'
 Bank-Full Depth= 2.00' Flow Area= 10.0 sf, Capacity= 20.55 cfs

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= 400.0' Slope= 0.0010 '/'
 Inlet Invert= 690.47', Outlet Invert= 690.06'



Reach 2R: West Ditch

Hydrograph



Summary for Pond 2P: Stormwater Surge Area

Inflow Area = 1.216 ac, 0.00% Impervious, Inflow Depth = 3.52" for 25-yr, 24-hr event
 Inflow = 5.77 cfs @ 11.91 hrs, Volume= 0.356 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
 Peak Elev= 684.89' @ 50.30 hrs Surf.Area= 7,188 sf Storage= 15,519 cf

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	682.00'	33,825 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
682.00	3,868	0	0
684.00	5,846	9,714	9,714
686.00	8,858	14,704	24,418
687.00	9,956	9,407	33,825

Pond 2P: Stormwater Surge Area

Hydrograph

