APPENDIX B
RUN-ON/ RUN-OFF CONTROL SYSTEM PLAN

Run-on and Run-off Control System Plan

WEC Temporary Ash Disposal Area

Public Power Generation Agency/
Hastings Utilities/City of Hastings, Nebraska

Gerald T. Whelan Energy Center

Hastings, Nebraska

August 6, 2021

WEC Temporary Ash Disposal Area
Run-On and Run-Off Control System Plan

Table of Contents

Attachments

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WEC Temporary Ash Disposal Area
Run-On and Run-Off Control System Plan

Professional Engineer Certification

"I hereby certify that this Run-on and Run-off Control System Plan for the CCR landfill to be known as the WEC Temporary Ash Disposal Area located at the Whelan Energy Center, operated by Hastings Utilities/City of Hastings, Nebraska meets the requirements of the Coal Combustion Residual Rule Title 40 of the Code of Federal Regulations (CFR) §257.81 and that I am a duly licensed Professional Engineer under the laws of the State of Nebraska."

Print Name: Lori J. Calub

Signature: Lori J. Calub

Date: 8-6-2021

License #: E-9881

My license renewal date is December 31, 2021.

I. Introduction

A. Purpose

On April 17, 2015 the U.S. Environmental Protection Agency (EPA) published 40 CFR 257 the Disposal of Coal Combustion Residuals for Electrical Utilities (CCR rule) for the regulation and management of coal combustion residuals (CCR) under the Resource Conservation and Recovery Act (RCRA). The 40 CFR §257.81 requires that an owner or operator of a CCR landfill prepare an initial run-on and run-off control system plan. The plan must document how the control systems have been designed and constructed to meet the applicable requirements of the CCR rule, supported by appropriate engineering calculations. In accordance with 40 CFR §257.81, the intent of stormwater management is to 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. Run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under 40 CFR §257.3-3. 40 CFR §257.3-3 references to the National Pollutant Discharge Elimination System (NPDES) permit program.

The Nebraska Department of Environment and Energy (NDEE) Title 132 Integrated Solid Waste Management Regulations have long required fossil fuel combustion ash disposal areas to design, construct and maintain run-on/run-off control systems (Title 132 Chapter 4 §003.04E) with criteria similar to that included in the CCR Rule criteria above. Title 132 Chapter 4 §004.05 surface water requirements further describe run-off from active portion of a fossil fuel combustion ash disposal area shall not cause a discharge of pollutants into waters of the State, including wetlands, that violate any requirements of the NPDES permit or cause the discharge of a non-point source of pollution to waters of the State that violate any requirements of an area-wide or state-wide water quality management plan.

B. Facility Background

The WEC Temporary Ash Disposal Area is a fossil fuel combustion ash disposal area that receives CCR generated by the Whelan Energy Center. The Whelan Energy Center (WEC) consists of two fossil fuel combustion units. WEC Unit No. 1 (WEC1) is owned by City of Hastings and operated by Hastings Utilities, which is the utilities department for the City of Hastings, Nebraska. WEC Unit No. 2 (WEC2) is owned by Public Power Generation Agency (PPGA) and Hastings Utilities/City of Hastings (Hastings) is a partner and designated operating agent for PPGA. WEC1 commercial operations began in 1981; WEC2 commercial operation began May 1, 2011. The coal combustion and emission controls generate different CCR materials.

CCR material from WEC1 is currently discharged to the WEC Temporary Ash Disposal Area as an ash slurry (fossil fuel combustion fly ash and bottom ash combined with service water). The

service water is used to facilitate the transfer through pipes and placement of the CCR. The service water used to sluice the WEC1 CCR is derived from on-site production wells (Wells A, B, and C) and Well D (when in service) located west of the WEC site. With the retrofit to a CCR landfill and ceasing coal combustion in WEC1 by October 2023, CCR will no longer be sluiced into the WEC Temporary Ash Disposal Area.

CCR material from WEC2 is directed to silos for temporary storage. Fly ash from WEC2 silos is removed dry directly from the silo into enclosed trucks for off-site markets. Scrubber ash from WEC2 silos is loaded moisture-conditioned into a dump truck and hauled to the WEC Temporary Ash Disposal Area. Bottom ash from WEC2 is collected within the plant from the submerged chain conveyor into a dump truck and hauled to the WEC Temporary Ash Disposal Area. Currently WEC2 bottom ash contact water is discharged separately to the WEC Temporary Ash Disposal Area. With the retrofit to a CCR landfill, the bottom ash effluent will no longer be discharged to the WEC Temporary Ash Disposal Area.

C. Plan Amendment

This Run-On and Run-Off Control System Plan addresses the current conditions and run-off control for the WEC Temporary Ash Disposal Area. At a minimum, this Plan must be reviewed, updated if needed, and re-certified every five years pursuant to the CCR rule. This Plan must also be amended when something changes in operations or at the site which impacts the run-on/run-off control systems.

II. Run-On Control System

The run-on control system for the WEC Temporary Ash Disposal Area consists of perimeter roads, ditches and grading sloped away from the landfill to prevent and minimize stormwater run-on. As shown on Figure 1, the disposal area is bounded by a perimeter roadway which limits run-on. The potential for run-on from the north and east was evaluated. Capacity flow calculations of the culverts managing the stormwater flow are included in Attachment 2. Calculations show that culverts and disposal area have sufficient capacity during the 25-year, 24-hour storm event to prevent run-on from the south storage to the active disposal area.

Precipitation falling on the outside of the perimeter road embankments is managed and monitored in accordance with NPDES Permit No. NE0113506-001 under the terms and conditions of the General NPDES Permit Number NER910435 for Storm Water Discharges from Industrial Activity to Waters of the State of Nebraska.

III. Run-Off Control System

The run-off control system for the WEC Temporary Disposal Area currently consists of collecting run-off within the disposal area prior to subsequent management. The run-off is from precipitation falling inside of the cell, the run-on areas, and portions of the perimeter roadway which slope inwards. The run-off contributing drainage area is approximately 30 acres,

generally split into the West Area and East Area of the WEC Temporary Ash Disposal Area. The total run-on and run-off volumes are calculated for each area for the design storm (25-year 24-hour event) and for a 100-yr 24-hour storm event. This includes sluiced liquid volumes during each 24-hr event, and run-on areas calculated. Calculations show the disposal area has sufficient capacity to hold the volumes generated without discharging to the south leachate retention pond.

Based on current topography, the East Area and West Area both have low lying areas to the south within the WEC Temporary Ash Disposal Area boundary that can contain a 100-yr 24-hr storm event at approximately 4-ft depth of water, while maintaining 1-ft of freeboard.

At times, liquid storage in the disposal area decreases, generally due to fluctuations in operations (hauling for beneficial reuse) or extended rainy periods. As those conditions develop, the site has existing culverts to connect and convey run-on/run-off to the existing leachate retention pond. Attachment 2 includes capacity calculations showing the culverts, outlet structures, and pond are adequately sized for the design storm.

IV. Future Run-Off Control – CCR Landfill

The future planned retrofit is proposed to construct a 6-acre lined CCR landfill and leachate pond in the northeast corner of the current disposal area after that area has been clean closed (i.e., removal of CCR, visual observation and sampling of base grade to confirm CCR removal). Current conditions direct run-on and run-off towards the south leachate retention pond, including sluicing liquids. When the retrofit area is constructed, about 6-acres will be removed from the area directed to the south, and instead that run-on/run-off will be managed separately. Shortly after the retrofit construction, sluicing operations will cease and more areas of the current disposal area are clean closed. For the current structures to the south, the retrofit construction and phased clean closure sequencing decreases demands on the system with each phase.

Attachment 1 shows the run-on/run-off calculation for the proposed new leachate pond. The run-on area is 6-acres, including the lined leachate pond. The calculation shows the pond contains the design 25-yr 24-hr storm, as well as the 100-yr 24-hr storm, and an estimated 2-weeks of leachate storage, allowing operations time to drain the pond after major storm events.

The separate storage stockpiles of bottom ash and scrubber (lime) ash are located within the CCR landfill boundary at least 10 feet from the perimeter of the landfill which allows drainage channels to direct run-off around the stockpiles and to the southwest. The stockpiles are temporary storage of CCR prior to loading and haul off-site for beneficial uses. CCR will be placed in the stockpiles and graded in such a manner to minimize ponding against the stockpiles. All 25-year, 24-hour stormwater run-off from the stockpiles is collected within the active CCR landfill retrofit area and gravity drained to the leachate pond prior to pumping. The projections of CCR generation and beneficial reuse (fly ash, bottom ash and scrubber ash) in the NDEE Title 132 permit shows no measurable net increase in CCR disposed in the landfill.

Scrubber ash management will include monitoring the stockpile footprint to minimize encroachment into the leachate pond area such that storage volume continues to be provided for the 25-year, 24-hour storm event. Although the size of the stockpiles will vary seasonally with beneficial reuse, run-off will still be collected, contained and controlled within the landfill footprint prior to further management.

Leachate pond water levels will be observed after storm events and during the CCR weekly inspection. When pond levels reach approximately 4-ft depth, Hastings personnel will normally begin pumping operations if it is safe for operators given the weather conditions. Run-off from the 25-year, 24-hour storm event may not begin pumping until after the storm ends for personnel safety. The site will operate a pump from the north or east leachate pond berm as needed. Pumping for the 25-year, 24-hour storm event will take approximately 70 hours (111,245 cubic feet (cf) x 7.48 gallons/cf ÷ 200 gallons per minute (gpm) ÷ 60 minutes/hour) provided a pump is used rated for approximately 200 gpm. If leachate is loaded out and hauled off site rather than used for dust control within the CCR landfill, pumping will take longer. In case of pump issues, the Hastings personnel will obtain a back-up pump from other City departments or through rental in order to prevent more than one foot of head on the liner for longer than 24 hours.

At this time, sampling of stormwater run-off from the WEC Temporary Ash Disposal Area has not been required by the NPDES permits. Sampling and management of run-off will be handled pursuant to the NPDES Permit NER910435 for Storm Water Discharges from Industrial Activity to Waters of the State of Nebraska or NPDES Permit No. NE0113506-001 for Industrial Wastewater, as may be updated with the NDEE. Plant personnel will regularly pump run-off water collected in the leachate pond, as described above, to maintain capacity for storm events. There is no unregulated stormwater run-off discharging off-site from the WEC property.

This Plan will be amended if CCR filling and disposed ash elevations further impact the run-off containment during active operations.

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Attachment 1

Leachate Pond Sizing

Project: WEC
Subject: Stormwater
Task: Leachate Pond Sizing

Computed by: G. Becker Date: 7/22/21
Checked by: K. Kinley Date: 7/28/2021

Objective: Demonstrate leachate pond can manage a 25-yr 24-hr storm event and two weeks of leachate storage.
References: Site data, historic calculations

Assumptions: 25-yr 24 hr storm event is 5.11-inches for Hastings, NE. (NOAA Atlas 14 Vol 8 Version 2)
100-yr 24 hr storm event is 6.70-inches for Hastings, NE. (NOAA Atlas 14 Vol 8 Version 2)

Pond design information:

Base elevation of pond	1874	ft
Top elevation	1884	ft
Volume to 1880 (2-ft depth)	28,592	cubic feet
Volume to 1880 (4-ft depth)	63,206	cubic feet
Volume to 1880 (6-ft depth)	104,416	cubic feet
Volume to 1882 (8-ft depth)	152,799	cubic feet
Volume to 1884 (top of pond elevation)	208,929	cubic feet

Design operating range. Pond shall be pumped to maintain leachate levels below 4-ft.
This maintains an estimated 145,723-cf of storage for the design storm event.
The design storm event, 25-yr 24-hr fits can be managed within the pond with freeboard.
The 100-yr 24-hr storm event is also checked for this design and is managed without exceeding 1-ft of leachate head on the cell liner.

Calculations:

Rainfall Volume:

25-yr 24-hr Storm Event			*100-yr 24-hr Storm Event*		
Drainage Area (Cell and Pond):	6	acres	Drainage Area (Cell and Pond):	6	acres
Drainage Area (Cell and Pond):	261,360	square feet	Drainage Area (Cell and Pond):	261,360	square feet
25 year, 24 hour storm rainfall:	5.11	inches	100 year, 24 Hour storm rainfall:	6.70	inches
25 year, 24 hour storm rainfall:	0.43	feet	100 year, 24 Hour storm rainfall:	0.56	feet
Est. percent runoff for cover material and pond:	98%		Est. percent runoff for cover material and pond:	98%	
Stormwater Volume in Rain Event:	109,070	cubic feet	Stormwater Volume in Rain Event:	143,007	cubic feet

Leachate Volume:

HELP Model Leachate Generation Est.	232	gal/acre/day	HELP Model Leachate Generation Est.	232	gal/acre/day
Generation for about 5-acres	1,160	gal/day	Generation for about 5-acres	1,160	gal/day
Required Storage Estimate for 2-Weeks:	16,240	gal/2-weeks	Required Storage Estimate for 2-Weeks:	16,240	gal/2-weeks
	2,171	cubic feet/ 2-weeks		2,171	cubic feet/ 2-weeks
Total capacity required (25-yr 24-hr storm)	111,241	cubic feet	Total capacity required (100-yr 24-hr storm)	145,178	cubic feet

Conclusion: The pond designed with the proposed retrofit manages the design 25yr-24hr storm event and 2-weeks of leachate volume. Operations will monitor pond levels and load out leachate when levels exceed about 4-ft. Leachate may be used in the lined retrofit area for dust control.

Attachment 2

Current Conditions

Runon/Runoff Calculations

Project: WEC
Subject: Stormwater - Retrofit
Task: Hydraulic Calculations

Computed by: K. Kinley Date: 8/1/2021
Checked by: L. Calub Date: 8/2/2021

Objective: Demonstrate disposal areas can manage a 100-yr 24-hr storm event before retrofit liner is installed (current conditions).

References: Site data, historic calculations
Hydraflow, Mannings

Assumptions: 25-yr 24 hr storm event is 5.11-inches on site. (NOAA Atlas 14 Vol 8 Version 2)
100-yr 24 hr storm event is 6.70-inches on site. (NOAA Atlas 14 Vol 8 Version 2)

Calculations: *Drainage Areas*

n for smooth surfaces	0.011	0.015

	Sheet Flow (ft)*	Channel Flow (ft)*	Acres	Peak flow (cfs)	Total Volume (cf in 24-hrs)
North Runon	50	1500	4.7	46.8	117,881
WEC1 Ash Sluice**	na	na	10-in forcemain	0.62	53,568
WEC2 Fly Ash Sluice	na	na	10-in forcemain	0	0
West Disposal Area	300	600	11.3	102.36	267,957
			Totals for west disposal area	**149.78**	**439,406**
East Runon	100	0	2.3	23.44	52,442
East Disposal Area	300	400	11.9	107.8	282,184
			Totals for east disposal area	**131.24**	**334,626**

*slopes subject to change with operations. Generally low slope. Modeled with 0.5%.
**400,000 GPD

Current Conditions - No discharge

Under current conditions, there is estimated to be no discharge during the 100-yr 24-hr storm event. Operations change over time on site. In order to maintain no discharge for each area, the 100-YR 24-hr volume must be held within the disposal area with 1-ft of freeboard.

Current elevation of ponded water is estimated at elev. 1893 by the site:

	Req. Storage (cf)	Area Req. if 4-ft deep (SF)
West Disposal Area	439,406	109,852
East Disposal Area	334,626	83,657

Future Conditions - Discharge to Leachate Pond
In the event the disposal area operations displace stormwater storage volume, the discharge structures will be utilized. Assumptions are as follows:

1. Starting pool elevation is 1892.5 (limited storage before riser discharge)
2. Storage is limited to 5,000-sf, 3:1 side slopes, and maximum elevation is 1898 (approx. inlet clear area)
3. Outflow culverts are modeled as 'dual barrel' to estimate peak storage.

Total flow to the leachate pond= 774,032 cf for 24-hrs
Leachate pond storage*= 1,568,160 cf
*Elevation 1884 to 1893, est. available for storage. Leachate Pond is 5.2 acres.

Conclusion: In the 100-yr storm event, the stormwater is contained within the disposal areas without overtopping. At such time that a disposal area no longer has the storage required, the discharge culverts will be hydraulically connected and utilized, and spillways reshaped. The discharge culverts are estimated to control the design storm without exceeding the berm elevation.

NOAA Atlas 14, Volume 8, Version 2
Location name: Hastings, Nebraska, USA*
Latitude: 40.5791°, Longitude: -98.314°
Elevation: 1898.24 ft**
* source: ESRI Maps
** source: USGS

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	**0.364** (0.290-0.466)	**0.431** (0.342-0.551)	**0.542** (0.429-0.695)	**0.637** (0.501-0.818)	**0.771** (0.588-1.01)	**0.877** (0.654-1.15)	**0.986** (0.711-1.31)	**1.10** (0.760-1.48)	**1.25** (0.834-1.71)	**1.37** (0.890-1.88)
10-min	**0.533** (0.424-0.683)	**0.631** (0.501-0.807)	**0.794** (0.628-1.02)	**0.932** (0.734-1.20)	**1.13** (0.861-1.48)	**1.28** (0.957-1.69)	**1.44** (1.04-1.92)	**1.61** (1.11-2.17)	**1.83** (1.22-2.50)	**2.01** (1.30-2.75)
15-min	**0.650** (0.517-0.832)	**0.769** (0.611-0.985)	**0.968** (0.766-1.24)	**1.14** (0.895-1.46)	**1.38** (1.05-1.80)	**1.57** (1.17-2.06)	**1.76** (1.27-2.34)	**1.96** (1.36-2.64)	**2.24** (1.49-3.05)	**2.45** (1.59-3.36)
30-min	**0.934** (0.743-1.20)	**1.11** (0.880-1.42)	**1.40** (1.11-1.79)	**1.65** (1.30-2.11)	**1.99** (1.52-2.60)	**2.26** (1.69-2.98)	**2.54** (1.83-3.38)	**2.83** (1.96-3.81)	**3.22** (2.14-4.39)	**3.52** (2.28-4.82)
60-min	**1.21** (0.958-1.54)	**1.43** (1.13-1.83)	**1.81** (1.43-2.32)	**2.14** (1.68-2.75)	**2.63** (2.01-3.45)	**3.02** (2.26-3.99)	**3.44** (2.48-4.59)	**3.87** (2.69-5.24)	**4.49** (2.99-6.14)	**4.97** (3.23-6.82)
2-hr	**1.48** (1.19-1.87)	**1.74** (1.40-2.20)	**2.21** (1.77-2.80)	**2.63** (2.10-3.34)	**3.26** (2.53-4.25)	**3.78** (2.86-4.94)	**4.33** (3.17-5.73)	**4.92** (3.46-6.59)	**5.75** (3.89-7.81)	**6.42** (4.22-8.72)
3-hr	**1.62** (1.31-2.04)	**1.91** (1.54-2.40)	**2.43** (1.96-3.05)	**2.91** (2.33-3.66)	**3.63** (2.85-4.72)	**4.24** (3.24-5.53)	**4.90** (3.61-6.46)	**5.61** (3.98-7.49)	**6.63** (4.52-8.96)	**7.46** (4.94-10.1)
6-hr	**1.88** (1.54-2.33)	**2.21** (1.80-2.73)	**2.80** (2.28-3.48)	**3.36** (2.72-4.18)	**4.21** (3.34-5.43)	**4.94** (3.82-6.37)	**5.73** (4.28-7.48)	**6.59** (4.73-8.72)	**7.83** (5.41-10.5)	**8.83** (5.92-11.8)
12-hr	**2.12** (1.76-2.60)	**2.52** (2.08-3.08)	**3.21** (2.65-3.94)	**3.83** (3.14-4.70)	**4.74** (3.79-6.00)	**5.50** (4.28-6.97)	**6.29** (4.74-8.09)	**7.14** (5.18-9.31)	**8.34** (5.82-11.0)	**9.29** (6.30-12.3)
24-hr	**2.45** (2.05-2.96)	**2.85** (2.38-3.44)	**3.56** (2.96-4.30)	**4.18** (3.46-5.07)	**5.11** (4.13-6.38)	**5.88** (4.64-7.37)	**6.70** (5.11-8.50)	**7.57** (5.55-9.75)	**8.80** (6.22-11.5)	**9.78** (6.72-12.8)
2-day	**2.80** (2.37-3.33)	**3.21** (2.71-3.82)	**3.93** (3.31-4.68)	**4.57** (3.82-5.46)	**5.52** (4.51-6.79)	**6.30** (5.02-7.79)	**7.13** (5.50-8.94)	**8.01** (5.95-10.2)	**9.26** (6.63-12.0)	**10.3** (7.14-13.3)
3-day	**3.02** (2.57-3.56)	**3.46** (2.94-4.08)	**4.22** (3.57-4.99)	**4.89** (4.12-5.80)	**5.87** (4.82-7.15)	**6.67** (5.35-8.17)	**7.51** (5.83-9.34)	**8.40** (6.28-10.6)	**9.63** (6.95-12.4)	**10.6** (7.45-13.7)
4-day	**3.21** (2.74-3.77)	**3.68** (3.14-4.32)	**4.48** (3.82-5.27)	**5.18** (4.39-6.11)	**6.19** (5.10-7.49)	**7.00** (5.64-8.53)	**7.85** (6.13-9.70)	**8.74** (6.56-11.0)	**9.97** (7.22-12.7)	**10.9** (7.72-14.1)
7-day	**3.78** (3.26-4.38)	**4.31** (3.71-5.00)	**5.19** (4.46-6.04)	**5.95** (5.09-6.94)	**7.02** (5.83-8.38)	**7.88** (6.40-9.47)	**8.75** (6.89-10.7)	**9.65** (7.32-12.0)	**10.9** (7.96-13.8)	**11.8** (8.45-15.1)
10-day	**4.31** (3.74-4.97)	**4.89** (4.24-5.64)	**5.86** (5.06-6.77)	**6.67** (5.73-7.73)	**7.81** (6.52-9.24)	**8.70** (7.11-10.4)	**9.61** (7.61-11.7)	**10.5** (8.04-13.0)	**11.8** (8.69-14.8)	**12.8** (9.17-16.2)
20-day	**5.87** (5.15-6.66)	**6.62** (5.81-7.53)	**7.85** (6.86-8.94)	**8.86** (7.71-10.1)	**10.2** (8.62-11.9)	**11.3** (9.32-13.2)	**12.3** (9.87-14.7)	**13.4** (10.3-16.2)	**14.7** (11.0-18.3)	**15.7** (11.5-19.8)
30-day	**7.17** (6.34-8.08)	**8.09** (7.15-9.13)	**9.57** (8.43-10.8)	**10.8** (9.43-12.2)	**12.4** (10.5-14.2)	**13.5** (11.2-15.7)	**14.7** (11.8-17.4)	**15.8** (12.3-19.1)	**17.3** (12.9-21.2)	**18.3** (13.4-22.9)
45-day	**8.82** (7.85-9.86)	**9.98** (8.88-11.2)	**11.8** (10.5-13.2)	**13.2** (11.7-14.9)	**15.1** (12.9-17.2)	**16.5** (13.8-19.0)	**17.8** (14.4-20.8)	**19.0** (14.8-22.7)	**20.5** (15.5-25.0)	**21.5** (16.0-26.7)
60-day	**10.2** (9.16-11.4)	**11.6** (10.4-12.9)	**13.7** (12.2-15.3)	**15.4** (13.6-17.2)	**17.5** (15.0-19.8)	**19.0** (16.0-21.7)	**20.4** (16.6-23.7)	**21.7** (17.0-25.8)	**23.3** (17.6-28.2)	**24.3** (18.1-30.0)

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

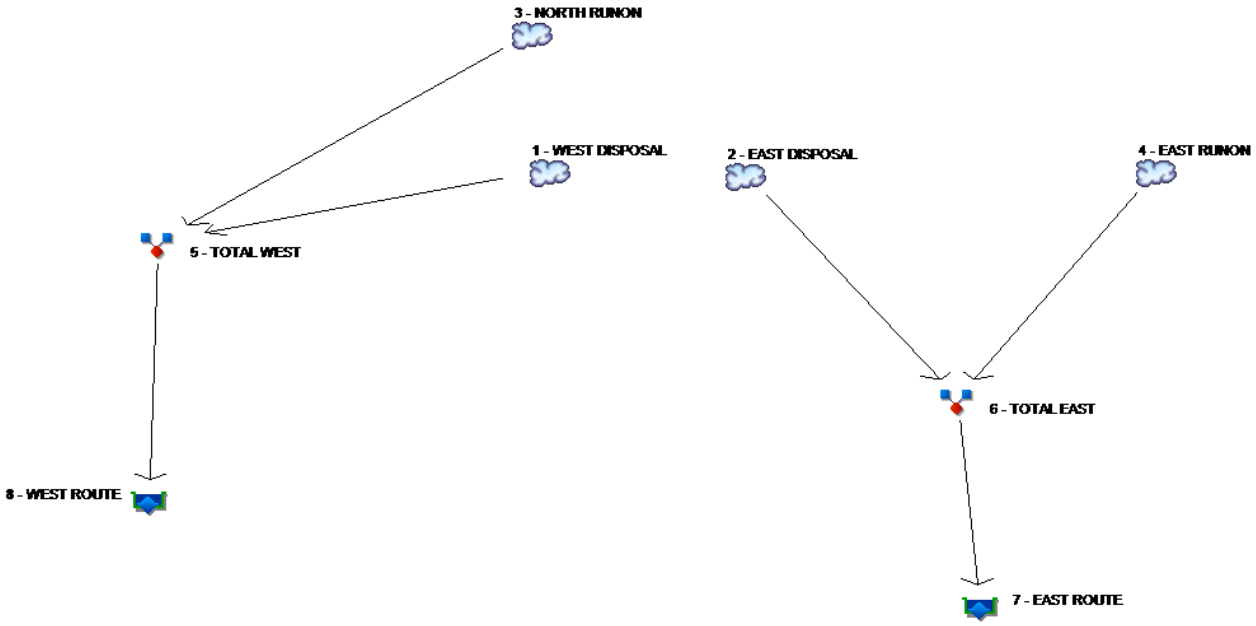
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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

Watershed Model Schematic



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

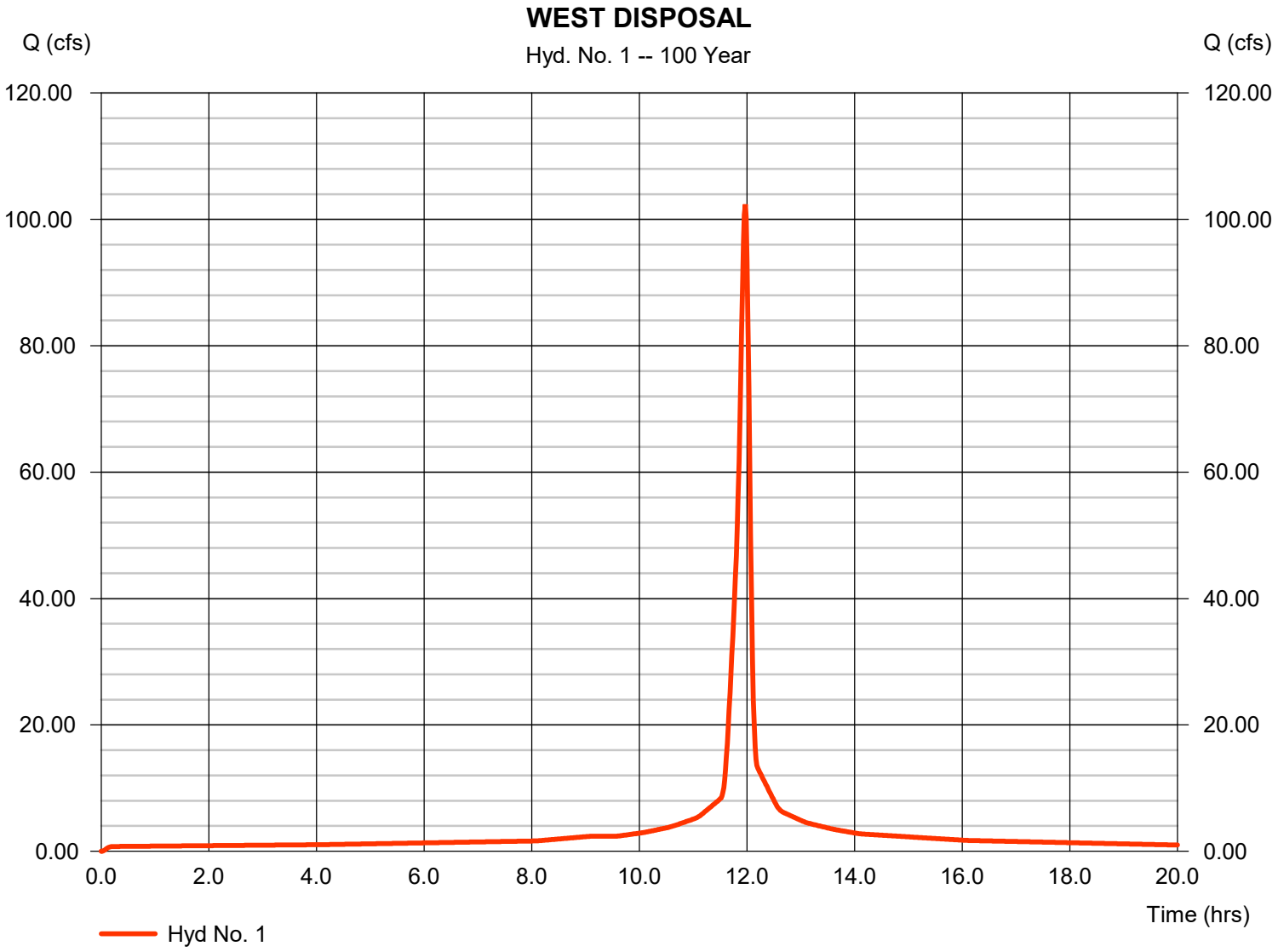
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	102.36	1	718	267,957	------	------	------	WEST DISPOSAL
2	SCS Runoff	107.80	1	718	282,184	------	------	------	EAST DISPOSAL
3	SCS Runoff	46.80	1	717	117,881	------	------	------	NORTH RUNON
4	SCS Runoff	23.44	1	715	52,442	------	------	------	EAST RUNON
5	Combine	148.48	1	718	385,838	1, 3,	------	------	TOTAL WEST
6	Combine	125.92	1	717	334,627	2, 4,	------	------	TOTAL EAST
7	Reservoir	93.54	1	721	320,978	6	1893.85	70,669	EAST ROUTE
8	Reservoir	110.92	1	721	376,722	5	1893.91	74,115	WEST ROUTE

Hydrograph Report

Hyd. No. 1

WEST DISPOSAL

Hydrograph type	=	SCS Runoff	Peak discharge	=	102.36 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.97 hrs
Time interval	=	1 min	Hyd. volume	=	267,957 cuft
Drainage area	=	11.300 ac	Curve number	=	100
Basin Slope	=	0.5 %	Hydraulic length	=	900 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.60 min
Total precip.	=	6.70 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

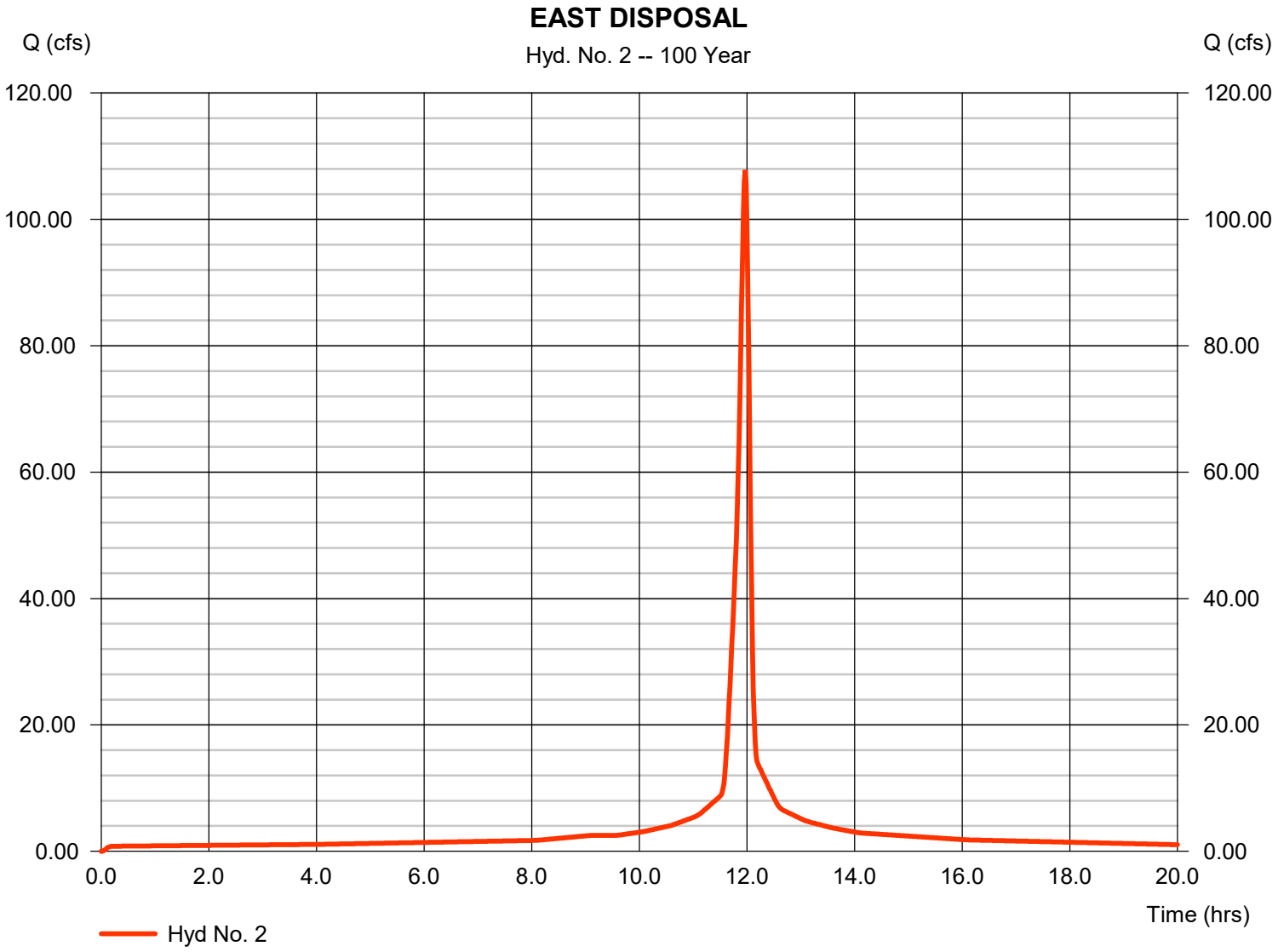


Hydrograph Report

Hyd. No. 2

EAST DISPOSAL

Hydrograph type	=	SCS Runoff	Peak discharge	=	107.80 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.97 hrs
Time interval	=	1 min	Hyd. volume	=	282,184 cuft
Drainage area	=	11.900 ac	Curve number	=	100
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.10 min
Total precip.	=	6.70 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

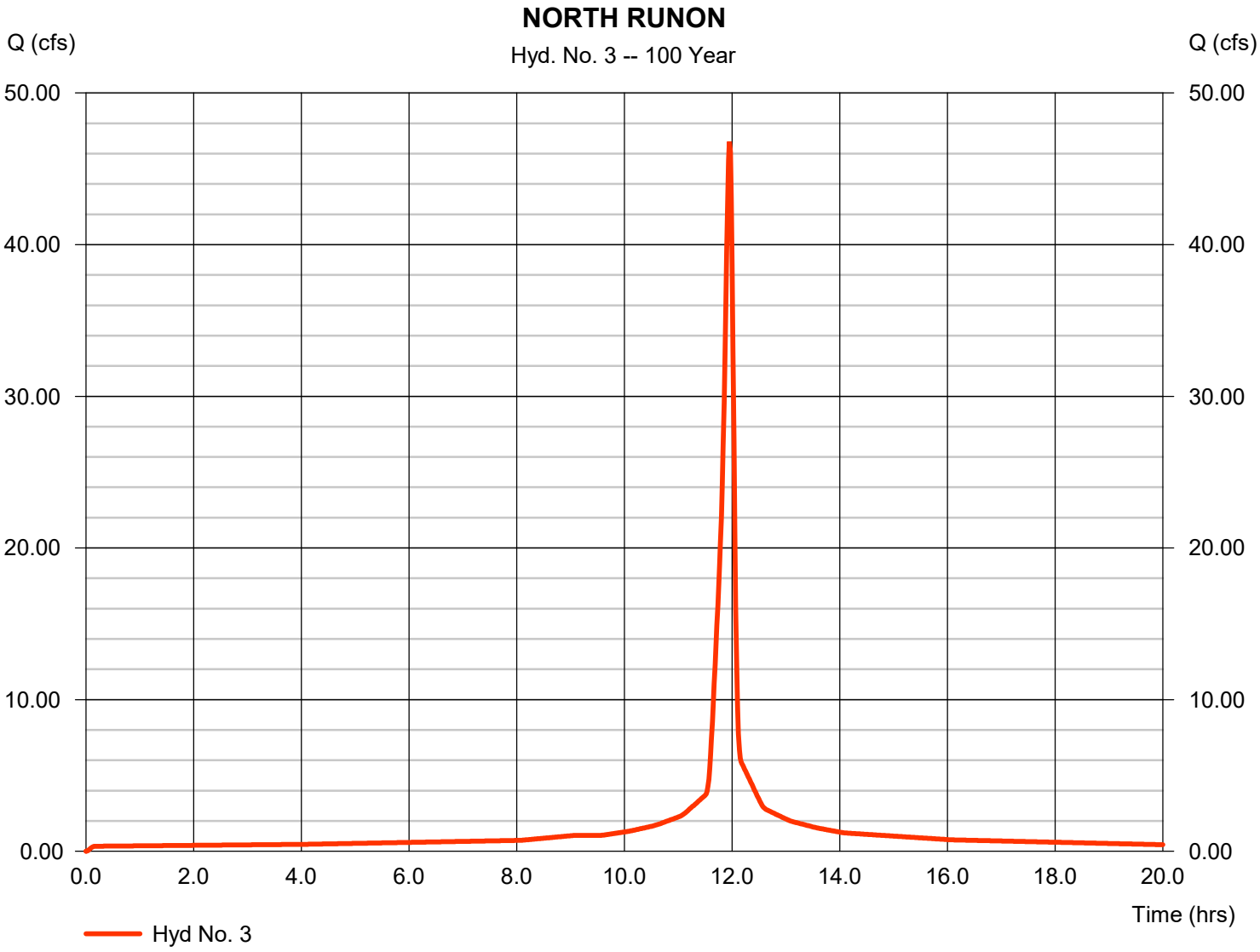


Hydrograph Report

Hyd. No. 3

NORTH RUNON

Hydrograph type	=	SCS Runoff	Peak discharge	=	46.80 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.95 hrs
Time interval	=	1 min	Hyd. volume	=	117,881 cuft
Drainage area	=	4.700 ac	Curve number	=	100
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.02 min
Total precip.	=	6.70 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

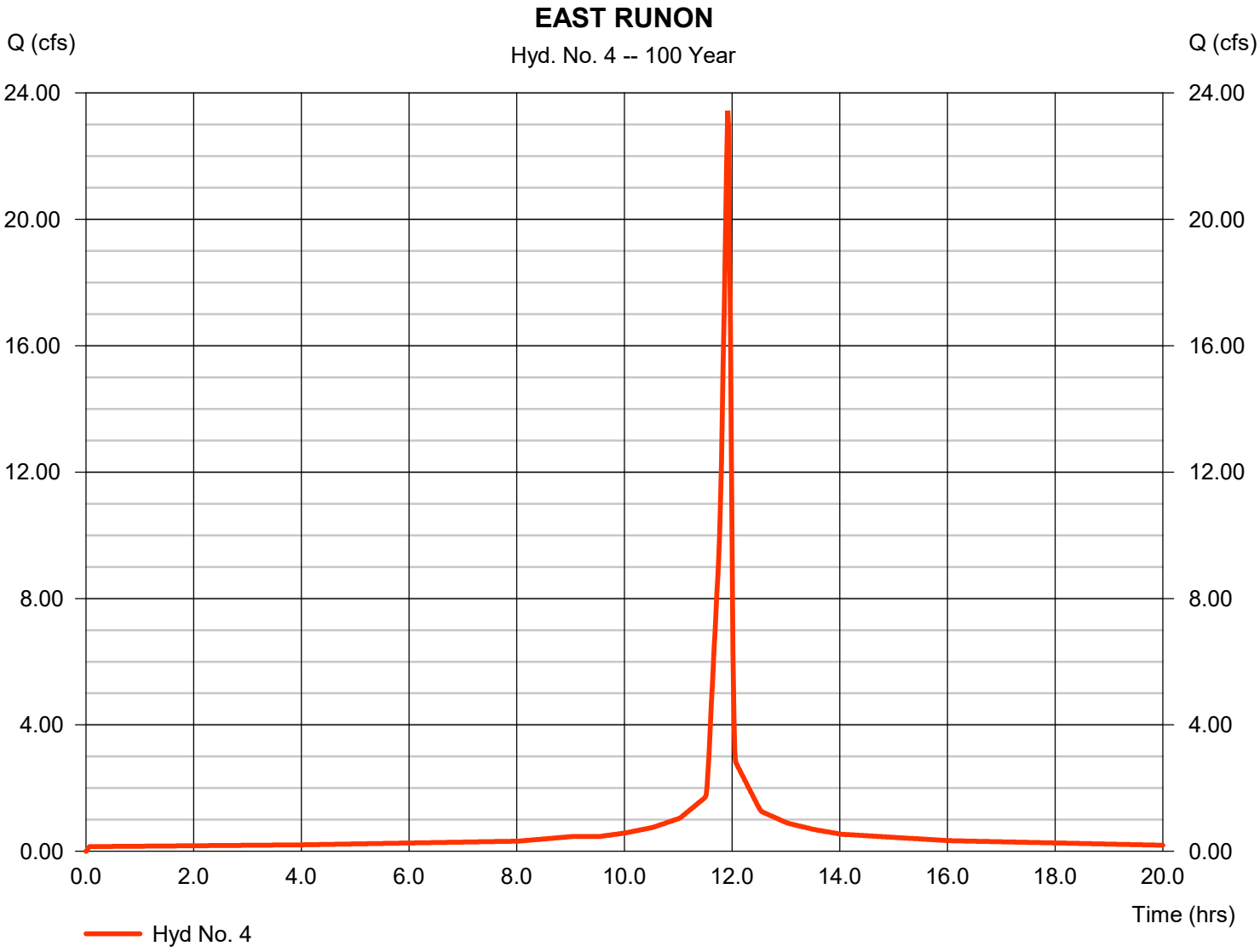


Hydrograph Report

Hyd. No. 4

EAST RUNON

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.44 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.92 hrs
Time interval	=	1 min	Hyd. volume	=	52,442 cuft
Drainage area	=	2.300 ac	Curve number	=	100
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	2.50 min
Total precip.	=	6.70 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



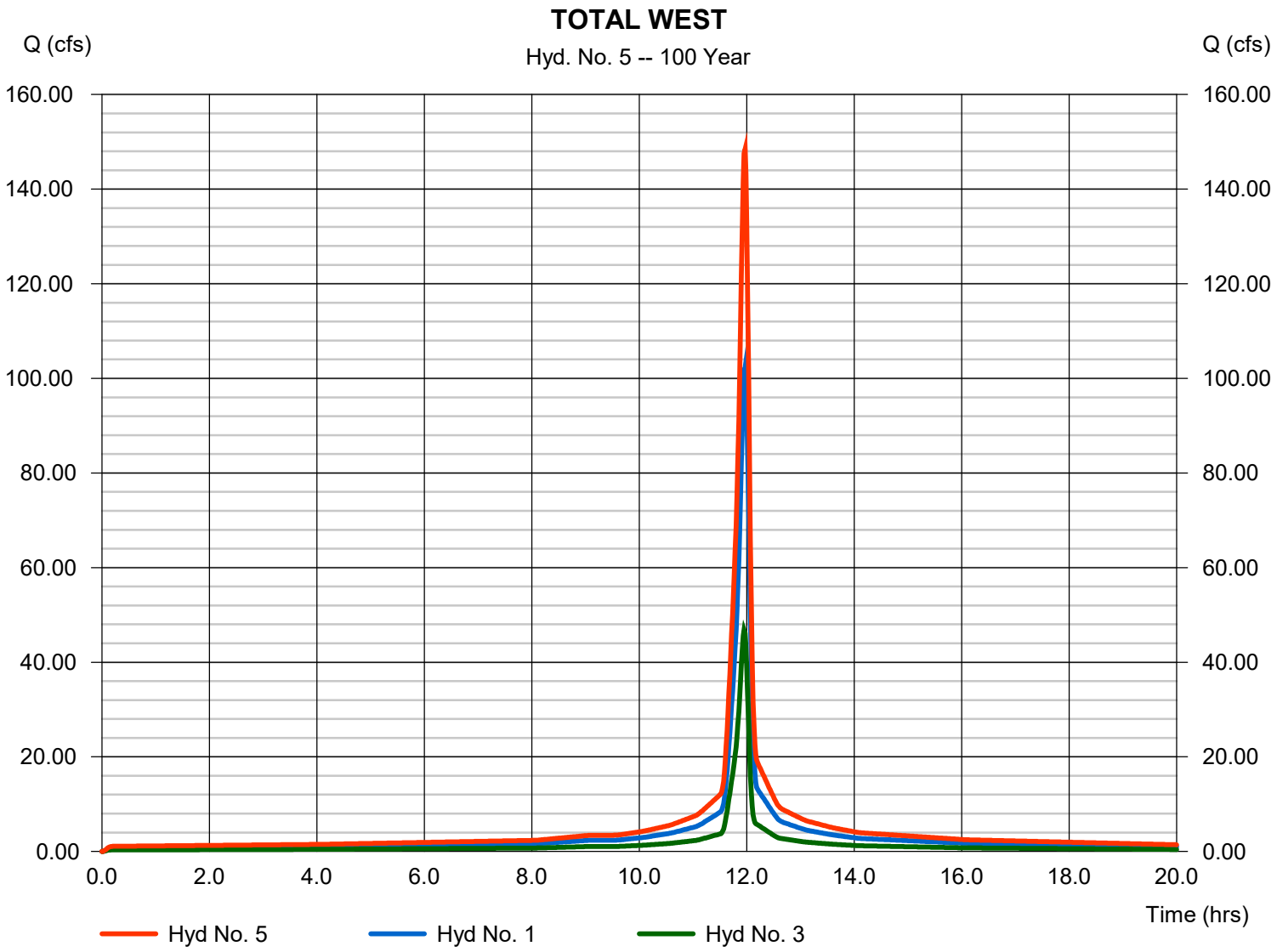
Hydrograph Report

Hyd. No. 5

TOTAL WEST

Hydrograph type	= Combine	Peak discharge	= 148.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 1 min	Hyd. volume	= 385,838 cuft
Inflow hyds.	= 1, 3	Contrib. drain. area	= 16.000 ac

+0.62-CFS BASE FLOW (WEC1 Ash Sluice) = 149.1-CFS

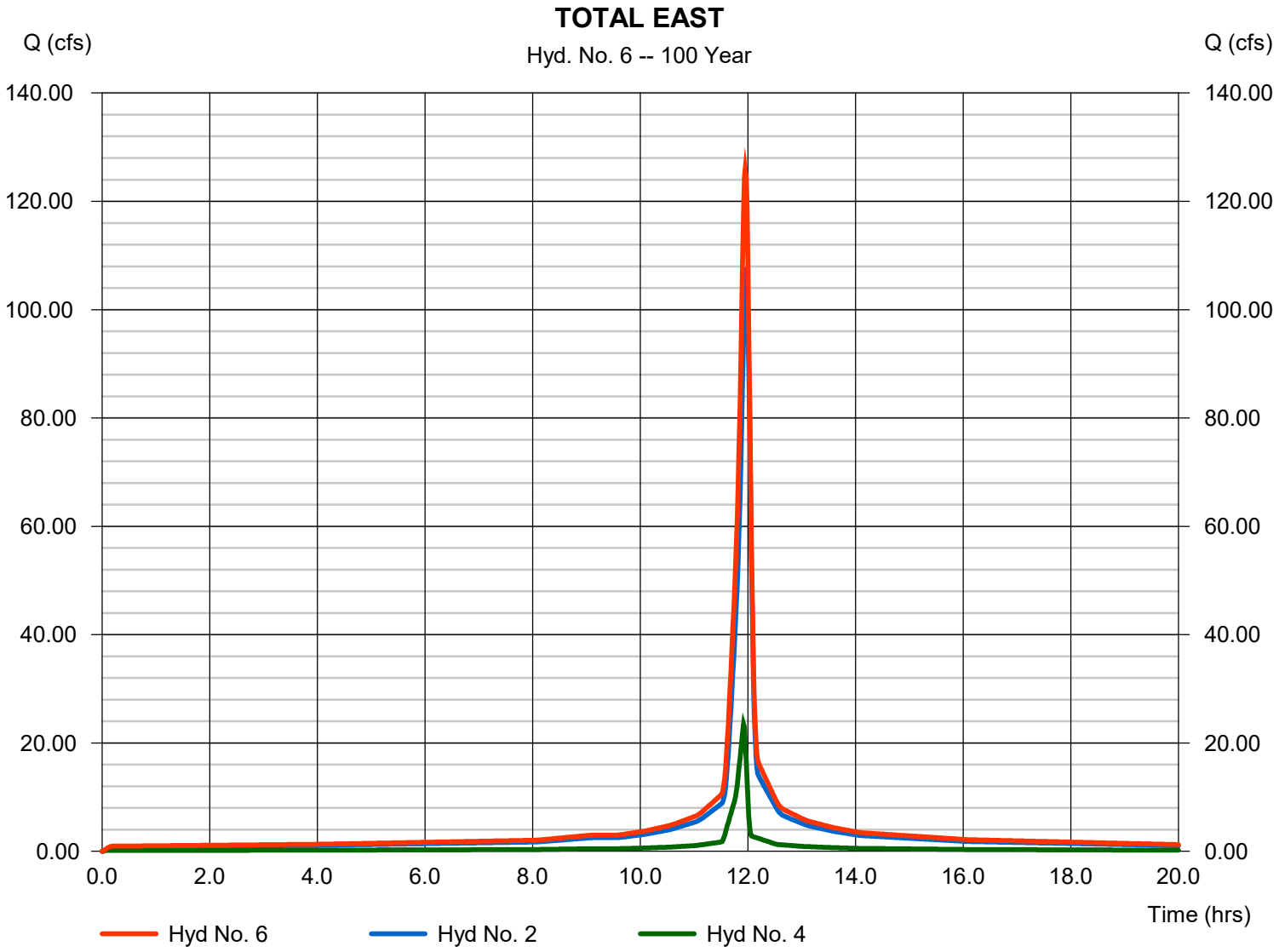


Hydrograph Report

Hyd. No. 6

TOTAL EAST

Hydrograph type	= Combine	Peak discharge	= 125.92 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.95 hrs
Time interval	= 1 min	Hyd. volume	= 334,627 cuft
Inflow hyds.	= 2, 4	Contrib. drain. area	= 14.200 ac



Hydrograph Report

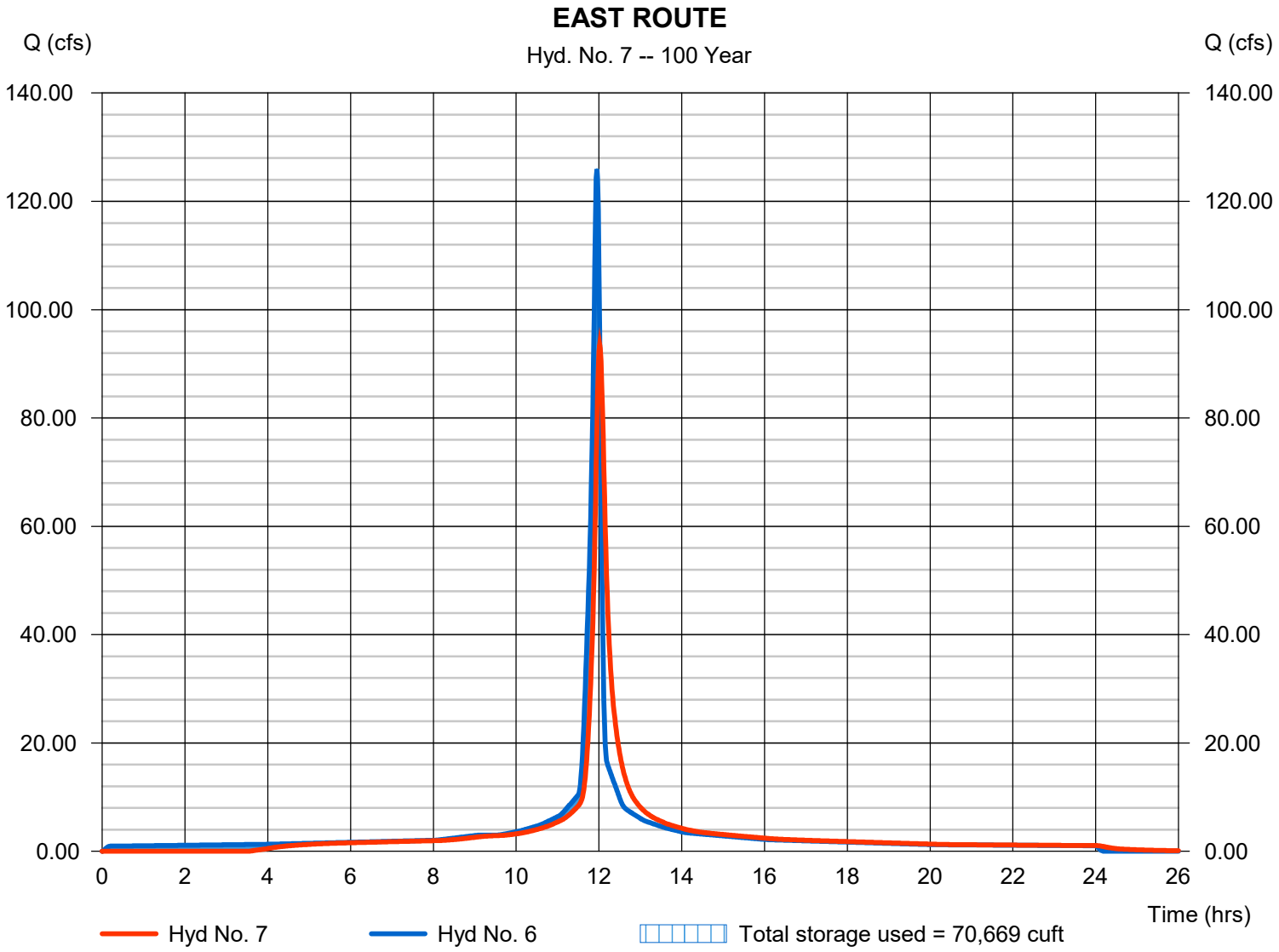
2X36" OUTLETS WITH 48" RISERS

Hyd. No. 7

EAST ROUTE

Hydrograph type	=	Reservoir	Peak discharge	=	93.54 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.02 hrs
Time interval	=	1 min	Hyd. volume	=	320,978 cuft
Inflow hyd. No.	=	6 - TOTAL EAST	Max. Elevation	=	1893.85 ft
Reservoir name	=	EAST OUTLET	Max. Storage	=	70,669 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - EAST OUTLET

2X36" OUTLETS WITH 48" RISERS

Pond Data

Trapezoid -Bottom L x W = 100.0 x 50.0 ft, Side slope = 3.00:1, Bottom elev. = 1892.50 ft, Depth = 5.50 ft

Stage / Storage Table

CLEAR AREA ONLY

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1892.50	5,000	0	0
0.55	1893.05	5,506	2,888	2,888
1.10	1893.60	6,034	3,172	6,060
1.65	1894.15	6,583	3,469	9,529
2.20	1894.70	7,154	3,777	13,306
2.75	1895.25	7,747	4,097	17,403
3.30	1895.80	8,362	4,429	21,832
3.85	1896.35	8,999	4,773	26,605
4.40	1896.90	9,657	5,129	31,734
4.95	1897.45	10,337	5,497	37,232
5.50	1898.00	11,039	5,877	43,109

INPUT APPROX. INVERT ELEV. AND LENGTHS TO MODEL DUAL CULVERT OUTFLOW

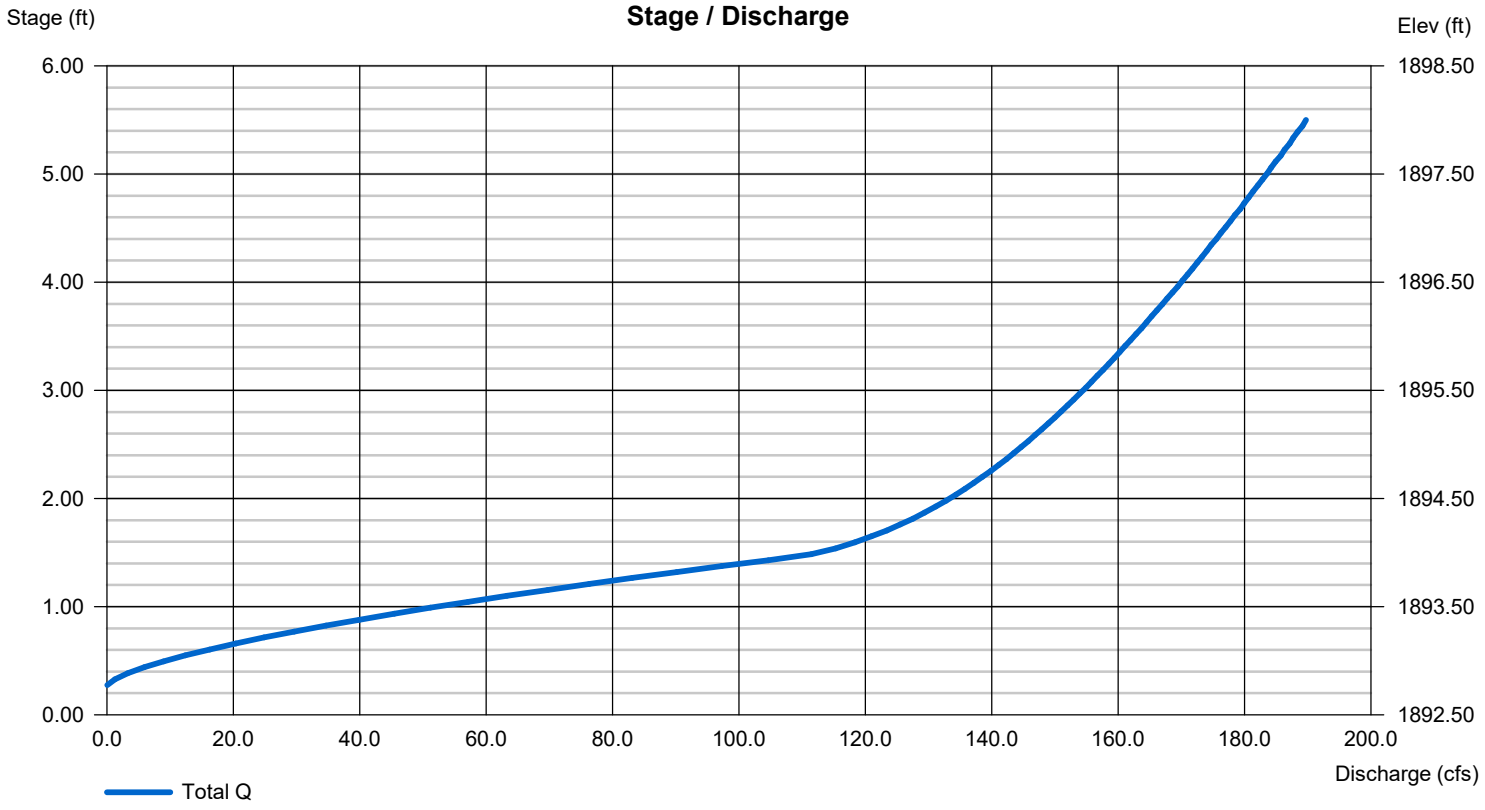
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 2	0	0	0
Invert El. (ft)	= 1888.67	0.00	0.00	0.00
Length (ft)	= 125.00	0.00	0.00	0.00
Slope (%)	= 4.20	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 25.14	0.00	0.00	0.00
Crest El. (ft)	= 1892.77	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

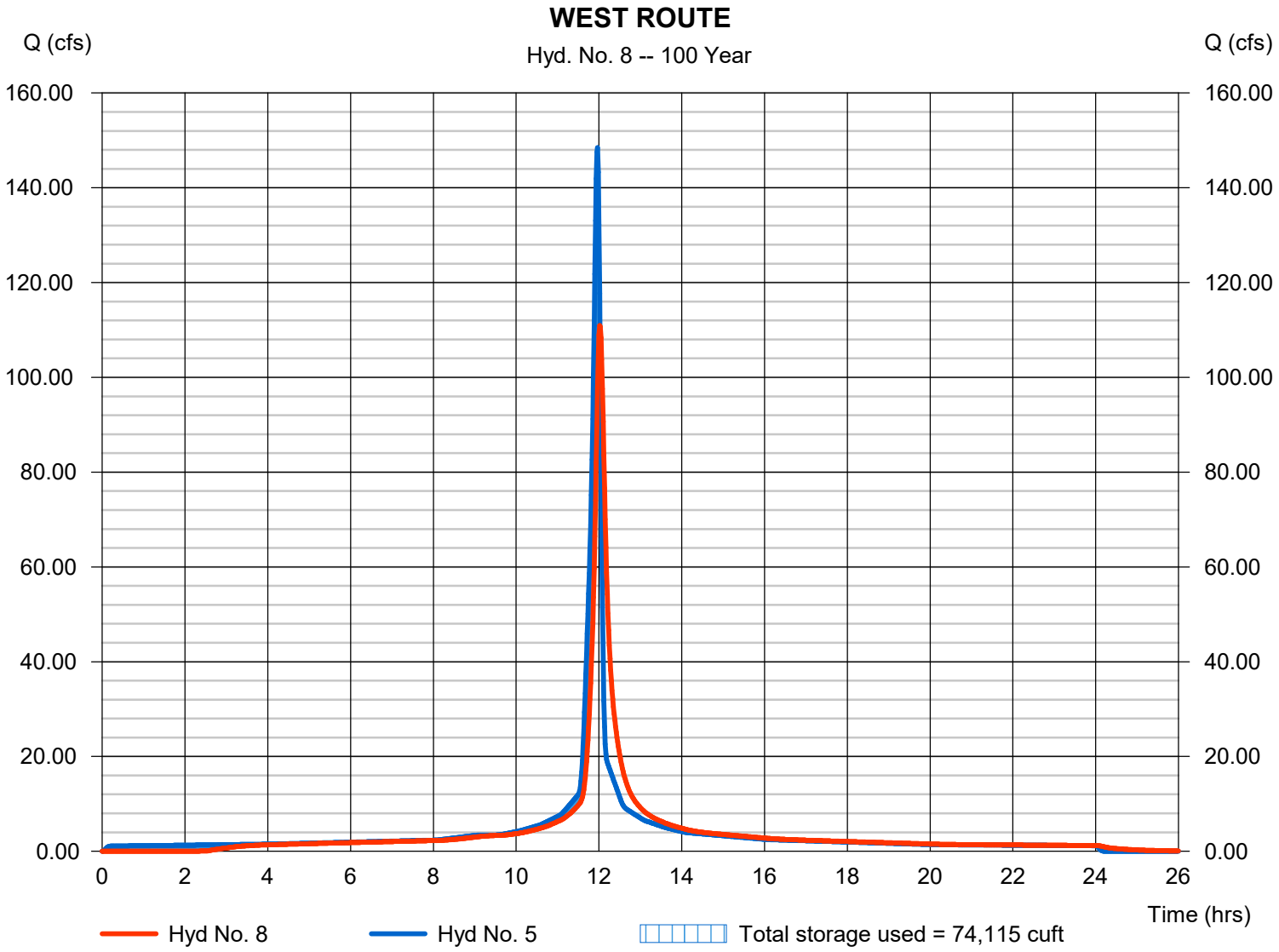
2X36" OUTLETS WITH 48" RISERS

Hyd. No. 8

WEST ROUTE

Hydrograph type	=	Reservoir	Peak discharge	=	110.92 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.02 hrs
Time interval	=	1 min	Hyd. volume	=	376,722 cuft
Inflow hyd. No.	=	5 - TOTAL WEST	Max. Elevation	=	1893.91 ft
Reservoir name	=	WEST OUTLET	Max. Storage	=	74,115 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - WEST OUTLET

2X36" OUTLETS WITH 48" RISERS

Pond Data

Trapezoid -Bottom L x W = 100.0 x 50.0 ft, Side slope = 3.00:1, Bottom elev. = 1892.50 ft, Depth = 5.50 ft

Stage / Storage Table

CLEAR AREA ONLY

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1892.50	5,000	0	0
0.55	1893.05	5,506	2,888	2,888
1.10	1893.60	6,034	3,172	6,060
1.65	1894.15	6,583	3,469	9,529
2.20	1894.70	7,154	3,777	13,306
2.75	1895.25	7,747	4,097	17,403
3.30	1895.80	8,362	4,429	21,832
3.85	1896.35	8,999	4,773	26,605
4.40	1896.90	9,657	5,129	31,734
4.95	1897.45	10,337	5,497	37,232
5.50	1898.00	11,039	5,877	43,109

INPUT APPROX. INVERT ELEV. AND LENGTHS TO MODEL DUAL CULVERT OUTFLOW

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	Inactive	0.00	0.00
Span (in)	= 36.00	36.00	0.00	0.00
No. Barrels	= 2	1	0	0
Invert El. (ft)	= 1888.60	1888.60	0.00	0.00
Length (ft)	= 125.00	125.00	0.00	0.00
Slope (%)	= 4.48	4.48	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

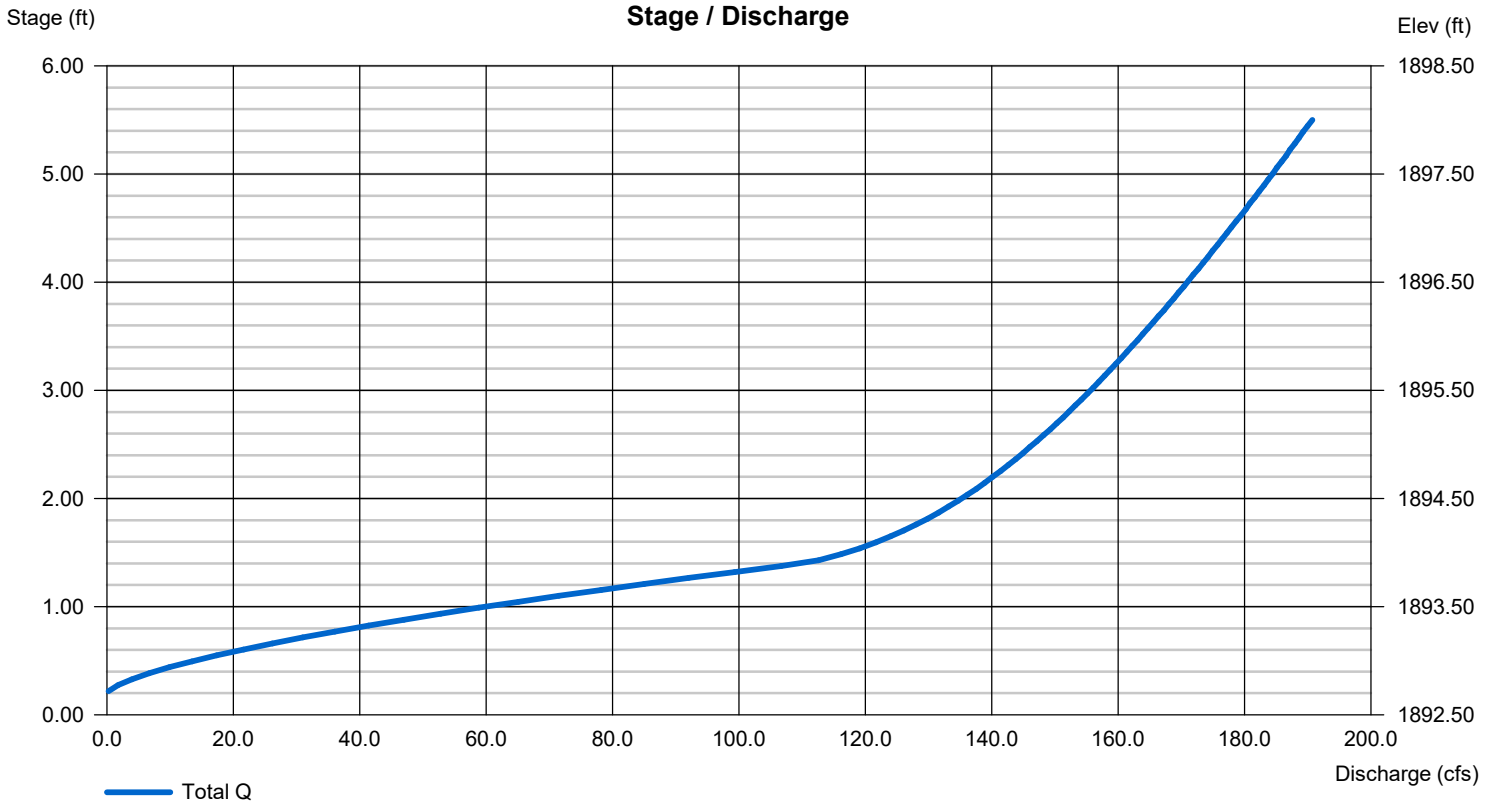
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 25.14	0.00	0.00	0.00
Crest El. (ft)	= 1892.70	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

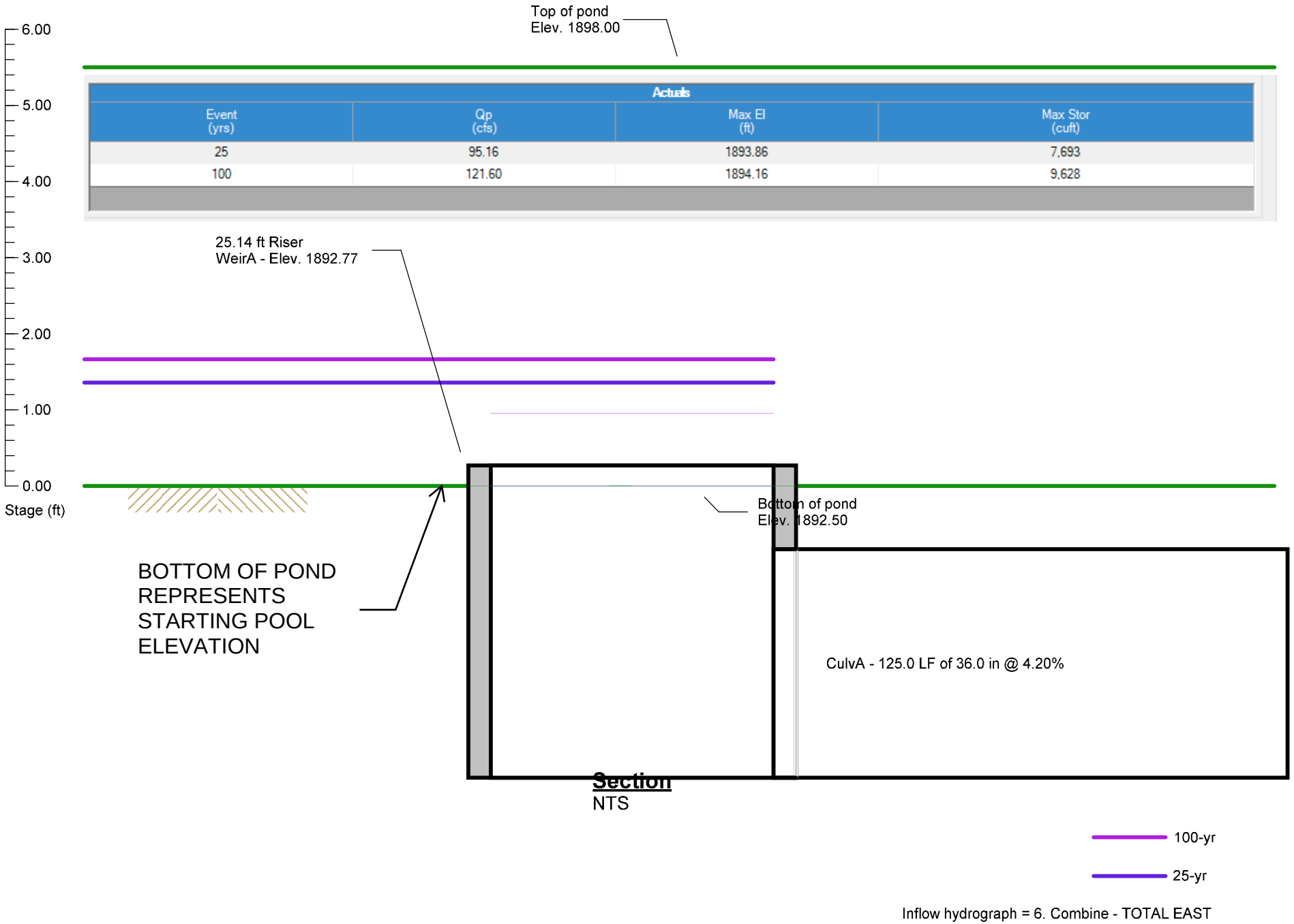
Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



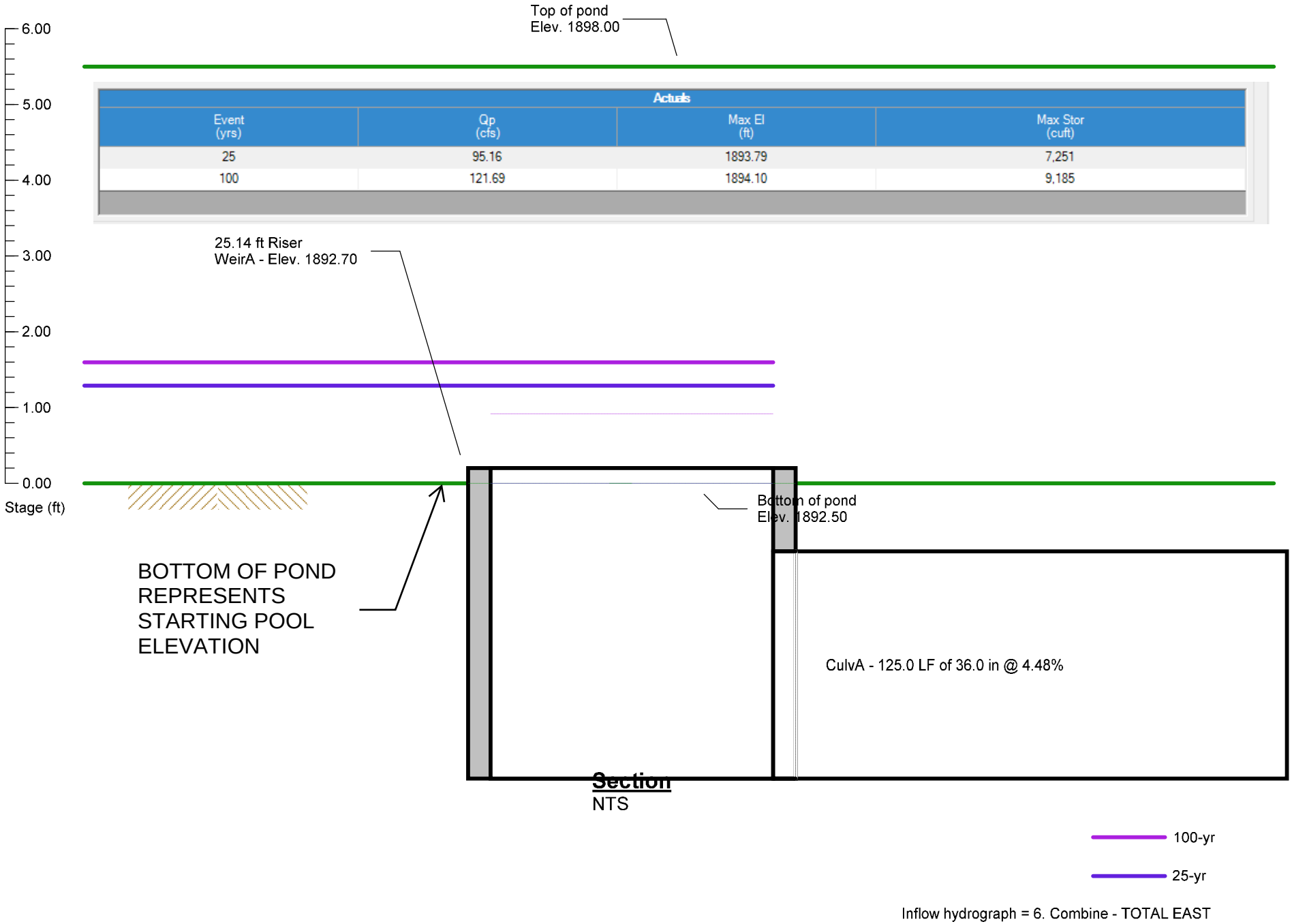
Pond No. 1 - EAST OUTLET



Actuals			
Event (yrs)	Qp (cfs)	Max El (ft)	Max Stor (cuft)
25	95.16	1893.86	7,693
100	121.60	1894.16	9,628

Inflow hydrograph = 6. Combine - TOTAL EAST

Pond No. 2 - WEST OUTLET



Actuals			
Event (yrs)	Qp (cfs)	Max El (ft)	Max Stor (cuft)
25	95.16	1893.79	7,251
100	121.69	1894.10	9,185

Inflow hydrograph = 6. Combine - TOTAL EAST

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Nov 20 2020

Circular Culvert

Invert Elev Dn (ft)	=	1883.00
Pipe Length (ft)	=	125.00
Slope (%)	=	4.00
Invert Elev Up (ft)	=	1888.00
Rise (in)	=	36.0
Shape	=	Circular
Span (in)	=	36.0
No. Barrels	=	1
n-Value	=	0.019
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Headwall
Coeff. K,M,c,Y,k	=	0.0078, 2, 0.0379, 0.69, 0.5

Max. flow for 1-culvert = 90-cfs. Max. flow for system is ~150-cfs. 2 culverts are required.

Embankment

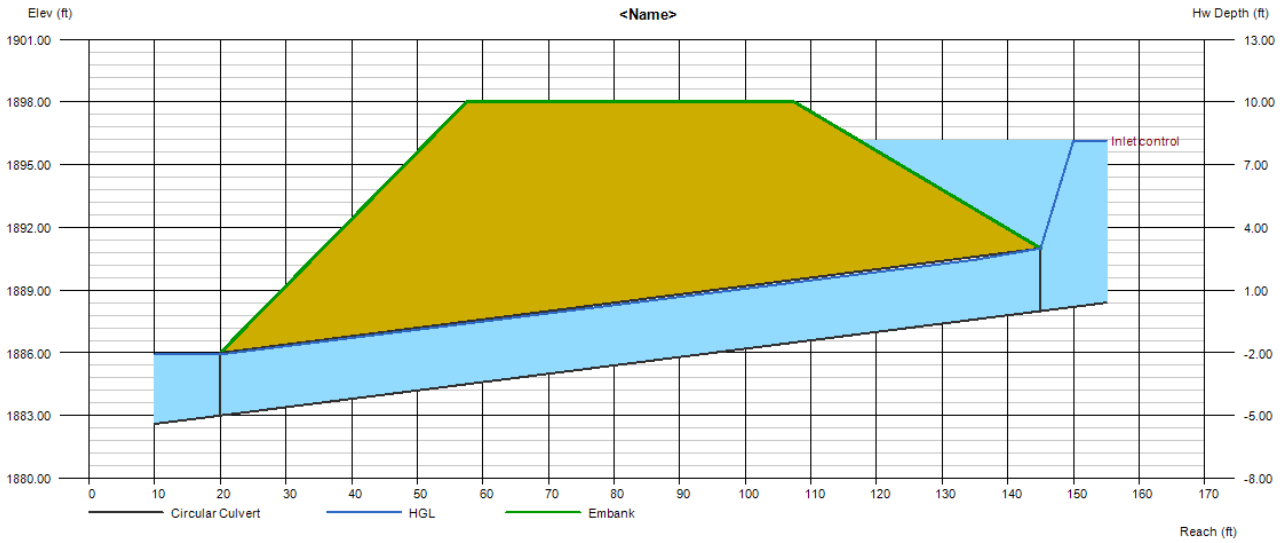
Top Elevation (ft)	=	1898.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	110.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	90.00
Qpipe (cfs)	=	90.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	12.82
Veloc Up (ft/s)	=	12.99
HGL Dn (ft)	=	1885.92
HGL Up (ft)	=	1890.85
Hw Elev (ft)	=	1896.15
Hw/D (ft)	=	2.72
Flow Regime	=	Inlet Control



Attachment 3

Future Retrofit

Runon/Runoff Calculations

Project: WEC
Subject: Stormwater - Retrofit
Task: Hydraulic Calculations

Computed by: K. Kinley Date: 8/1/2021
Checked by: L. Calub Date: 8/2/2021

Objective: Demonstrate disposal areas can manage a 100-yr 24-hr storm event after retrofit is installed.

References: Site data, historic calculations
Hydraflow, Mannings

Assumptions: 25-yr 24 hr storm event is 5.11-inches on site. (NOAA Atlas 14 Vol 8 Version 2)
100-yr 24 hr storm event is 6.70-inches on site. (NOAA Atlas 14 Vol 8 Version 2)

Calculations: *Drainage Areas*

n for smooth surfaces	0.011	0.015			
	Sheet Flow (ft)*	**Channel Flow (ft)***	**Acres**	**Peak flow (cfs)**	**Total Volume (cf in 24-hrs)**
North Runon	50	1500	4.7	46.8	117,881
WEC1 Ash Sluice**	na	na	10-in forcemain	0.62	53,568
WEC2 Fly Ash Sluice	na	na	10-in forcemain	0	0
West Disposal Area	300	600	11.3	102.36	267,957
			Totals for west disposal area	**149.78**	**439,406**
East disposal runoff area after retrofit is approximately 5.9-acres, no change in flow distance.					
East Runon	100	0	2.3	23.44	52,442
East Disposal Area	300	400	5.9	53.45	139,907
			Totals for east disposal area	**76.89**	**192,349**

*slopes subject to change with operations. Generally low slope. Modeled with 0.5%.
**400,000 GPD

Retrofit Conditions - No discharge

Under retorfit conditions, there is estimated to be no discharge during the 100-yr 24-hr storm event. Operations change over time on site. In order to maintain no discharge for each area, the 100-YR 24-hr volume must be held within the disposal area with 1-ft of freeboard.

Current elevation of ponded water is estimated at elev. 1893 by the site:

	Req. Storage (cf)	Area Req. if 4-ft deep (SF)
West Disposal Area	439,406	109,852
East Disposal Area	192,349	48,087

Future Conditions - Discharge to Leachate Pond
In the event the disposal area operations displace stormwater storage volume, the discharge structures will be utilized. Assumptions are as follows:

1. Starting pool elevation is 1892.5 (limited storage before riser discharge)
2. Storage is limited to 5,000-sf, 3:1 side slopes, and maximum elevation is 1898 (approx. inlet clear area)
3. Outflow culverts are modeled as 'dual barrel' to estimate peak storage.

Total flow to the leachate pond= 631,755 cf for 24-hrs
Leachate pond storage*= 1,568,160 cf
*Elevation 1884 to 1893, est. available for storage. Leachate Pond is 5.2 acres.

Conclusion: In the 100-yr storm event, the stormwater is contained within the disposal areas without overtopping. At such time that a disposal area no longer has the storage required, the discharge culverts will be hydraulically connected and utilized, and spillways reshaped. The discharge culverts are estimated to control the design storm without exceeding the berm elevation.

Hydrograph Report

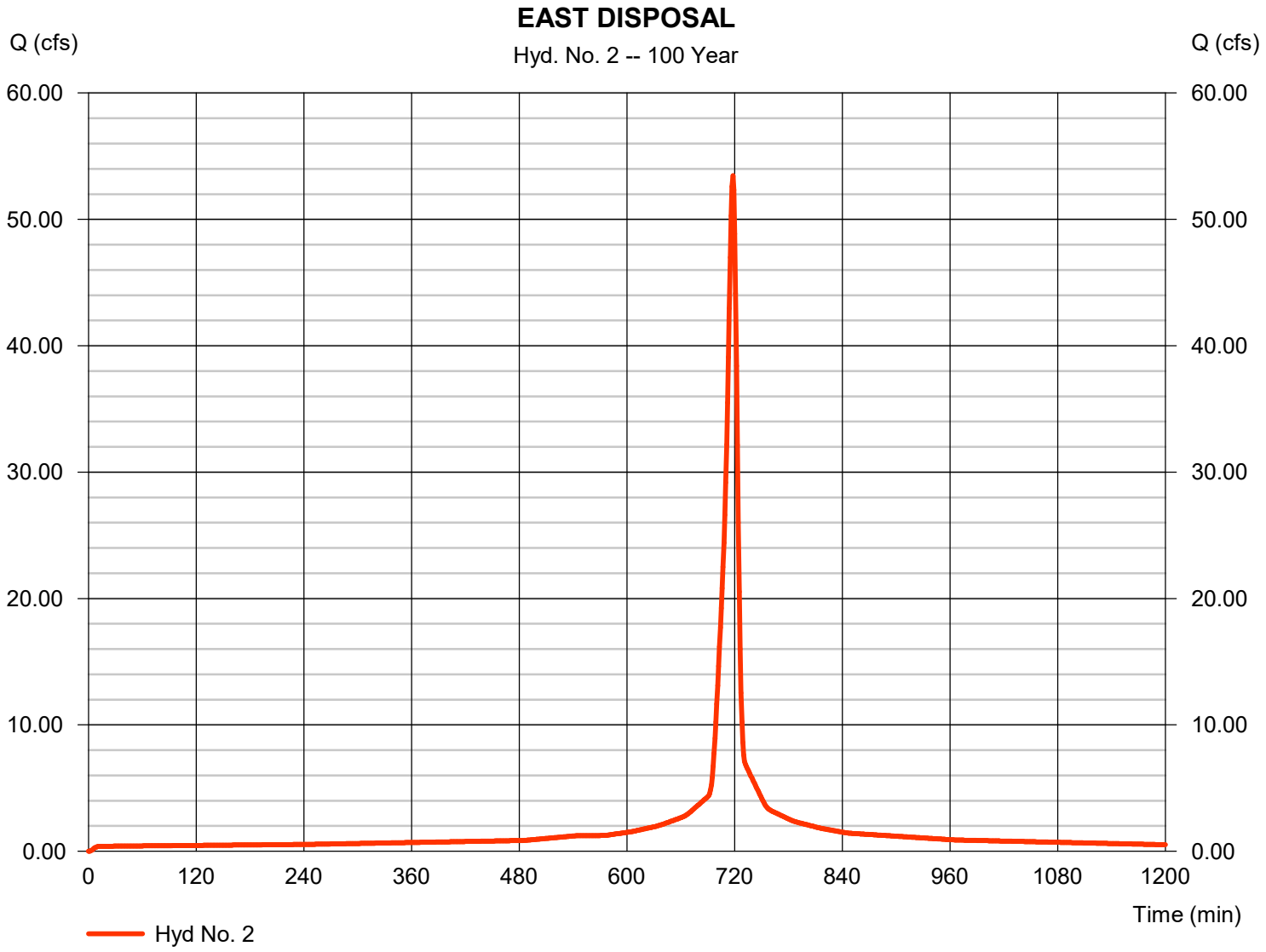
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2(

EAST DISPOSAL HYDROGRAPH AFTER RETROFIT - CONDITION LOWERS MANAGEMENT REQUIREMENT BY REMOVING AREA FROM CALCULATION. CURRENT CONDITIONS ARE CONTROLLING FOR DESIGN CALCULATION.

Hyd. No. 2

EAST DISPOSAL

Hydrograph type	=	SCS Runoff	Peak discharge	=	53.45 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	139,907 cuft
Drainage area	=	5.900 ac	Curve number	=	100
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.10 min
Total precip.	=	6.70 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Attachment 4

Historic Stormwater Calculations –

Select Pages

HISTORIC -SELECT PAGES

APPENDIX M
SITE DRAINAGE CALCULATIONS

A. SIZE LEACHATE RETENTION POND

1) Total Volume Quantities (process flows peak day flow on 24 hrs basis and include safety factor of 1.5)

Daily Durations (t)=	24 hrs	or	1440 min		
No. Discharge Days =	1 day	or	1440 min		
Factor of Safety (FS)=	1.5				
1cf =	7.48 gallons				
1 acre =	43,560 sf				
V =	FS*Q*t ac-ft				
a) Ash Sluice Water - Unit 1		Qsw =	600 gpm	Vsw=	3.98 ac-ft/day
a) Ash Sluice Water - Unit 2		Qfa =	831 gpm	Vfa=	5.51 ac-ft/day
c) Cooling Tower (1&2)		Qct =	0 gpm	Vct=	0.00 ac-ft/day
d) Scrubber Ash Sluicing - Unit 2		Qb =	534 gpm	Vb=	3.54 ac-ft/day
		Vt =	1965 gpm	Vt =	13.03 ac-ft/day

2) Size Leachate Retention Pond to completely retain 25yr, 24 hr rainfall and process flows

Total Rainfall =	4.9 in	NOAA
Evaporation =	0.15 in/day	Regional evaporation for Hastings (56 in/yr)
Vap =	10 ac-ft	Ash pond runoff = (total rainfall-evaporation)*(area of East & West Ash Ponds)
Vlr =	1.7 ac-ft	Leachate retention pond runoff =
Side Slopes	4H:1V	(total rainfall-evaporation)*(Top of Berm Area of Water Depth with +)

Leachate Retention Pond Design

		Floor			Top of Berm					
	Water Depth ft	W1 ft	L1 ft	A1 sf	W2 ft	L2 ft	A2 sf	Vrequired ac-ft	Vavailable ac-ft	Vavailable CF
	4	300	425	127,500	332	457	151,724	24.41	12.82	558,448
x	4.4	300	425	127,500	335	460	154,259	24.43	14.23	619,870
	5	300	425	127,500	364	489	177,996	24.65	17.53	763,740
	6	300	425	127,500	372	497	184,884	24.71	21.51	937,152
xx	7	300	425	127,500	380	505	191,900	24.77	25.66	1,117,900
	8	300	425	127,500	388	513	199,044	24.84	29.99	1,306,176
	9	300	425	127,500	396	521	206,316	24.90	34.49	1,502,172

1-indicates pond bottom dimensions and areas
2-indicates top of berm dimensions and areas
Vrequired = Vt + Vap + Vlr
x = pond dimensions to hold process water only.
xx = pond dimensions to hold process water and storm water.

Estimates are similar for leachate pond storage available

B. SIZE CONNECTOR PIPES (25-YEAR STORM): ASH PONDS

Rational Method; Q = CiA

1) C = Runoff Coefficient = 1.00

2) Tc = Time of Concentration
Since Tc ~ 0 for runoff at each Ash Pond, use Tc = 5 min.

3) Rainfall Intensity: i = 8.2 in/hour for 25 year storm event, Tc= 5 min Reference 1

4) Ash Pond (east) W=640ft H=860 ft Ae= 550,400 SF 12.64 acres
Ash Pond (west) W=640ft H=860 ft Aw= 550,400 SF 12.64 acres

5) Calculate Runoff for Tc = 5 min

	Q (cfs)	C	i(in/hr)	A (acres)
Ae	104	1	8.2	12.64
Aw	104	1	8.2	12.64

Q is higher for 100-yr storm

6) Maximum Daily Flows during normal operating conditions

a) Ash Sluice Water - Unit 1	Qsw =	600 gpm	1.3 cfs
b) Ash Sluice Water - Unit 2	Qfa =	831 gpm	1.9 cfs
c) Cooling Tower (1&2)	Qct =	0 gpm	0.0 cfs
d) Scrubber Ash Sluicing - Unit 2	Qb =	534 gpm	1.2 cfs
	Qt =	1965 gpm	4.4 cfs

Revised estimate is 400k GPD, 0.62-cfs

7) Determine Number of Connector Pipes to Each Pond Considering 5-minute Duration Storm

Max Q (from west pond) = Qw + Qsw + Qfa = 107 cfs
Assume number of pipes, n = 2
Qn = Q/n = 53.40 cfs
Verify Qn Provided Qn = 1.48*A*R^.67*S^.5/n A = Pipe Area
slope(S) = 0.025
mannings n = 0.024
diameter = 36 in
Qn provided = 57.28 cfs OK

Installed slope is higher

8) Size Ash Pond Spillway

Spillway to be reshaped with culvert connection

Head on Pipe Spillway (H)= Spillway crest elevation - design high water level of leachate retention pond
Spillway crest elevation = 1891.00 feet, from drawings
Design high water level of leachate retention pond = 1885.29 feet, from drawings
H = 5.71 feet
Table 2-8, ref. 4
For H = 5.71 Spillway capacity = 68.80 cfs > 53.40 cfs, OK

9) Spillway Capacity Considering Pipe length
Pipe length = 120 lf
Pipe diameter = 36 in

Table 2-8, ref. 4 Correct flow for Length of 120 lf
Correction factor from table = 0.86
So, corrected discharge capacity = 68.80 x 0.86 = 59.17 cfs
59.17 cfs > 53.40 cfs, OK

10) Determine Riser Size

Required Q = 53.40 cfs
Riser size = 48 in
From Figure 2-13, ref. 4: Max. head above the orifice crest when passing required Q = 1.2 ft
Elevation of orifice crest = 1888.67 ft, from drawings
Elevation of spillway crest = 1891.00 ft, from drawings
2.33 ft > 1.2 ft, OK

1.6-ft - OK

11) Area of Orifices Required

Asssume height (h) above crest of orifice = 2 inches = 0.17 ft

Qorifice = Cd*A*(2gh)^.5

Q=	Discharge = 1/2*Qt*FS/n =	1.64	cfs per outlet pipe
Cd=	Orifice Coefficient =	0.70	
h =	Height =	0.17	ft
g =	Gravity =	32.20	ft/sec^2
A =	Orifice Area =	0.72	sf
Assume 3	openings, A =	0.24	sf

Meets base flow from sluice

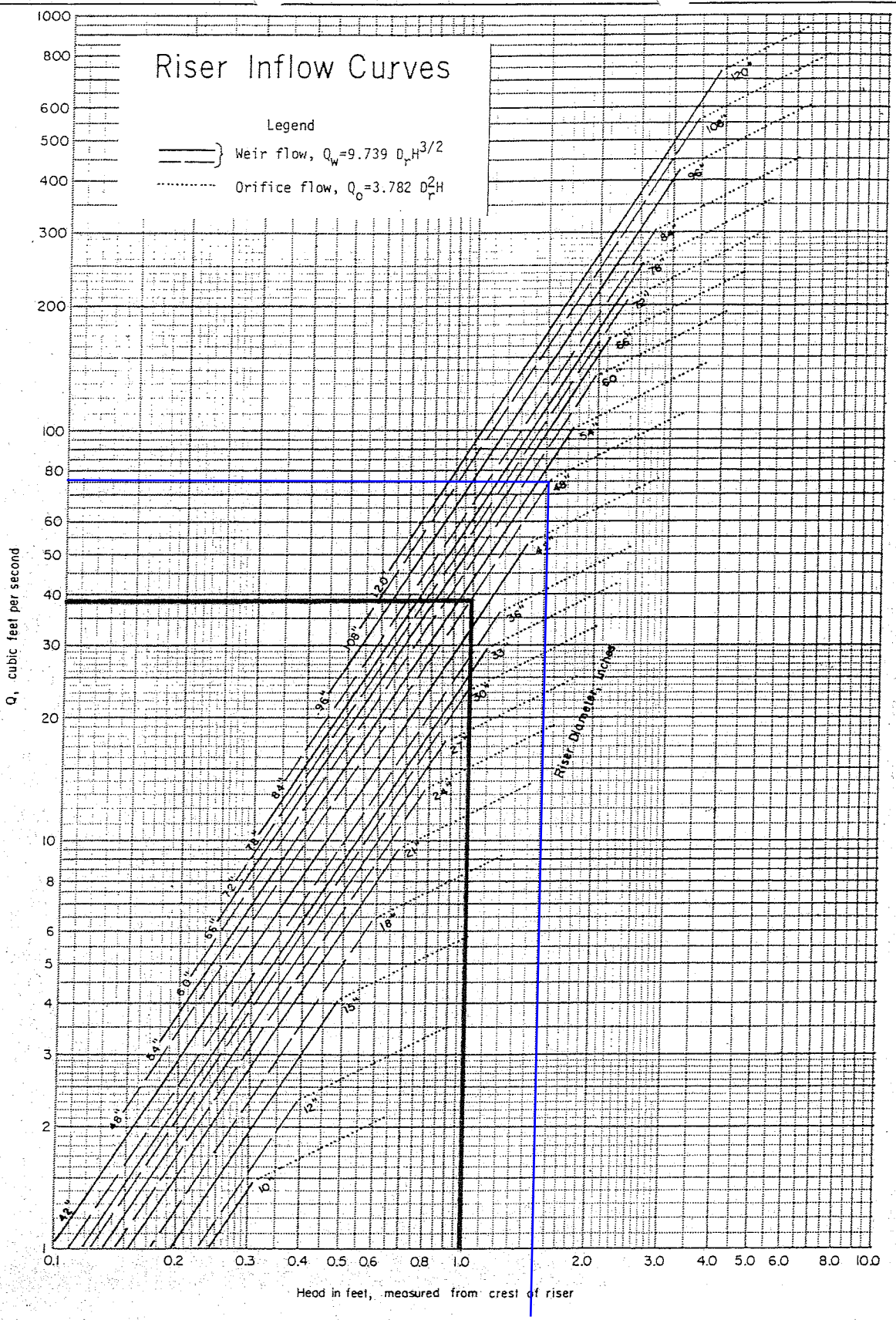
Assume orifice height = 4 inches = 0.33 ft
Orifice length = 0.72 ft

Use 3 openings 4 inch high by 1.50 ft long

12) Rise of Water in Ash Pond From 25-year 24-hour storm
From sheet 2, total rainfall from a 25-year 24-hour storm event = 4.9 in = 0.41 ft

See hydraflow output for clear areas.

Ref. 4



Source: Soil Conservation Service

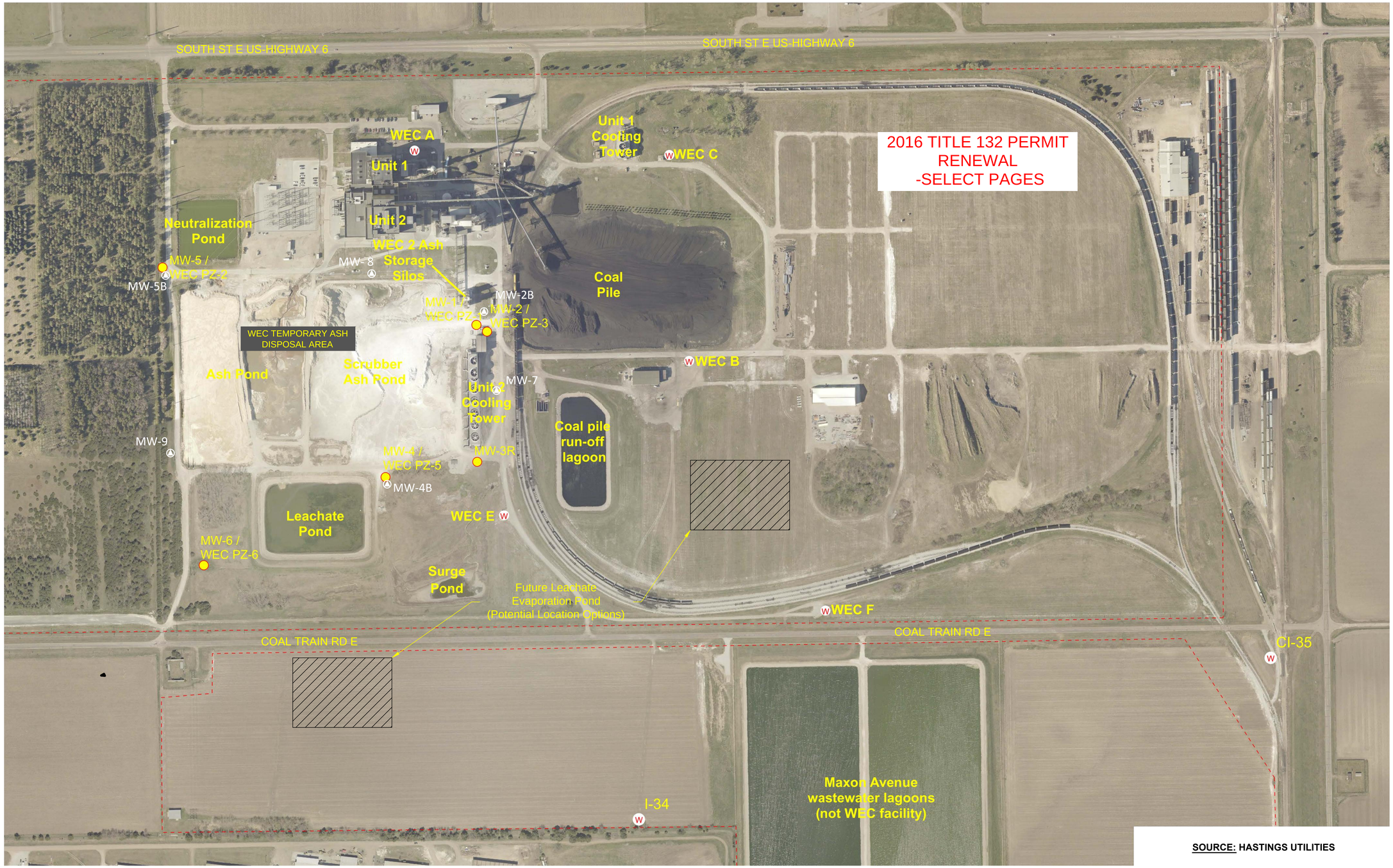
Riser Inflow Curves
Sediment Basin

Date
JAN 1993

Figure
2-13

CITY OF OMAHA

Soil Erosion and Sediment Control



SOURCE: HASTINGS UTILITIES

ISSUE	DATE	DESCRIPTION
0	10/6/2016	NDEQ TITLE 132 PERMIT RENEWAL

PROJECT MANAGER L. CALUB

PROJECT NUMBER 000000010040278

PROFESSIONAL MECHANICAL ENGINEER
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STATE OF NEBRASKA

public power generation agency

HASTINGS UTILITIES

GERALD T. WHELAN ENERGY CENTER
WEC TEMPORARY ASH DISPOSAL AREA

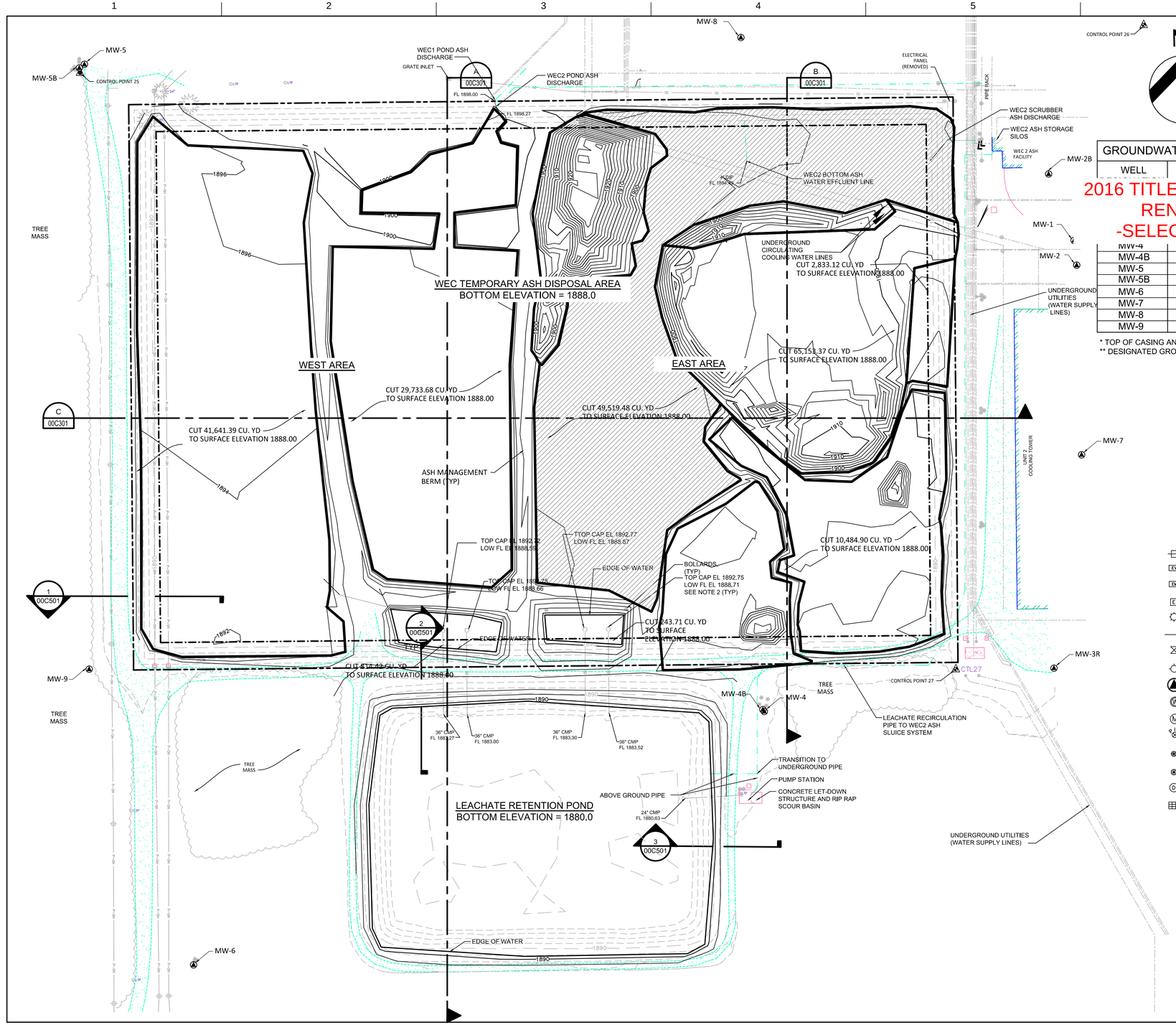
SITE PLAN

0 1" 2"

FILENAME 00C101.DWG

SCALE -

SHEET 00C101



GROUNDWATER MONITORING WELLS

2016 TITLE 132 PERMIT RENEWAL -SELECT PAGES

WELL			TOP OF CASING ELEVATION*	GROUND ELEVATION*	COMMENT
			1902.93	1900.68	DETECTION MONITORING WELL
			1903.18	1900.93	DRY
			1902.96	1900.60**	DETECTION MONITORING WELL
			1900.45	1897.98	DETECTION MONITORING WELL
MW-4	333868.31	2329891.66	1899.21	1895.19	DRY
MW-4B	333876.00	2329890.22	1897.02	1894.69**	DETECTION MONITORING WELL
MW-5	334830.77	2328882.44	1898.90	1897.60	DRY
MW-5B	334819.84	2328884.33	1899.16	1897.21**	DETECTION MONITORING WELL
MW-6	333507.64	2329055.42	1896.72	1893.54	DETECTION MONITORING WELL
MW-7	334250.89	2330359.26	1901.23	1899.14**	DETECTION MONITORING WELL
MW-8	334864.54	2329857.95	1903.37	1901.05**	DETECTION MONITORING WELL
MW-9	333935.57	2328898.85	1896.54	1894.31**	DETECTION MONITORING WELL

* TOP OF CASING AND GROUND ELEVATIONS PROVIDED BY HASTINGS UTILITIES.
** DESIGNATED GROUND ELEVATIONS DEPICT THE ELEVATION OF THE TOP OF THE CONCRETE SLAB NEAREST TO THE CASING ON THE NORTH SIDE.

CONTROLS	NORTHING	EASTING	ELEVATION	LONG DESCRIPTION
25	334815.14	2328892.86	1896.51	BRASS CAP
26	334879.51	2330467.21	1900.86	BRASS CAP
27	333932.07	2330190.86	1894.46	BRASS CAP

*NOTE: STATE PLANE CONTROL IS BASED ON NEBRASKA SOUTH ZONE NAD 27. VERTICAL CONTROL IS BASED ON NGVD29.

LEGEND

- POWER POLE
- ELECTRICAL VAULT
- ELECTRICAL METER
- ELECTRICAL BOX
- LIGHT POLE
- GUY WIRE
- WATER VALVE
- FIRE HYDRANT
- MONITORING WELL
- WATER WELL
- UNKOWN MANHOLE
- POST INDICATOR VALVE
- STEEL POST
- BOLLARD
- STORM DRAIN MANHOLE
- GATE INLET
- CONIFEROUS TREE
- TREE MASS
- STORM SEWER LINE
- OVERHEAD ELECTRIC
- DISCHARGE PIPE
- EDGE OF GRAVEL
- EDGE OF CONCRETE
- EDGE OF WATER
- CONCRETE
- GRAVEL
- BUILDING LINE
- CONTROL POINT
- ASH DISPOSAL AREA BOUNDARY
- ORIGINAL TOE OF SLOPE

NOTES:
1. TOPOGRAPHIC SURVEY OF ASH DISPOSAL AREA AND LEACHATE DETENTION POND BY JEO CONSULTING PERFORMED ON 08/17/2016. SURROUNDING ROADWAYS AND STRUCTURES FROM TOPOGRAPHIC SURVEY BY OLSSON ASSOCIATES PERFORMED ON 07/14/2011.
2. RISER ELEVATIONS PROVIDED BY HASTINGS UTILITIES.

ISSUE	DATE	DESCRIPTION
1	11/3/2016	RESPONSE TO NDEQ COMMENTS
0	10/6/2016	NDEQ TITLE 132 PERMIT RENEWAL

PROJECT MANAGER L. CALUB
PROJECT NUMBER 000000010040278

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public power generation agency

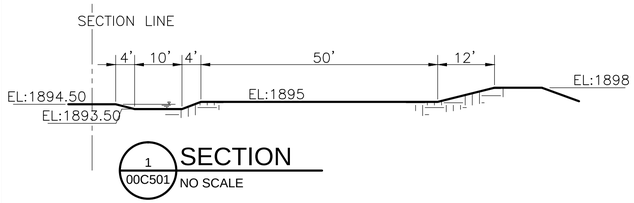
HASTINGS UTILITIES

GERALD T. WHELAN ENERGY CENTER
WEC TEMPORARY ASH DISPOSAL AREA

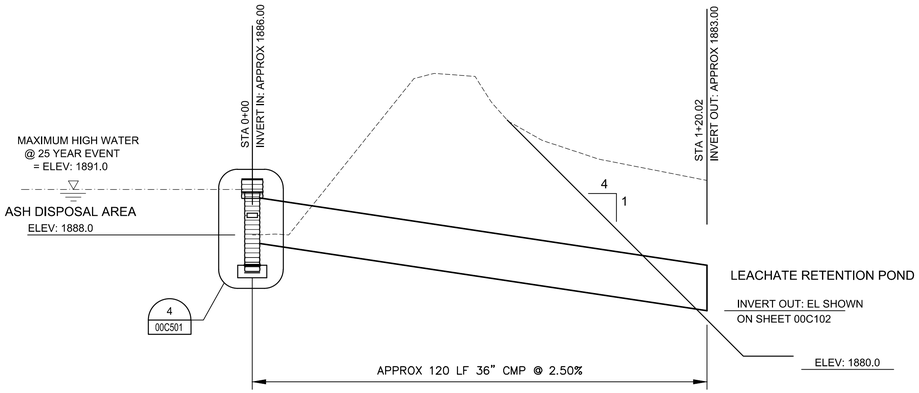
ASH DISPOSAL AREA PLAN

0 1" 2"

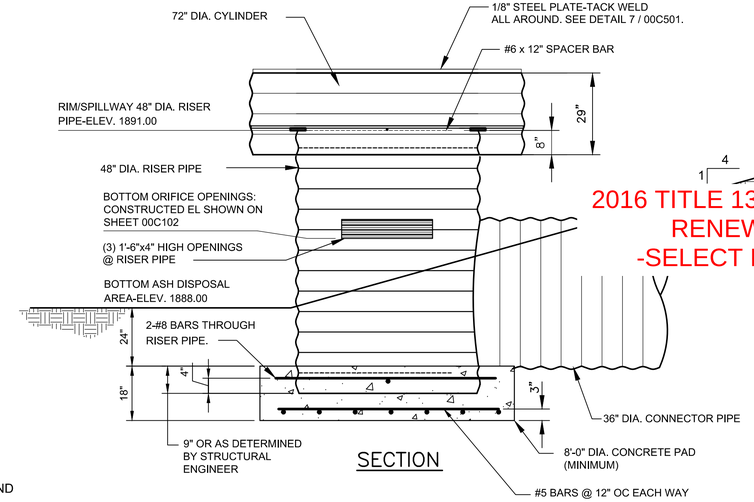
FILENAME 00C102.DWG
SCALE -
SHEET 00C102



1 / 00C501 SECTION
NO SCALE

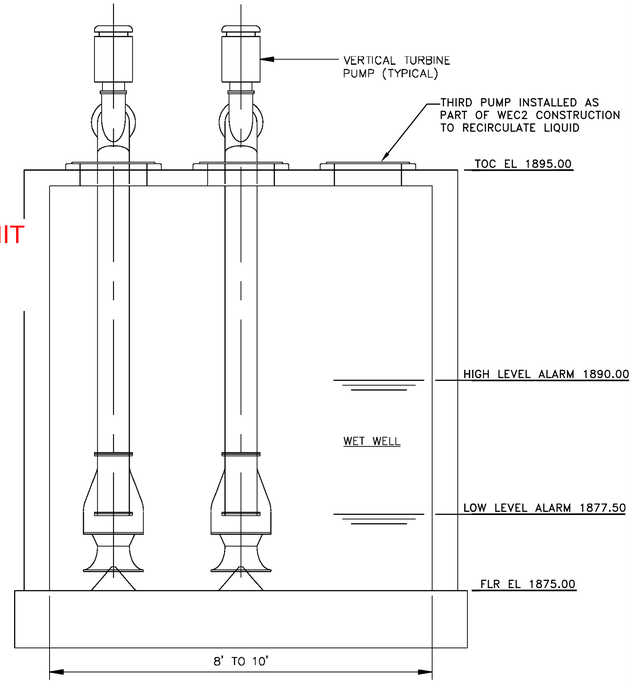


2 / 00C501 PIPE PROFILE @ ASH DISPOSAL AREA
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 5'

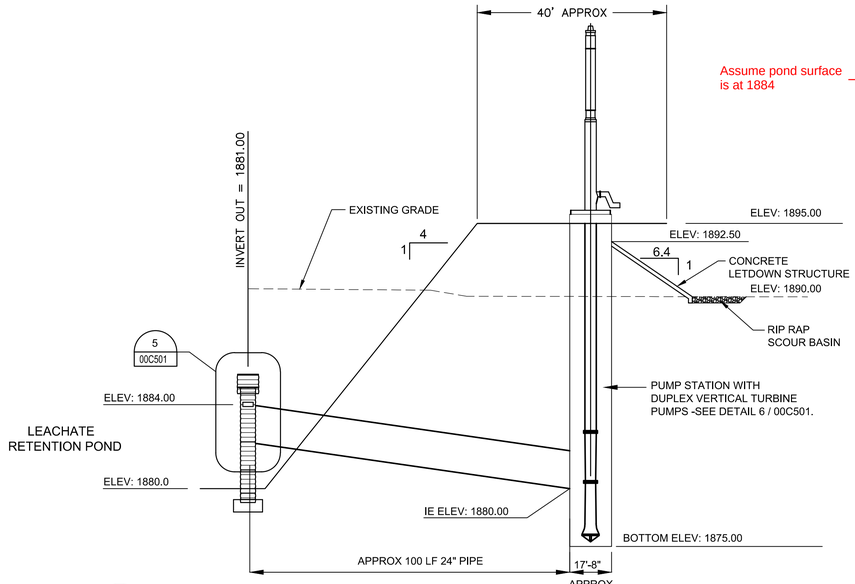


4 / 00C501 RISER INLET @ ASH DISPOSAL AREA
NO SCALE

2016 TITLE 132 PERMIT
RENEWAL
-SELECT PAGES

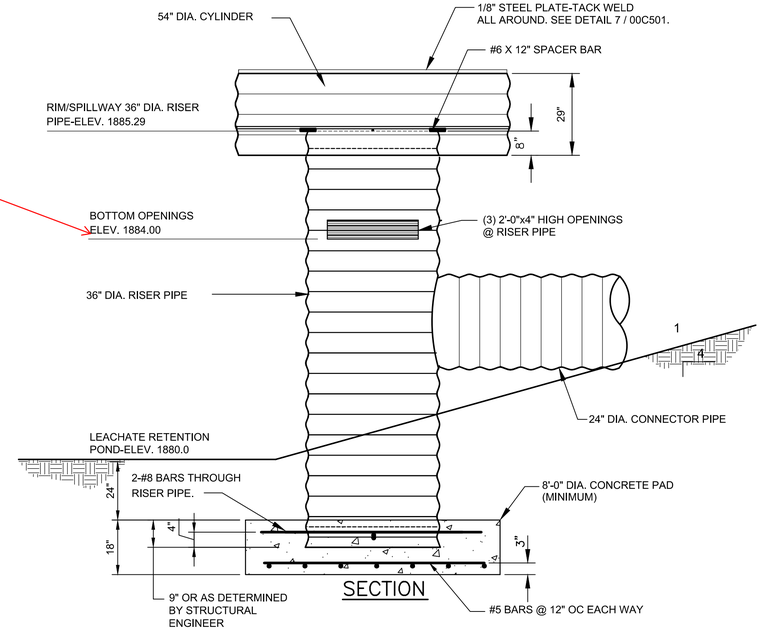


6 / 00C501 PUMP STATION DETAIL
NO SCALE

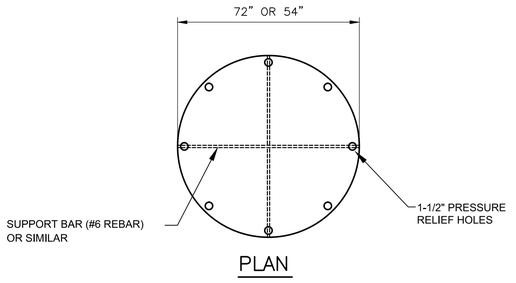


3 / 00C501 PIPE PROFILE @ LEACHATE RETENTION POND
NO SCALE

Assume pond surface
is at 1884



5 / 00C501 RISER DETAIL @ LEACHATE RETENTION PUMP
NO SCALE



7 / 00C501 RISER BAFFLE DETAIL
NO SCALE

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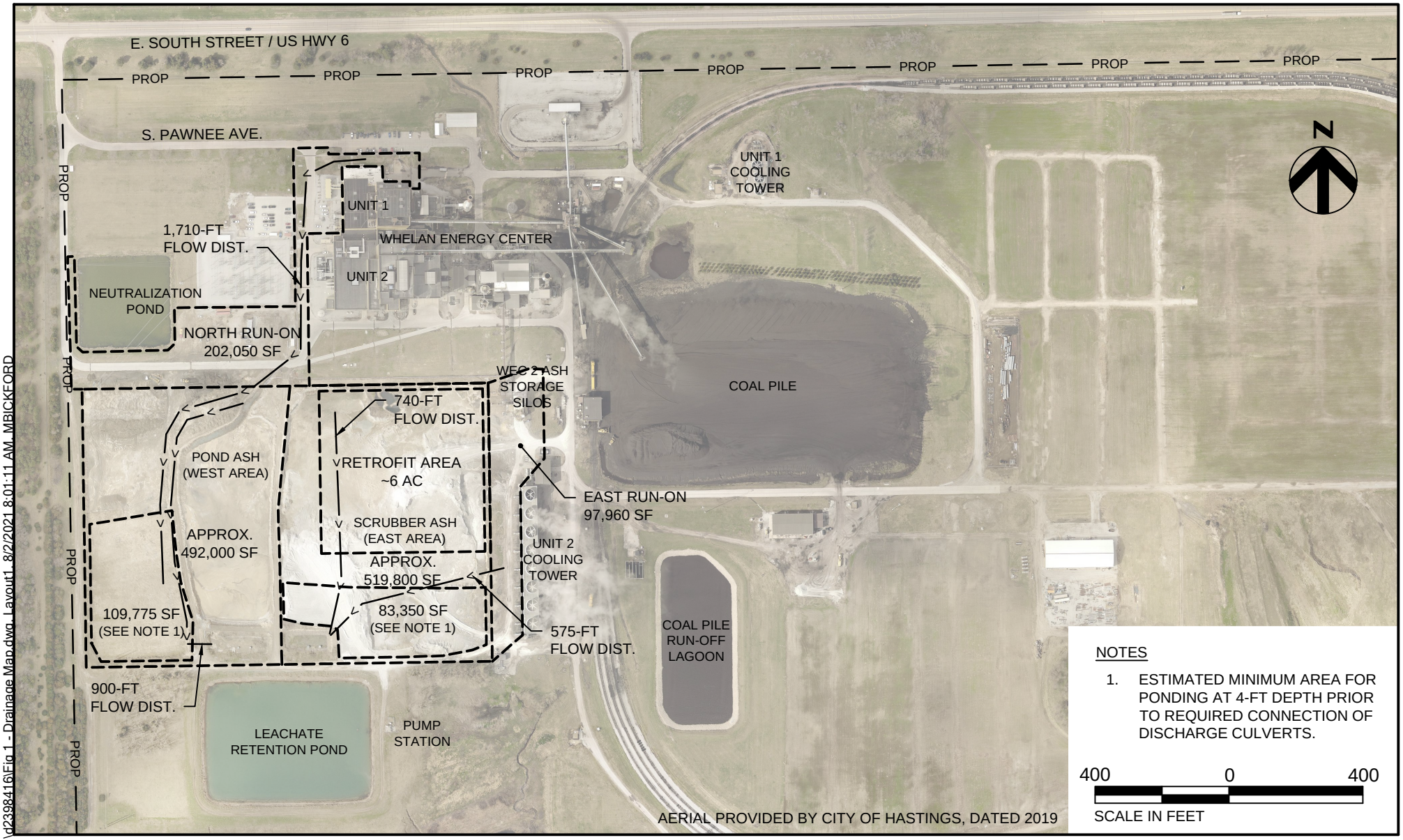
WEC TEMPORARY ASH DISPOSAL AREA

LEACHATE MANAGEMENT DETAILS

0 1" 2"
FILENAME 00C501.DWG
SCALE AS SHOWN
SHEET 00C501

Figure 1

Stormwater Areas



C:\pwworking\central01\d2398416\Fig 1 - Drainage Map.dwg, Layout1, 8/2/2021 8:01:11 AM, MBICKFORD

PUBLIC POWER GENERATION AGENCY
GERALD T. WHELAN ENERGY CENTER
TEMPORARY ASH DISPOSAL AREA

DRAINAGE MAP

DATE
AUGUST 2021

FIGURE
1