Inflow Design Flood Control System Plan
Jeffrey Energy Center
Inactive Bottom Ash Pond

Prepared for:

Westar Energy

Jeffrey Energy Center

St. Marys, Kansas

Prepared by:

APTIM Environmental & Infrastructure, Inc.

April 2018

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Plan Review/Amendment Log §257.82(c)(2-4)

Date of Review	Reviewer Name	Sections Amended and Reason	Version

CCR Regulatory Requirements

USEPA CCR Rule Criteria **40 CFR 257.82**	**Jeffrey Energy Center (JEC)** Inactive Bottom Ash Pond Inflow Design Flood Control System Plan
§257.82(a)(1) stipulates: *(a) The owner or operator of an existing or new CCR Pond or any lateral expansion of a CCR Pond must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.* *(1) The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood specified in paragraph (a)(3) of this section.*	Section 5.3.1
§257.82(a)(2) stipulates: *(2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (a)(3) of this section.*	Section 5.3.1

USEPA CCR Rule Criteria **40 CFR 257.82**	**Jeffrey Energy Center (JEC)** Inactive Bottom Ash Pond Inflow Design Flood Control System Plan
§257.82(a)(3) stipulates: *(3) The inflow design flood is:* *(i) For a high hazard potential CCR Pond, as determined under §257.73(a)(2) or §257.74(a)(2), the probable maximum flood;* *(ii) For a significant hazard potential CCR Pond, as determined under §257.73(a)(2) or §257.74(a)(2), the 1,000-year flood;* *(iii) For a low hazard potential CCR Pond, as determined under §257.73(a)(2) or §257.74(a)(2), the 100-year flood; or* *(iv) For an incised CCR Pond, the 25-year flood.*	Section 4.0
§257.82(b) stipulates: *(b) Discharge from the CCR unit must be handled in accordance with the surface water requirements under §257.3-3.*	Section 3.3

USEPA CCR Rule Criteria **40 CFR 257.82**	**Jeffrey Energy Center (JEC)** Inactive Bottom Ash Pond Inflow Design Flood Control System Plan
§257.82(c)(1) stipulates: *(c) Inflow design flood control system plan—* *(1) Content of the plan. The owner or operator must prepare initial and periodic inflow design flood control system plans for the CCR unit according to the timeframes specified in paragraphs (c)(3) and (4) of this section. These plans must document how the inflow design flood control system has been designed and constructed to meet the requirements of this section. Each plan must be supported by appropriate engineering calculations. The owner or operator of the CCR unit has completed the inflow design flood control system plan when the plan has been placed in the facility's operating record as required by §257.105(g)(4).*	Sections 1.0 - 7.0
§257.82(c)(2) stipulates: *(2) Amendment of the plan. The owner or operator of the CCR unit may amend the written inflow design flood control system plan at any time provided the revised plan is placed in the facility's operating record as required by §257.105(g)(4). The owner or operator must amend the written inflow design flood control system plan whenever there is a change in conditions that would substantially affect the written plan in effect.*	Section 6.3

USEPA CCR Rule Criteria **40 CFR 257.82**	**Jeffrey Energy Center (JEC)** Inactive Bottom Ash Pond Inflow Design Flood Control System Plan
§257.82(c)(3) stipulates: *(3) Timeframes for preparing the initial plan—* *(i) Existing CCR Ponds. The owner or operator of the CCR unit must prepare the initial inflow design flood control system plan no later than October 17, 2016.* *(ii) New CCR Ponds and any lateral expansion of a CCR Pond. The owner or operator must prepare the initial inflow design flood control system plan no later than the date of initial receipt of CCR in the CCR unit.*	Section 1.0

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USEPA CCR Rule Criteria 40 CFR 257.82	**Jeffrey Energy Center (JEC)** Inactive Bottom Ash Pond Inflow Design Flood Control System Plan
§257.82(c)(4) stipulates: *(4) Frequency for revising the plan. The owner or operator must prepare periodic inflow design flood control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first periodic plan. The owner or operator may complete any required plan prior to the required deadline provided the owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed an inflow design flood control system plan when the plan has been placed in the facility's operating record as required by §257.105(g)(4).*	Section 6.3
§257.82(c)(5) stipulates: *(5) The owner or operator must obtain a certification from a qualified professional engineer stating that the initial and periodic inflow design flood control system plans meet the requirements of this section.*	Section 7.0

USEPA CCR Rule Criteria 40 CFR 257.82	**Jeffrey Energy Center (JEC)** Inactive Bottom Ash Pond Inflow Design Flood Control System Plan
§257.82(d) stipulates: *(d) 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).*	Section 6.0

APTIM

1.0 INTRODUCTION

APTIM Environmental and Infrastructure, Inc. (APTIM, f/k/a CB&I Environmental & Infrastructure, Inc., CB&I) has prepared the following Inflow Design Flood Control System Plan (Plan) at the request of Westar Energy (Westar) for the inactive Bottom Ash Pond (Pond) located at the Jeffrey Energy Center (JEC) in St. Mary's, Kansas. JEC is a coal-fired power plant that has been in operations since 1980. The inactive Pond has been deemed to be a regulated coal combustion residue (CCR) unit by the United States Environmental Protection Agency (USEPA), through the Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (CCR Rule) 40 CFR §257 and §261

CCR regulations set forth within Title 40 Code of Federal Regulations (CFR) Part §257.82, provide guidelines for inflow design flood control systems to ensure that inactive CCR units are designed to safely manage stormwater flow during the inflow design flood. Specifically, §257.82 stipulates the following:

> §257.82:"*(a) The owner or operator of an existing or new CCR Pond or any lateral expansion of a CCR Pond must design, construct, operate, and maintain an inflow design flood control system… (1) The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood… and (2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood"*

As demonstrated in this Plan, the inflow design flood control system has been designed to safely manage the inflow design flood and is in compliance with 40 CFR Part §257.82. This document provides discussion of APTIM's professional judgement/opinion regarding specific aspects of the Rule as they pertain to the Pond which has been deemed as a regulated CCR unit at Westar's JEC. This Plan will be placed within the Facility Operations Plan, in accordance with §257.100(e)(4)(ii).

2.0 REGULATORY OVERVIEW OF INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN REQUIREMENTS

On July 26, 2016 the United States Environmental Protection Agency (USEPA) extended the requirements of the Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (CCR Rule) 40 CFR §257 and §261, for certain inactive CCR Ponds. The Pond has been determined to be inactive by 40 CFR §257.53 and therefore has been deemed to be a regulated, inactive CCR unit by the USEPA through the CCR Rule. Westar is currently in the process of closing the Pond in-place in accordance with §257.100(d) of the CCR Rule and intends to complete closure of the Pond in 2018.

This Plan marks the initial analysis of the facility inflow design flood control system based on final closure conditions. Construction activities may occur at the facility that will subsequently modify the final closure conditions as described within this Plan. This Plan will be amended in accordance with §257.82(2), which stipulates:

> §257.81(2): *"The owner or operator of the CCR unit may amend the written inflow design flood control system plan at any time provided the revised plan is placed in the facility's operating record as required by §257.105(g)(4). The owner or operator must amend the written inflow design flood control system plan whenever there is a change in conditions that would substantially affect the written plan in effect."*

Amendments to this Plan will be documented within the Plan Review/Amendment Log immediately following the Table of Contents.

This Plan also details Westar's compliance with the recordkeeping requirements specified in Section 6.0.

3.0 JEC INACTIVE BOTTOM ASH POND OVERVIEW

Westar owns and operates all waste management units at JEC in St. Marys, Pottawatomie County, Kansas. JEC is located approximately 4.5 miles north of Belvue, Kansas and approximately 4.3 miles west of Highway 63 and resides in Sections 1, 2, 11, and 12, Township 9 South, Range 11 East and Sections 6 and 7, Township 9 South, Range 12 East. At JEC the Pond is located southeast of Fly Ash Area 1, north of the FGD Landfill, west of Bottom Ash Area 1, and east of the Tower Hill Lake. The location of the Pond is depicted in **Figure 1**.

3.1 Design and Construction History

3.1.1 Original Design

A Type C fly ash berm and overflow was constructed in the early 1980's by plant staff to separate the Pond and Tower Hill Lake. The fly ash was deposited in lifts of approximately 9 to 15-inches, processed to a desired moisture content, and compacted. The Pond foundation and abutment materials primarily consists of the native underlying geologic materials. The Pond was not constructed with an engineered liner system. There are no drawings or documents available for review for the original design/construction of the berm.

3.1.2 Design Modifications

In 2000 the berm was expanded by raising the embankment to its current elevation to provide additional CCR material storage volume and to add an emergency spillway and instrumentation devices. These modifications were designed by Black & Veatch and were approved and stamped by the Kansas Department of Agriculture, Department of Water Resources (KSDWR) Chief Engineer on June 29, 2000. With the modifications, the berm became a permitted dam (Pond Dam) under Permit DPT-0160.

3.1.3 Pond Closure

The Pond has not received CCR material prior to October 2015 and is in the process of being closed. Historically the Pond received CCR material from the plant, storm water, decant water from Bottom Ash Area 1, and runoff. The final cover design and construction of the Pond will meet 40 CFR §257.100(b)(3)(i) and (ii). Site topography prior to final closure is depicted in **Figure 2**.

3.2 Inflow Design Flood Control System

As discussed previously, the Pond is in the process of completing closure activities by dewatering and final cover capping in line with 40 CFR §257.102(d). As a result of closure, diversion ditches along the north and south boundaries of the Pond have been constructed to capture stormwater run-on from adjacent areas to be discharged to Tower Hill Lake.

Two spillway structures connect the north and south diversion ditches to Tower Hill Lake. The south outlet structure was designed and constructed as part of the original Pond Dam. The south outlet structure is an open-channel spillway approximately 450-feet long, 40-feet wide, with 3H:1V side slopes. It has a rock control crest at 1,165 ft MSL. The upstream side of the spillway is lined with a minimum of 1.5-foot thick layer of limestone riprap. The south outlet structure manages stormwater flow from adjacent areas to the south captured by the south diversion ditch and the southern portion of the capped Pond.

The north outlet structure was designed and constructed as part of Pond closure activities. The CCR unit has been dewatered and is currently undergoing closure via capping in-place. The north outlet structure is a concrete-lined box culvert connecting stormwater flows from adjacent areas to the north captured by the north diversion ditch and the northern portion of the capped Pond. The box culvert is approximately 271-feet long, 12-feet wide, and 6-feet tall. The downstream side of the box culvert is lined with riprap to minimize erosion or scour.

Stormwater that falls onto the final cover cap system of the Pond will also be directed into the north and south diversion ditches through positive grading. In addition, ditches have been installed on the final cover cap system to convey stormwater from the final cover to the north and south diversion ditches. The final cover cap ditches provide a preferential flow path during flood-level storm events to accelerate drainage from the cap area. These features are designed to shed all stormwater within 48 hours of the 100-year storm event. All stormwater flows will eventually discharge into Tower Hill Lake and consequently flow to the NPDES discharge location. The inflow design flood control system and contributing subcatchment areas are depicted in **Figure 3**.

4.0 HAZARD POTENTIAL DEFINITION (§257.82(a)(3))

In accordance with §257.82(a)(3), the inflow design flood event utilized to demonstrate compliance with the Rule is determined by the hazard potential classification. Hazard potential classifications are based on potential loss or damage to the following:

- Human life
- Economic loss
- Environmental damage
- Disruption of lifeline facilities

An Initial Hazard Potential Classification Assessment has also been undertaken in line with §257.73(a)(2) and has been classified as a Low Hazard Potential closed CCR unit. The Initial Hazard Potential Classification is available on Westar's CCR Rule Compliance Data and Information website**.**

As defined in §257.82(a)(3), the 100-year flood event (100-year, 24-hour storm event) is utilized for inflow design flood control system analysis for low hazard potential closed CCR units. The inflow design control system will be evaluated to demonstrate the ability to adequately manage stormwater flow, per §257.82(a)(1), and collect and control the peak discharge, per §257.82(a)(2).

4.1 Emergency Action Plan

According to 40 CFR Part 257.74(a)(3), an Emergency Action Plan (EAP) is required for all CCR units that have been classified as either a high hazard potential or significant hazard potential CCR Pond. Based on the hazard potential classification, an EAP for the Pond is not required.

5.0 INFLOW DESIGN FLOOD CONTROL SYSTEM ANALYSIS

5.1 Methodology Overview

In order to determine compliance with 40 CFR Part §257.82 for the inflow design flood control system at the Pond, site topography and inflow design flood control system features were modeled using the computer model software HydroCAD. This computer model is used to developed discharge rates and volumes associated with the subcatchments contributing to the flow into the Pond. Inflow design flood features were modeled to ensure that these features are capable of managing peak discharge rates and volumes associated with the inflow design flood.

5.2 Model Input Parameters

To ensure that the inflow design flood control system complies with 40 CFR Part §257.82, all elements were modeled with numerous conservative assumptions. AutoCAD Civil3D 2016 (AutoCAD) was utilized to delineate key features and the model HydroCAD was used to develop discharge rates and volumes for the inflow design flood event. HydroCAD is a computer aided design program used to model hydrology and hydraulics of stormwater using either TR-20 or TR-55 procedures developed by the Soil Conservation Services (now the Natural Resource Conservation Service).

The stormwater modeling methodology used the following analysis methods, as further describe in subsequent text:

Runoff Calculation Method:	SCS TR-20
Pond Routing Method:	Storage Indication Method (Modified-Puls)
Storm Distribution:	Rainfall Intensity Table for Kansas Counties - 1997
Unit Hydrograph:	SCS
Antecedent Moisture Condition:	2

The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), developed methods TR-20 and TR-55 as standardized stormwater modeling. Both provide similar results; the main differentiation in methodology is based on the use of chart-based solutions vs. computer modeling. TR-55, frequently called the “tabular method” was developed prior to the widespread use or computer modeling. As such it was developed to utilize chart based solutions to use the SCS runoff equation. TR-20 is a computer based modeling approach that is more complex and generally considered more accurate than TR-55.

5.2.1 Rainfall Totals and Distributions

Rainfall intensities for the inflow design flood system analysis are determined by the hazard potential classification. The Pond has been classified to be a low hazard potential CCR unit. The 100-year flood event (100-year, 24-hour storm event) will be utilized within the model, in accordance with 40 CFR Part §257.82(3) which states:

> §257.82(3) stipulates: *"(3) The inflow design flood is: … (iii) For a low hazard potential CCR Pond, as determined under §257.73(a)(2) or §257.74(a)(2), the 100-year flood;"*

The rainfall depth and distribution pattern for the inflow design flood system analysis was determined using *Rainfall Intensity Tables for Kansas Counties - 1997*, developed for the Kansas Department of Transportation and authored by University of Kansas professor Bruce M. McEnroe. The rainfall depth for the modeled scenario was selected from this report and entered into HydroCAD. TR-55 outlines that an NRCS Type II 24-hour storm distribution is appropriate within this region of Kansas. The distribution pattern may be selected from a drop-down list in HydroCAD. The rainfall total and distribution table utilized within the analysis can be found in **Appendix A**.

5.2.2 Subcatchment Boundaries and Process Flows

Subcatchment areas (also known as watersheds) were delineated using AutoCAD based on topographic breaks within the areas to be analyzed. For the inflow design flood system analysis, direct precipitation onto the Pond and all areas contributing to stormwater run-on into the north and south diversion ditches were delineated and imported into HydroCAD. In addition, process flows provided by Westar that are designed to be managed by the south diversion ditch were included in the model. The inflow design flood control system and contributing subcatchment areas are depicted in **Figure 3**.

5.2.3 Run-off Coefficient Variables

Curve numbers are used to identify the runoff characteristics of an area. Curve numbers consider both the land cover that will be encountered by surface water (such as grass, CCR material, standing water, etc.) as well as the type of soil that underlies the land cover. The underlying soil is important because soil matrix has a large impact on whether water infiltrates the soil or is shed.

The SCS (NRCS) technical resource TR-55 provides lookup tables of curve numbers for combinations of various land covers and the underlying surficial soils. As further described below, APTIM developed assumptions of surficial soil types and delineated various landcovers to develop a weighted average for each modeled subcatchment area using values specified in TR-55.

Surficial Soil Types

According to the KDHE-BWM Industrial Landfill Permit No. 0359 application (Permit application) for the JEC, the facility is covered with mostly silty clay loam. The Permit application defines the surficial soil type as Hydrologic Soil Group D (HSG-D) based on the high run-off potential of the native soils. Surficial soil type within the HydroCAD model was conservatively assumed to be HSG-D in all areas within the Industrial Landfill Permit boundary.

Land Covers

The land covers were determined based on a review of aerial photography and the topographic survey for the Pond boundary and adjacent areas.

Stormwater run-off from the Pond and adjacent areas was conservatively defined to have good grass cover. The TR-55 manual designates good grass cover as grassland with greater than 75% vegetative density. For the purpose of the model, this area was defined as good grass cover in accordance with the TR-55 manual.

5.2.4 Time of Concentration

The time of concentration, defined as the longest amount of time a waterdrop would take to travel from the headwater of a subcatchment area to its downstream edge (ie. prior to being managed by a downstream element) was delineated in AutoCAD and manually entered in HydroCAD.

The following assumptions were made in the calculations:

- For each subcatchment the time of concentration, T_c, is the sum of the travel times, T_t, of various consecutive flow segments. There are three types of flow: sheet flow, shallow concentrated flow, and open channel flow.

- Sheet flow is assumed to become shallow concentrated flow at 100 feet. It is noted that TR-20 and TR-55 methods specify 300 feet, but subsequent research has generally shown 100 feet to be more accurate.

- The Manning's coefficient "n" for sheet flow was assumed to be 0.015, indicative of short grass. This number is appropriate for vegetated subcatchment areas.

- An average flow velocity of 7.0 ft/sec was assumed in shallow concentrated flow calculations for the Pond subcatchment and adjacent areas, which is considered most indicative of the vegetated areas.

5.2.5 Stormwater Conveyance Features

Stormwater run-on from adjacent areas and stormwater run-off is designed to be captured in the north and south diversion ditches. In addition, ditches have been installed on the final cover cap system to convey stormwater from the final cover to the north and south diversion ditches. During the 100-year flood event, the north and south diversion ditches will be used to adequately manage flows from the Pond to collect and control stormwater during and after the peak discharge. The north and south diversion ditches have been modeled in HydroCAD based on the most recent design drawing set for the ongoing closure construction activities.

5.2.6 Spillway Structures

Stormwater captured from the north and south diversion ditches as well as the final cover cap system are designed to discharge through the north and south outlet structures to Tower Hill Lake. The south outlet structure was modeled in HydroCAD based on drawings and descriptions provided in the Pond Dam modification reported by Black & Veatch in 2000. The north outlet structure was modeled in HydroCAD based on the Jeffrey Energy Center - CCR Impoundment Closure Design 100% Design submitted in February 2017.

5.3 Model Findings

The HydroCAD results for the 100-year flood event (100-year, 24-hour storm event) were analyzed to evaluate the inflow design flood control system at the Pond. Results from the model indicate that the inflow design flood control system properly manages stormwater run-on from adjacent areas and stormwater run-off from the Pond. Erosion or scour is not anticipated to occur during the 100-year flood within the ditch segments and the final cover cap system.

5.3.1 Inflow Design Flood Control System Analysis (§257.82(a))

The inflow design flood control system analysis was completed to demonstrate that the existing system complies with 40 CFR Part §257.82(a), which states:

> *"(1) The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood specified in paragraph (a)(3) of this section.*
>
> *(2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (a)(3) of this section."*

A review of the model shows that during the 100-year flood event, stormwater conveyance features at the Pond have been designed to properly manage stormwater while providing a preferential flowpath for any stormwater that exceeds maximum design elevations.

Results from the inflow design flood control system analysis can be found in **Appendix B.**

5.4 Engineering Evaluation of Findings

5.4.1 Design Appropriateness Based on Model Findings

Based on the model findings, it has been demonstrated that the inflow design flood control system complies with 40 CFR Part §257.82(a) of the Rule. The inflow design flood control system has been appropriately designed to properly manage direct precipitation and stormwater run-on associated with the 100-year flood event.

5.4.2 Operations and Maintenance Considerations

APTIM recommends that the stormwater conveyance features and outlet structures that direct stormwater to Tower Hill Lake be maintained. Regular inspections of the inflow design flood control system are recommended in order to clear debris, repair erosion, and monitor any erosion control measures.

6.0 RECORDS RETENTION AND MAINTENANCE (§257.82(d))

6.1 Incorporation of Plan into Operating Record

§257.105(g) of 40 CFR Part 257 provides record keeping requirements to ensure that the Plan must be placed in the facility's operating record. Specifically, §257.105(g) stipulates:

> §257.105(g) stipulates*: "(g) Operating criteria. The owner or operator of a CCR unit subject to this subpart must place the following information, as it becomes available,*

in the facility's operating record: (4) The initial and periodic inflow design flood control system plan as required by §257.82(c)."

This Report will be placed within the Facility Operating Record upon Westar's review and approval.

6.2 Notification Requirements

§257.106(g) of 40 CFR Part 257 provides guidelines for the notification of the availability of the initial and periodic plan. Specifically, §257.106(g) stipulates:

> §257.106(g) stipulates: "*(g) Operating criteria. The owner or operator of a CCR unit subject to this subpart must notify the State Director and/or appropriate Tribal authority when information has been placed in the operating record and on the owner or operator's publicly accessible internet site. The owner or operator must: ((4) Provide notification of the availability of the initial and periodic inflow design flood control system plans specified under §257.105(g)(4)"*

The State Director and appropriate Tribal Authority will be notified upon placement of this Report in the Facility Operating Record.

§257.107(g) of 40 CFR Part 257 provides publicly accessible Internet site requirements to ensure that the Plan is accessible through the Westar webpage. Specifically, §257.107(g) stipulates:

> §257.107(g) stipulates: *"(g) Operating criteria. The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site: (4) The initial and periodic inflow design flood control system plans specified under §257.105(g)(4)."*

This Plan will be uploaded to Westar's CCR compliance reporting website upon Westar's review and approval.

6.3 Plan Amendments (§257.82(c)(3))

This Plan has been completed in accordance with §257.82(c)(3) to provide an initial analysis of the inflow design flood control system. This Plan will continue to undergo review as the closure activities continue. Westar is required to prepare inflow design flood control system plans every five (5) years, as required by §257.82(c)(4) of the CCR Rule. The amended Plan will be reviewed and recertified by a registered professional engineer and will be placed in JEC's facility operating record as required per §257.105(g)(4). The amended Plan will supersede and replace any prior versions. Availability of the amended Plan will be noticed to the State Director per §257.106(g)(4) and posted to the publicly accessible internet site per §257.107(g)(4).

A record of Plan reviews/assessments is provided on the first page of this document, immediately following the Table of Contents.

7.0 PROFESSIONAL ENGINEER CERTIFICATION (§257.82(c)(5))

The undersigned registered professional engineer is familiar with the requirements of the CCR Rule and has visited and examined the Jeffrey Energy Center or has supervised examination of the Jeffrey Energy Center by appropriately qualified personnel. The undersigned registered professional engineer attests that this Inflow Design Flood Control Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and meets the requirements of §257.82, and that this Plan is adequate for the JEC facility. This certification was prepared as required by §257.82(c)(5)

Name of Professional Engineer: Richard Southorn

Company: APTIM

Signature:

Date: 04/16/18

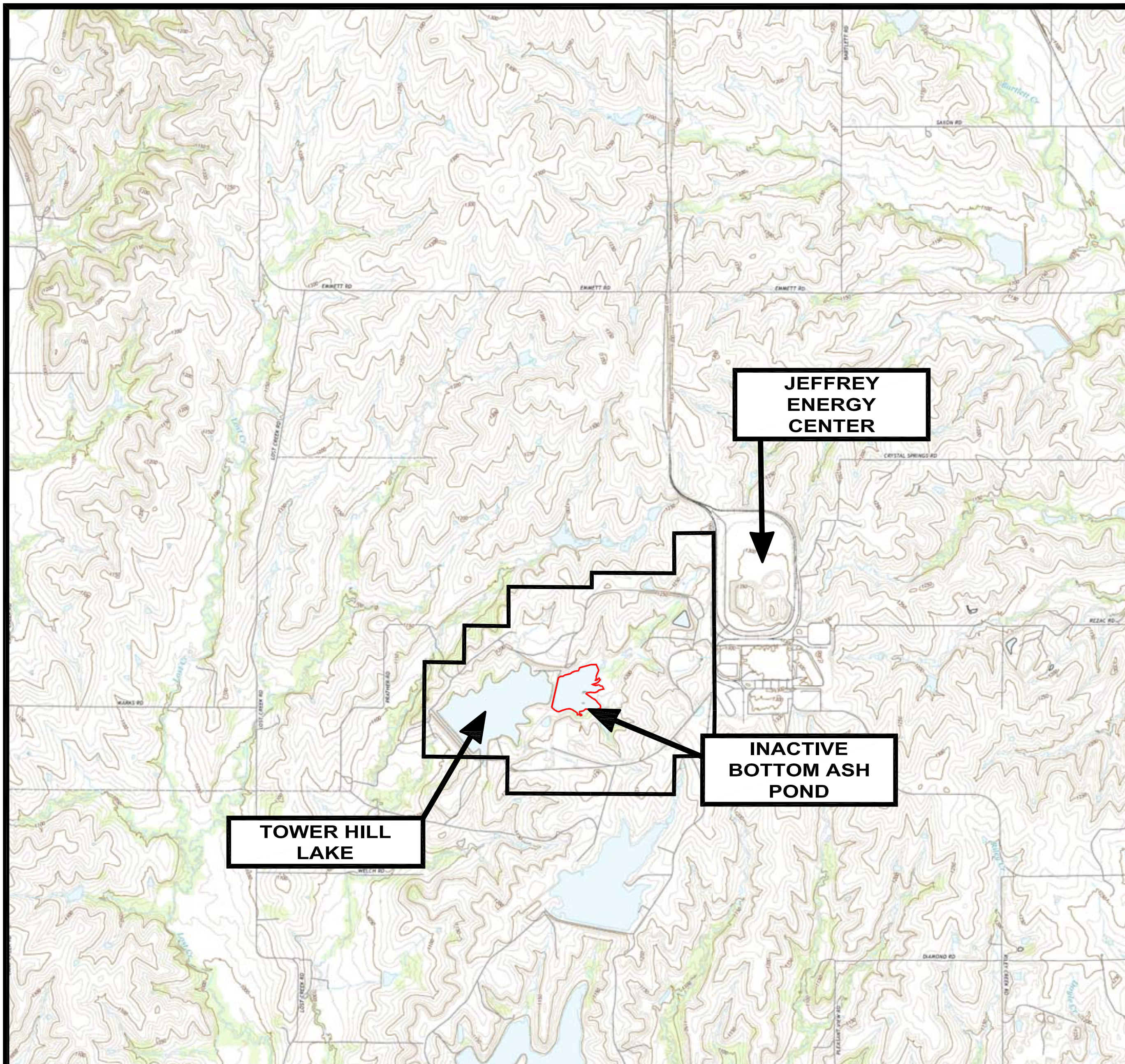
PE Registration State: Kansas

PE Registration Number: PE25201

Professional Engineer Seal:

FIGURES

Figure 1 - Inactive Bottom Ash Pond, Site Location Plan
Figure 2 - Inactive Bottom Ash Pond, Site Topography Prior to Closure
Figure 3 - Inactive Bottom Ash Pond, Inflow Design Flood Control System



LEGEND

CCR UNIT BOUNDARY

KDHE-BWM INDUSTRIAL LANDFILL PERMIT NO. 0359 BOUNDARY

N

0 5000'

GRAPHIC SCALE

NOTES

1. AERIAL TOPO OBTAINED FROM USGS 7.5-MINUTE SERIES, EMMETT AND LACLEDE QUADRANGLE, KANSAS, 2014.
2. ALL BOUNDARIES ARE APPROXIMATE.

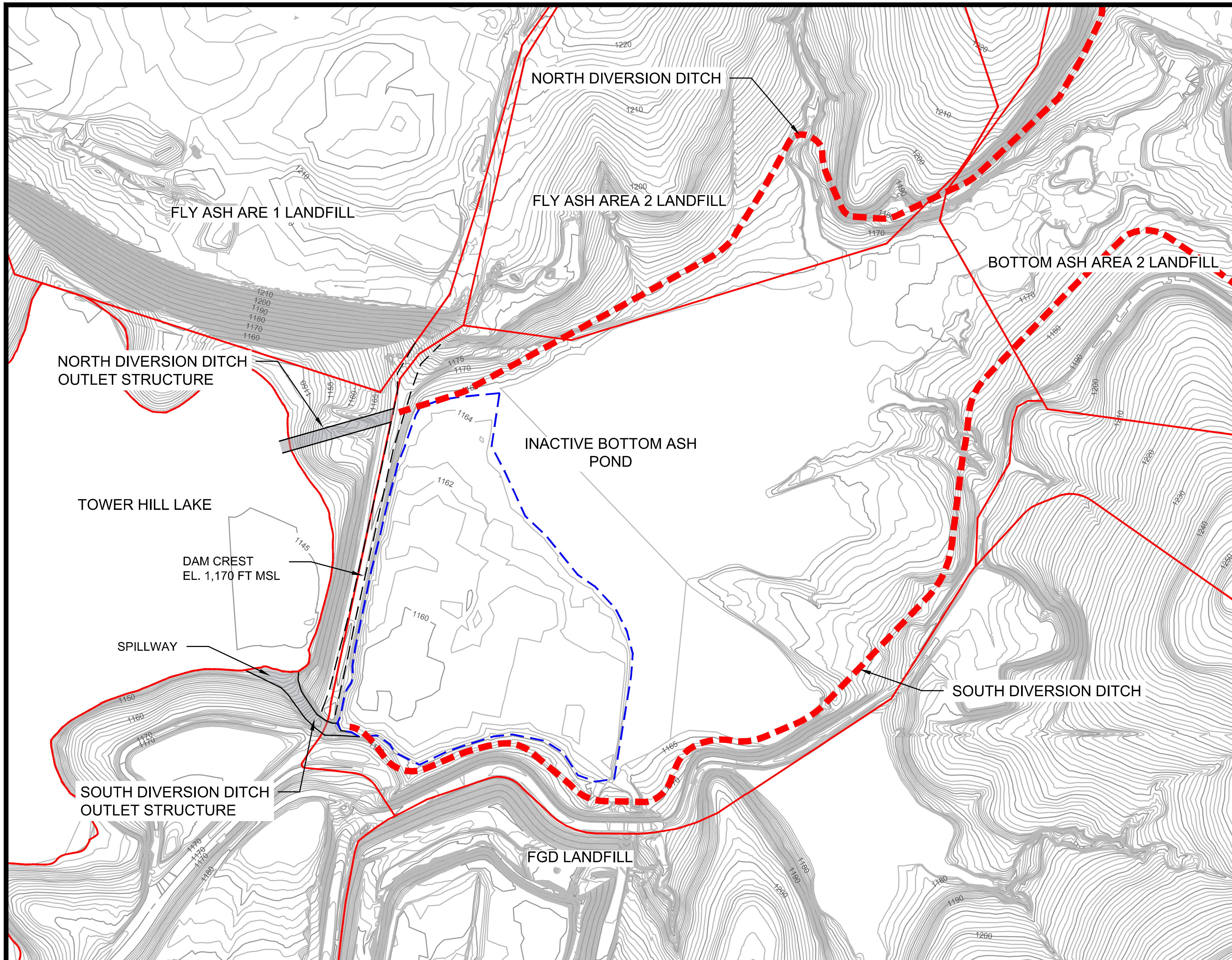
APTIM

APTIM Environmental & Infrastructure, Inc.

WESTAR ENERGY
25905 JEFFREY RD., ST. MARYS, KS

FIGURE 1
FGD LANDFILL
SITE LOCATION PLAN

APPROVED BY:	RDS	PROJ. NO.:	631232565	DATE:	APRIL 2018



N

0 350'

GRAPHIC SCALE

LEGEND

- APPROXIMATE CCR UNIT BOUNDARY
- APPROXIMATE WATER ELEVATION
- APPROXIMATE POND DAM BOUNDARY
- APPROXIMATE SPILLWAY BOUNDARY
- APPROXIMATE DIVERSION DITCH DELINEATION

NOTES

1. EXISTING CONTOURS DEVELOPED BY PROFESSIONAL ENGINEERING CONSULTANTS IN APRIL 2016.
2. FOR CLARITY, NOT ALL SITE FEATURES MAY BE SHOWN.
3. ALL BOUNDARY AND FEATURE LOCATIONS ARE APPROXIMATE.

REV. NO.	DATE	DESCRIPTION

Westar Energy®

APTIM

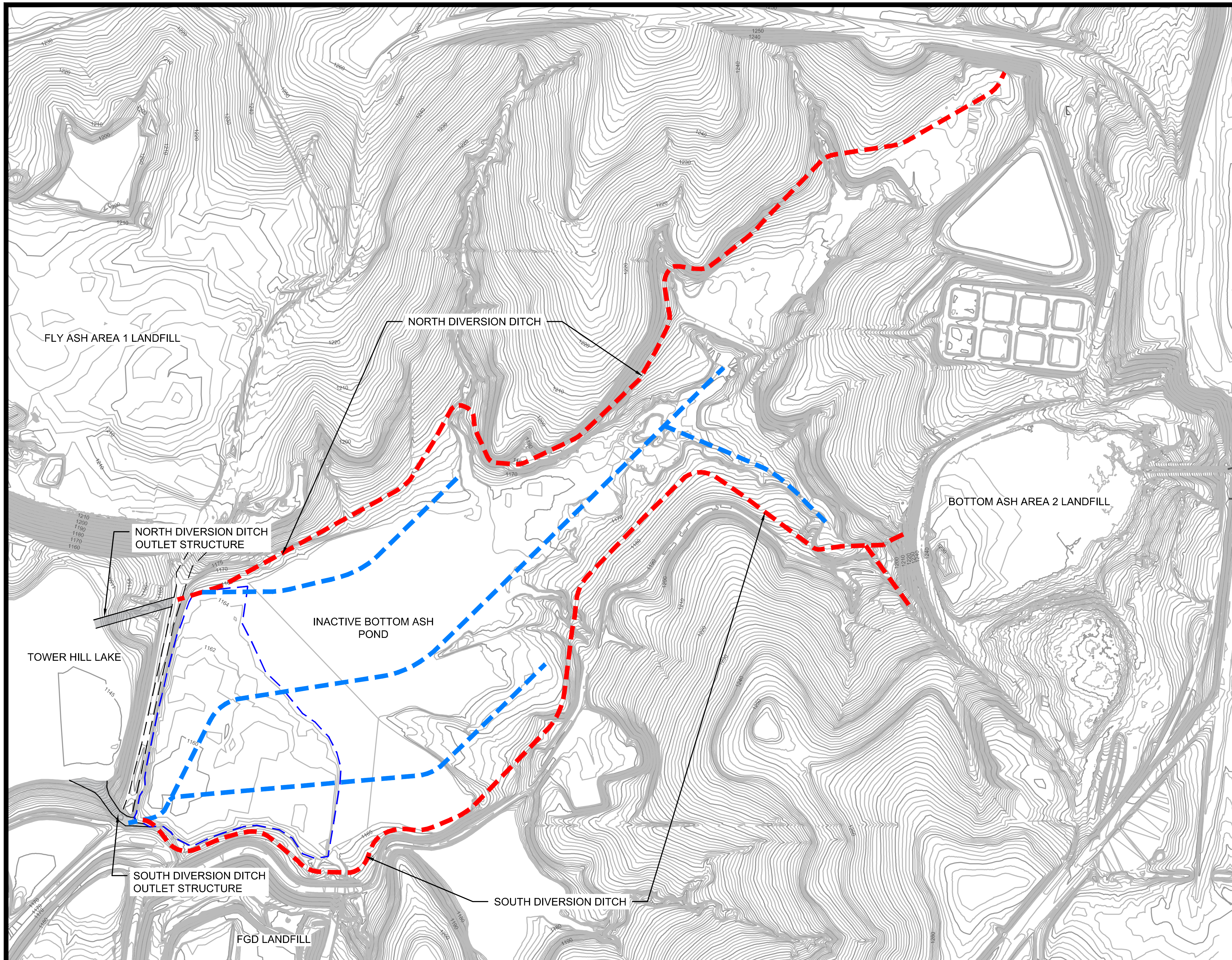
APTIM Environmental & Infrastructure, Inc.

WESTAR ENERGY
25905 JEFFREY RD., ST. MARYS, KS

FIGURE 2
INACTIVE BOTTOM ASH POND
SITE TOPOGRAPHY PRIOR TO CLOSURE

DRAWN BY: ORC	APPROVED BY: MMS	PROJ. NO.: 631232565	DATE: APRIL 2018

T:\AutoCAD\Projects\Westar Energy\Jeffrey\Compliance Reports\Inactive BAP\Inactive Bottom Ash Pond Figures 2 and 3.dwg, DWG To PDF.pc3



N

0 500'

GRAPHIC SCALE

LEGEND

Red dashed line	APPROXIMATE INFLOW DESIGN FLOOD CONTROL SYSTEM FEATURES
Blue dashed line (heavy)	APPROXIMATE FINAL COVER CAP DITCH SEGMENTS
Blue dashed line (thin)	APPROXIMATE WATER ELEVATION
Black dashed line	APPROXIMATE POND DAM BOUNDARY
Solid line	APPROXIMATE SPILLWAY BOUNDARY

NOTES

1. EXISTING CONTOURS DEVELOPED BY PROFESSIONAL ENGINEERING CONSULTANTS IN APRIL 2016.
2. FOR CLARITY, NOT ALL SITE FEATURES MAY BE SHOWN.
3. ALL BOUNDARY AND FEATURE LOCATIONS ARE APPROXIMATE.

REV. NO.	DATE	DESCRIPTION

Westar Energy®

APTIM

APTIM Environmental & Infrastructure, Inc.

WESTAR ENERGY
25905 JEFFREY RD., ST. MARYS, KS

FIGURE 3
INACTIVE BOTTOM ASH POND
INFLOW DESIGN FLOOD CONTROL SYSTEM

DRAWN BY:	APPROVED BY:	PROJ. NO.:	DATE:
ORC	RDS	631232565	APRIL 2018

T:\AutoCAD\Projects\Westar Energy\Jeffrey\Compliance Reports\Inactive BAP\Inflow Design Flood Control Plan\Inflow Design Flood Control System Plan Figure 3.dwg, DWG To PDF.pc3

APPENDICES

Appendix A - Rainfall Intensity Tables for Kansas Counties

Appendix B - Inflow Design Flood Control System HydroCAD Output Files

APPENDIX A

Rainfall Intensity Tables for Kansas Counties

RAINFALL INTENSITY TABLES

FOR KANSAS COUNTIES

Developed for

Kansas Department of Transportation

by

Bruce M. McEnroe

Department of Civil and Environmental Engineering
University of Kansas
Lawrence, Kansas

June, 1997

RAINFALL INTENSITY TABLE

POTTAWATOMIE COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD 1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:05	4.63	5.40	6.48	7.26	8.41	9.31	10.20
0:06	4.44	5.19	6.23	6.99	8.10	8.98	9.84
0:07	4.28	5.00	6.02	6.76	7.84	8.68	9.52
0:08	4.12	4.83	5.82	6.54	7.58	8.41	9.22
0:09	3.98	4.66	5.62	6.32	7.34	8.14	8.93
0:10	3.84	4.50	5.43	6.11	7.10	7.87	8.64
0:11	3.70	4.34	5.25	5.91	6.86	7.61	8.36
0:12	3.57	4.19	5.07	5.71	6.64	7.36	8.09
0:13	3.45	4.05	4.91	5.53	6.43	7.14	7.84
0:14	3.33	3.92	4.76	5.36	6.24	6.92	7.61
0:15	3.22	3.80	4.62	5.21	6.06	6.73	7.40
0:16	3.12	3.69	4.49	5.07	5.91	6.56	7.21
0:17	3.03	3.58	4.37	4.94	5.76	6.40	7.04
0:18	2.94	3.49	4.26	4.82	5.63	6.26	6.89
0:19	2.86	3.40	4.16	4.71	5.50	6.12	6.74
0:20	2.78	3.31	4.07	4.61	5.39	6.00	6.60
0:21	2.71	3.23	3.98	4.51	5.28	5.88	6.48
0:22	2.64	3.16	3.89	4.42	5.18	5.77	6.36
0:23	2.58	3.09	3.81	4.33	5.08	5.66	6.24
0:24	2.52	3.02	3.74	4.25	4.99	5.56	6.13
0:25	2.46	2.95	3.67	4.17	4.90	5.46	6.03
0:26	2.41	2.89	3.60	4.10	4.81	5.37	5.93
0:27	2.36	2.84	3.53	4.03	4.73	5.28	5.83
0:28	2.31	2.78	3.47	3.96	4.65	5.20	5.74
0:29	2.26	2.73	3.41	3.89	4.58	5.11	5.65
0:30	2.22	2.68	3.35	3.83	4.50	5.03	5.56
0:31	2.18	2.63	3.30	3.76	4.43	4.96	5.48
0:32	2.14	2.59	3.24	3.70	4.37	4.88	5.39
0:33	2.10	2.54	3.19	3.65	4.30	4.81	5.31
0:34	2.06	2.50	3.14	3.59	4.24	4.74	5.24
0:35	2.03	2.46	3.09	3.54	4.17	4.67	5.16
0:36	1.99	2.42	3.05	3.48	4.11	4.60	5.09
0:37	1.96	2.38	3.00	3.43	4.05	4.54	5.01
0:38	1.93	2.35	2.96	3.38	4.00	4.47	4.95
0:39	1.90	2.31	2.91	3.34	3.94	4.41	4.88
0:40	1.87	2.28	2.87	3.29	3.88	4.35	4.81
0:41	1.84	2.24	2.83	3.24	3.83	4.29	4.75
0:42	1.81	2.21	2.79	3.20	3.78	4.23	4.68
0:43	1.79	2.18	2.75	3.16	3.73	4.18	4.62
0:44	1.76	2.15	2.72	3.11	3.68	4.12	4.56
0:45	1.74	2.12	2.68	3.07	3.63	4.07	4.50

RAINFALL INTENSITY TABLE

POTTAWATOMIE COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD 1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:46	1.71	2.09	2.64	3.03	3.58	4.02	4.44
0:47	1.69	2.06	2.61	2.99	3.54	3.96	4.39
0:48	1.67	2.03	2.57	2.95	3.49	3.91	4.33
0:49	1.64	2.01	2.54	2.92	3.45	3.86	4.28
0:50	1.62	1.98	2.51	2.88	3.41	3.82	4.22
0:51	1.60	1.96	2.48	2.84	3.36	3.77	4.17
0:52	1.58	1.93	2.45	2.81	3.32	3.72	4.12
0:53	1.56	1.91	2.42	2.77	3.28	3.68	4.07
0:54	1.54	1.88	2.39	2.74	3.24	3.63	4.02
0:55	1.52	1.86	2.36	2.71	3.20	3.59	3.98
0:56	1.50	1.84	2.33	2.67	3.17	3.55	3.93
0:57	1.48	1.81	2.30	2.64	3.13	3.51	3.88
0:58	1.46	1.79	2.27	2.61	3.09	3.47	3.84
0:59	1.45	1.77	2.25	2.58	3.06	3.43	3.79
1:00	1.43	1.75	2.22	2.55	3.02	3.39	3.75
1:05	1.35	1.65	2.10	2.41	2.86	3.20	3.54
1:10	1.28	1.56	1.99	2.28	2.70	3.03	3.36
1:15	1.21	1.48	1.89	2.17	2.57	2.88	3.19
1:20	1.15	1.41	1.79	2.06	2.44	2.74	3.04
1:25	1.09	1.34	1.71	1.97	2.33	2.61	2.90
1:30	1.04	1.28	1.63	1.88	2.23	2.50	2.77
1:35	1.00	1.22	1.56	1.80	2.13	2.39	2.65
1:40	0.95	1.17	1.50	1.72	2.05	2.30	2.55
1:45	0.91	1.12	1.44	1.66	1.97	2.21	2.45
1:50	0.87	1.08	1.38	1.59	1.89	2.13	2.36
1:55	0.84	1.04	1.33	1.54	1.83	2.05	2.28
2:00	0.81	1.00	1.29	1.48	1.76	1.98	2.20
2:05	0.78	0.96	1.24	1.43	1.71	1.92	2.13
2:10	0.75	0.93	1.20	1.39	1.65	1.86	2.06
2:15	0.72	0.90	1.16	1.35	1.60	1.80	2.00
2:20	0.70	0.87	1.13	1.31	1.56	1.75	1.95
2:25	0.68	0.84	1.10	1.27	1.51	1.71	1.89
2:30	0.66	0.82	1.06	1.23	1.47	1.66	1.84
2:35	0.64	0.80	1.04	1.20	1.44	1.62	1.80
2:40	0.62	0.77	1.01	1.17	1.40	1.58	1.75
2:45	0.60	0.75	0.98	1.14	1.37	1.54	1.71
2:50	0.58	0.73	0.96	1.12	1.33	1.50	1.67
2:55	0.57	0.72	0.94	1.09	1.30	1.47	1.64
3:00	0.56	0.70	0.92	1.07	1.28	1.44	1.60

RAINFALL INTENSITY TABLE

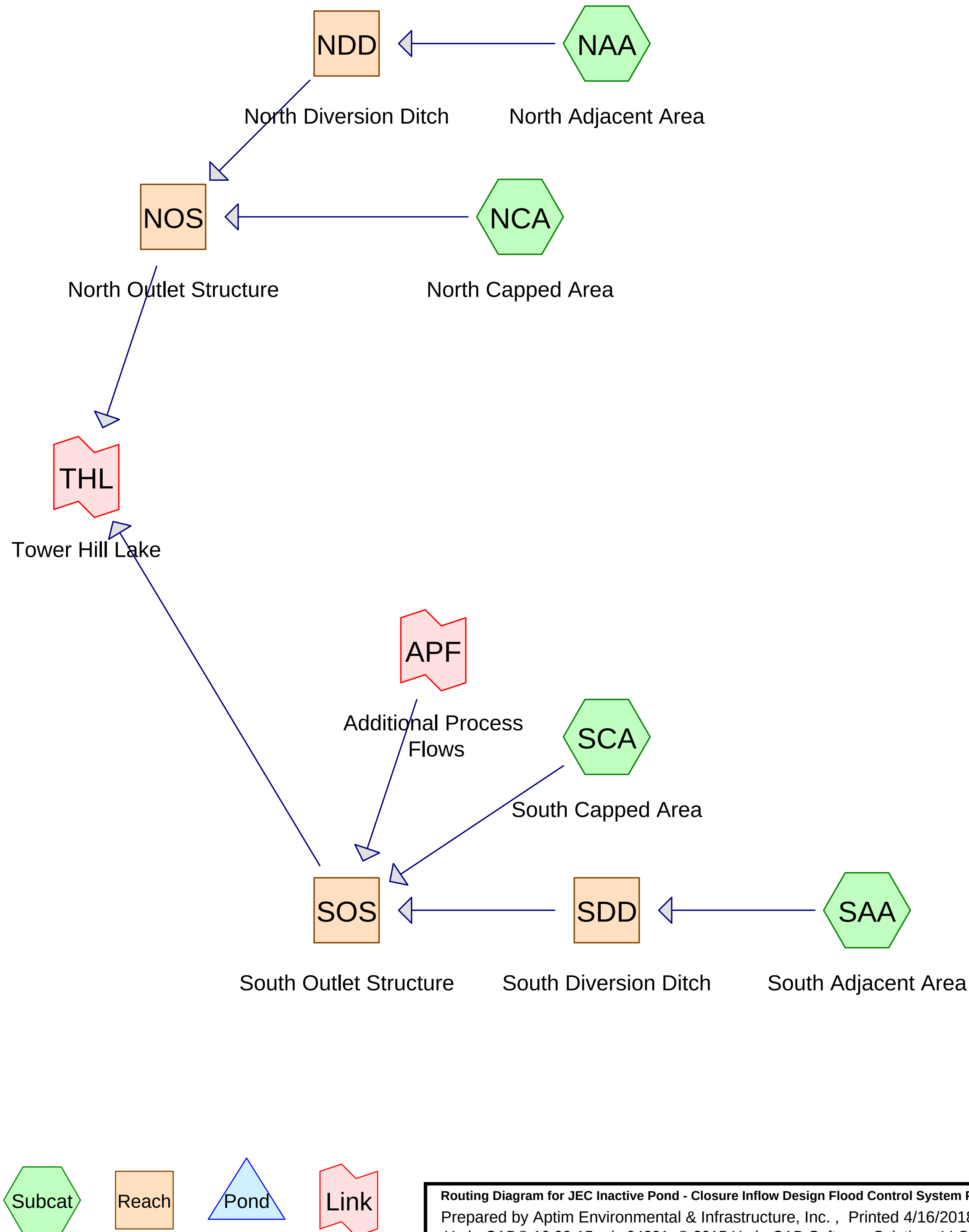
POTTAWATOMIE COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

DURATION,			RETURN PERIOD				
HR:MIN	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
3:15	0.52	0.66	0.86	1.00	1.20	1.35	1.50
3:30	0.49	0.62	0.81	0.94	1.13	1.28	1.42
3:45	0.47	0.59	0.77	0.90	1.07	1.21	1.35
4:00	0.44	0.56	0.73	0.85	1.02	1.15	1.28
4:15	0.43	0.54	0.70	0.81	0.97	1.10	1.22
4:30	0.41	0.51	0.67	0.78	0.93	1.05	1.17
4:45	0.39	0.49	0.64	0.75	0.89	1.01	1.12
5:00	0.38	0.48	0.62	0.72	0.86	0.97	1.08
5:15	0.37	0.46	0.60	0.69	0.83	0.93	1.04
5:30	0.36	0.44	0.58	0.67	0.80	0.90	1.00
5:45	0.34	0.43	0.56	0.65	0.77	0.87	0.96
6:00	0.33	0.42	0.54	0.63	0.75	0.84	0.93
6:30	0.31	0.39	0.51	0.59	0.70	0.79	0.88
7:00	0.30	0.37	0.48	0.56	0.66	0.75	0.83
7:30	0.28	0.35	0.45	0.53	0.63	0.71	0.78
8:00	0.27	0.33	0.43	0.50	0.60	0.67	0.75
8:30	0.26	0.32	0.41	0.48	0.57	0.64	0.71
9:00	0.24	0.30	0.39	0.46	0.54	0.61	0.68
9:30	0.23	0.29	0.38	0.44	0.52	0.59	0.65
10:00	0.22	0.28	0.36	0.42	0.50	0.56	0.63
10:30	0.22	0.27	0.35	0.40	0.48	0.54	0.60
11:00	0.21	0.26	0.34	0.39	0.46	0.52	0.58
11:30	0.20	0.25	0.32	0.38	0.45	0.50	0.56
12:00	0.19	0.24	0.31	0.36	0.43	0.49	0.54
13:00	0.18	0.23	0.29	0.34	0.41	0.46	0.51
14:00	0.17	0.21	0.28	0.32	0.38	0.43	0.48
15:00	0.16	0.20	0.26	0.30	0.36	0.41	0.45
16:00	0.15	0.19	0.25	0.29	0.35	0.39	0.43
17:00	0.15	0.18	0.24	0.28	0.33	0.37	0.41
18:00	0.14	0.18	0.23	0.26	0.31	0.35	0.39
19:00	0.14	0.17	0.22	0.25	0.30	0.34	0.38
20:00	0.13	0.16	0.21	0.24	0.29	0.33	0.36
21:00	0.13	0.16	0.20	0.23	0.28	0.31	0.35
22:00	0.12	0.15	0.20	0.23	0.27	0.30	0.33
23:00	0.12	0.15	0.19	0.22	0.26	0.29	0.32
24:00	0.11	0.14	0.18	0.21	0.25	0.28	0.31

APPENDX B

Inflow Design Flood Control System HydroCAD Output Files



Routing Diagram for JEC Inactive Pond - Closure Inflow Design Flood Control System Plan

Prepared by Aptim Environmental & Infrastructure, Inc. , Printed 4/16/2018

Summary for Subcatchment NAA: North Adjacent Area

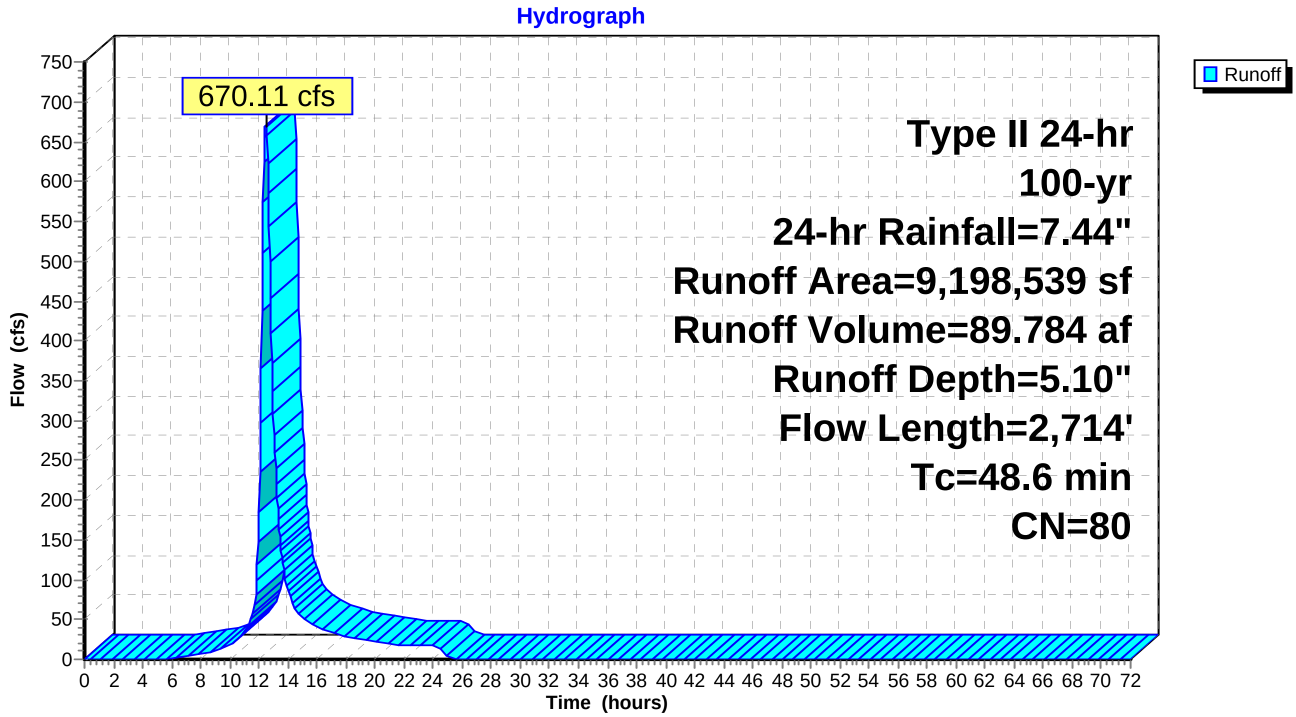
Runoff = 670.11 cfs @ 12.47 hrs, Volume= 89.784 af, Depth= 5.10"

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 100-yr, 24-hr Rainfall=7.44"

Area (sf)	CN	Description
9,198,539	80	>75% Grass cover, Good, HSG D
9,198,539		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.8	300	0.0292	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
28.8	2,414	0.0399	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
48.6	2,714	Total			

Subcatchment NAA: North Adjacent Area



Summary for Subcatchment NCA: North Capped Area

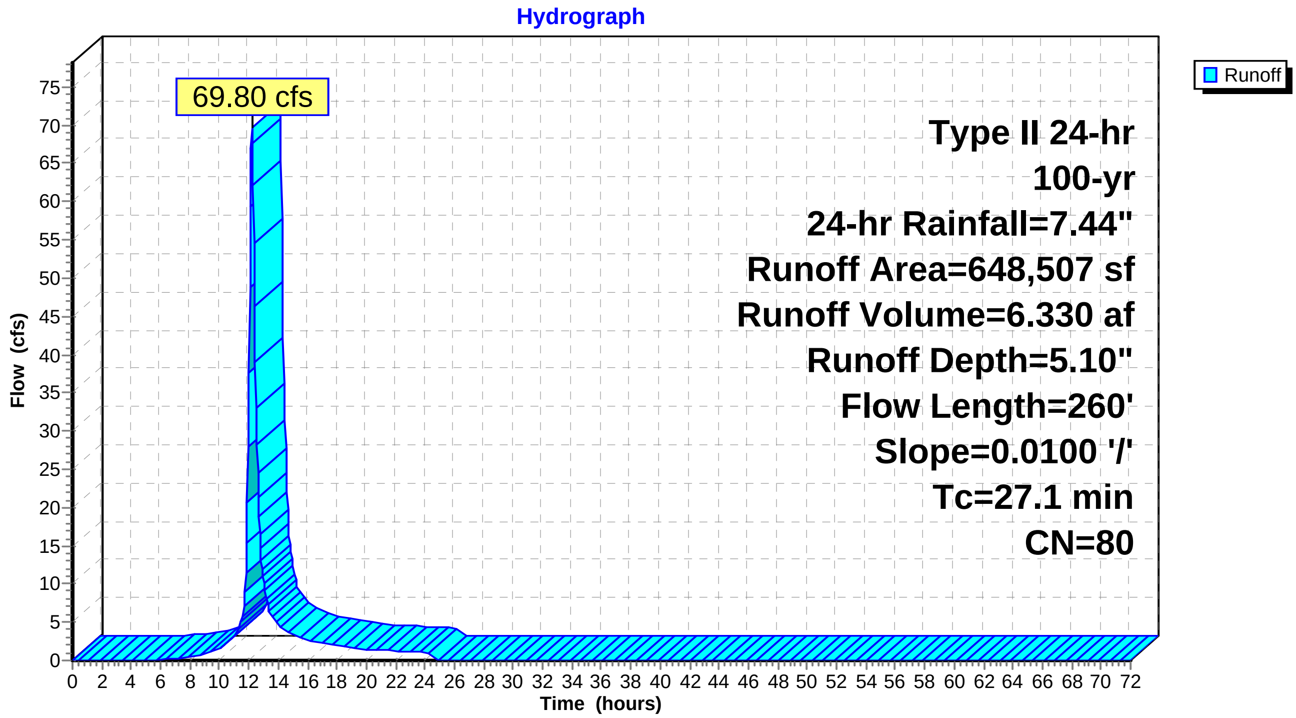
Runoff = 69.80 cfs @ 12.20 hrs, Volume= 6.330 af, Depth= 5.10"

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 100-yr, 24-hr Rainfall=7.44"

Area (sf)	CN	Description
648,507	80	>75% Grass cover, Good, HSG D
648,507		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.1	260	0.0100	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"

Subcatchment NCA: North Capped Area



Summary for Subcatchment SAA: South Adjacent Area

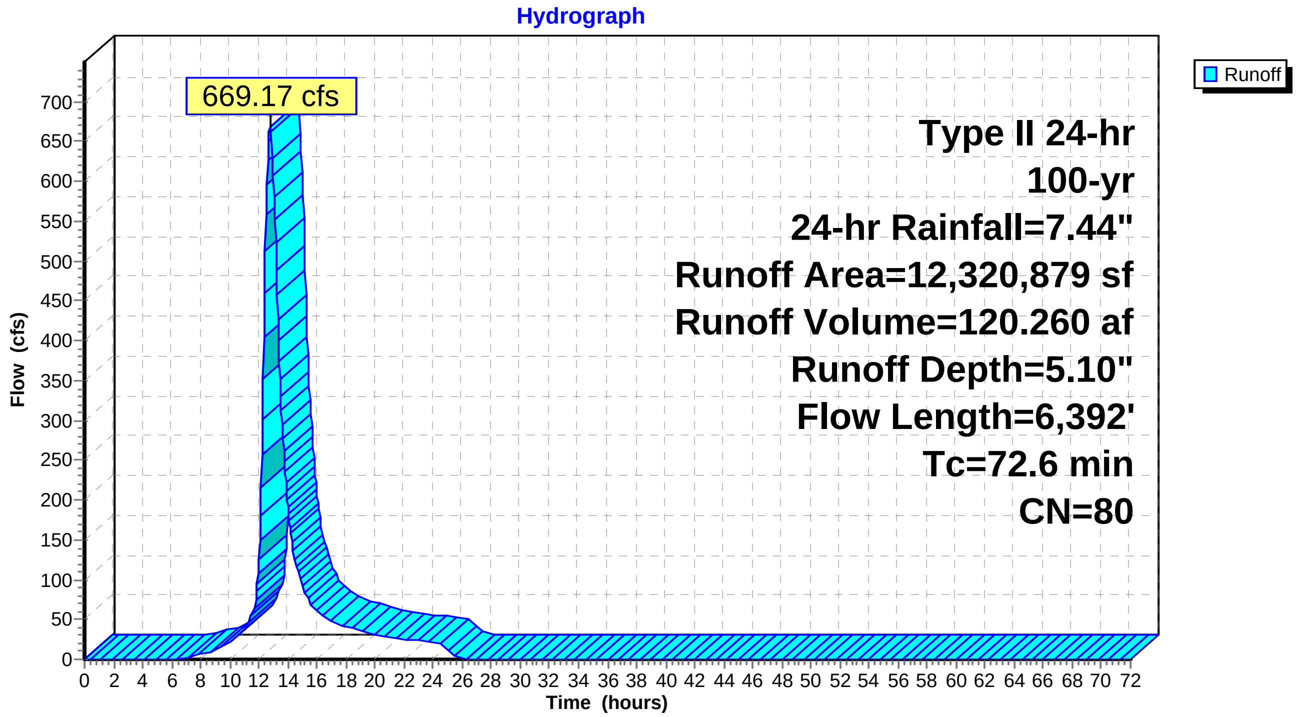
Runoff = 669.17 cfs @ 12.78 hrs, Volume= 120.260 af, Depth= 5.10"

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 100-yr, 24-hr Rainfall=7.44"

Area (sf)	CN	Description
12,320,879	80	>75% Grass cover, Good, HSG D
12,320,879		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.2	300	0.0480	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
56.4	6,092	0.0144	1.80		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
72.6	6,392	Total			

Subcatchment SAA: South Adjacent Area



Summary for Subcatchment SCA: South Capped Area

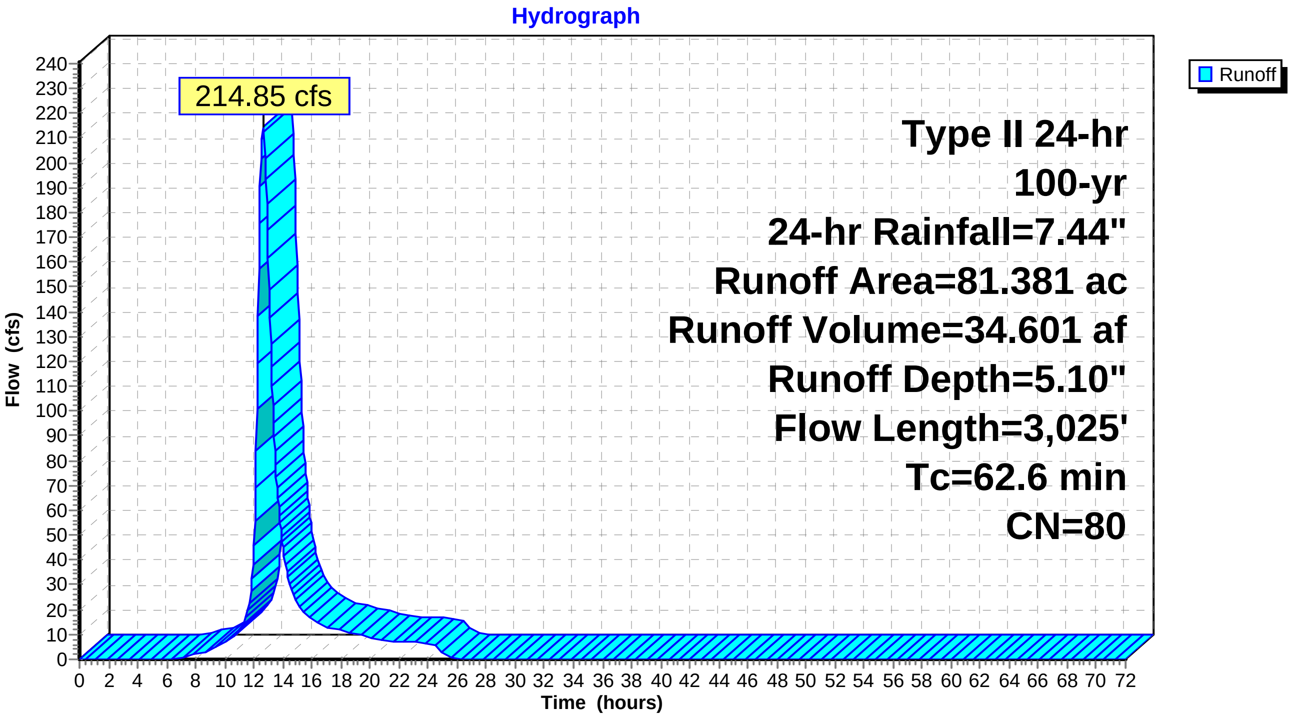
Runoff = 214.85 cfs @ 12.64 hrs, Volume= 34.601 af, Depth= 5.10"

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 100-yr, 24-hr Rainfall=7.44"

Area (ac)	CN	Description
81.381	80	>75% Grass cover, Good, HSG D
81.381		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.8	300	0.0089	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
30.8	2,725	0.0445	1.48		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
62.6	3,025	Total			

Subcatchment SCA: South Capped Area



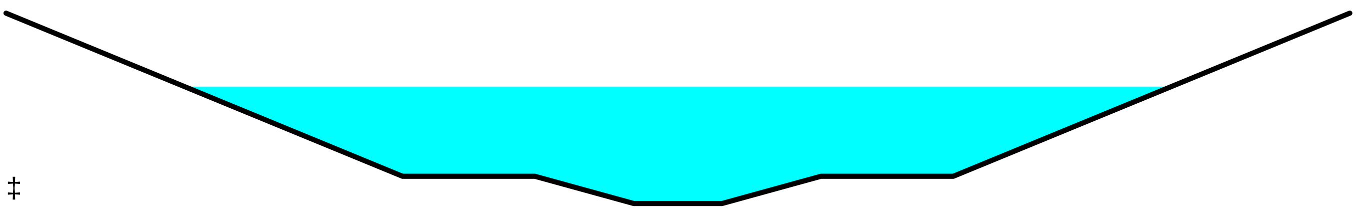
Summary for Reach NDD: North Diversion Ditch

Inflow Area = 211.169 ac, 0.00% Impervious, Inflow Depth = 5.10" for 100-yr, 24-hr event
Inflow = 670.11 cfs @ 12.47 hrs, Volume= 89.784 af
Outflow = 553.72 cfs @ 13.01 hrs, Volume= 89.784 af, Atten= 17%, Lag= 32.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.49 fps, Min. Travel Time= 19.4 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 97.7 min

Peak Storage= 646,888 cf @ 12.69 hrs
Average Depth at Peak Storage= 4.30'
Bank-Full Depth= 7.00' Flow Area= 266.5 sf, Capacity= 1,618.39 cfs

Custom cross-section, Length= 5,235.0' Slope= 0.0030 '/' (101 Elevation Intervals)
Constant n= 0.035
Inlet Invert= 0.00', Outlet Invert= -15.71'

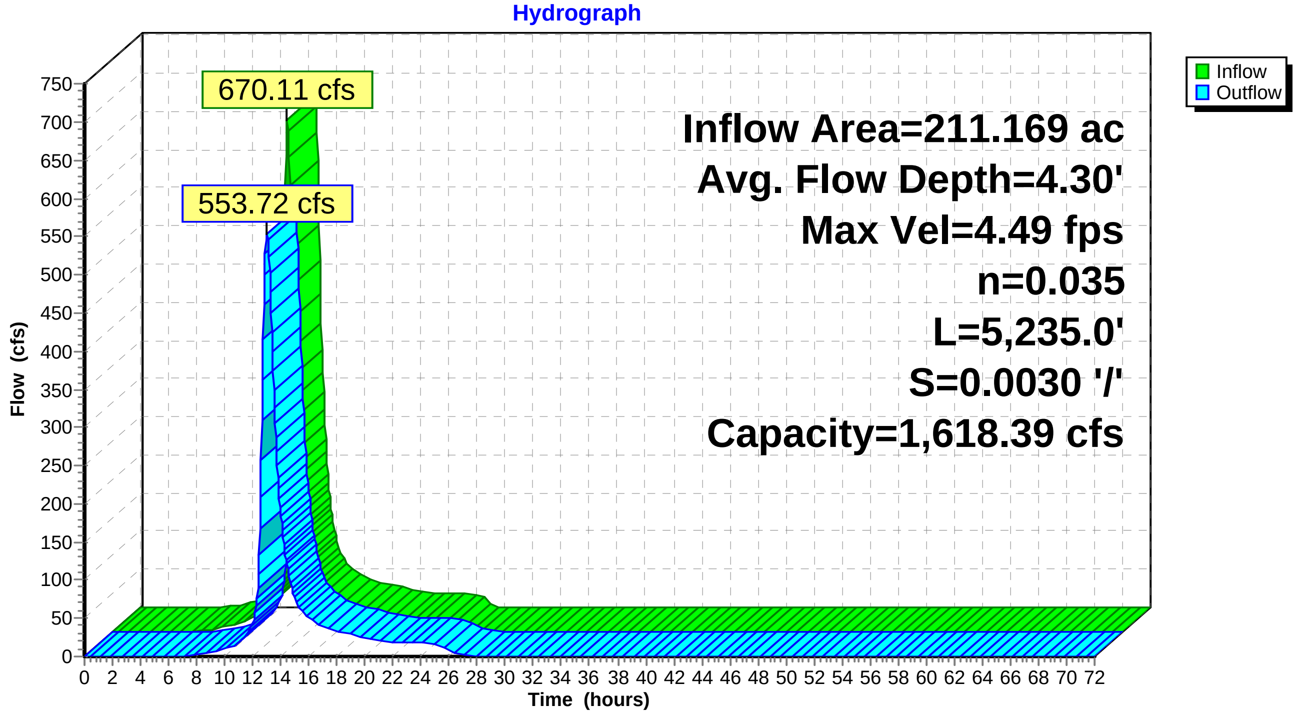


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	7.00	0.00
18.00	1.00	6.00
24.00	1.00	6.00
28.50	0.00	7.00
32.50	0.00	7.00
37.00	1.00	6.00
43.00	1.00	6.00
61.00	7.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0	0.00
1.00	8.5	25.2	44,498	9.57
7.00	266.5	63.2	1,395,128	1,618.39

Reach NDD: North Diversion Ditch



Summary for Reach NOS: North Outlet Structure

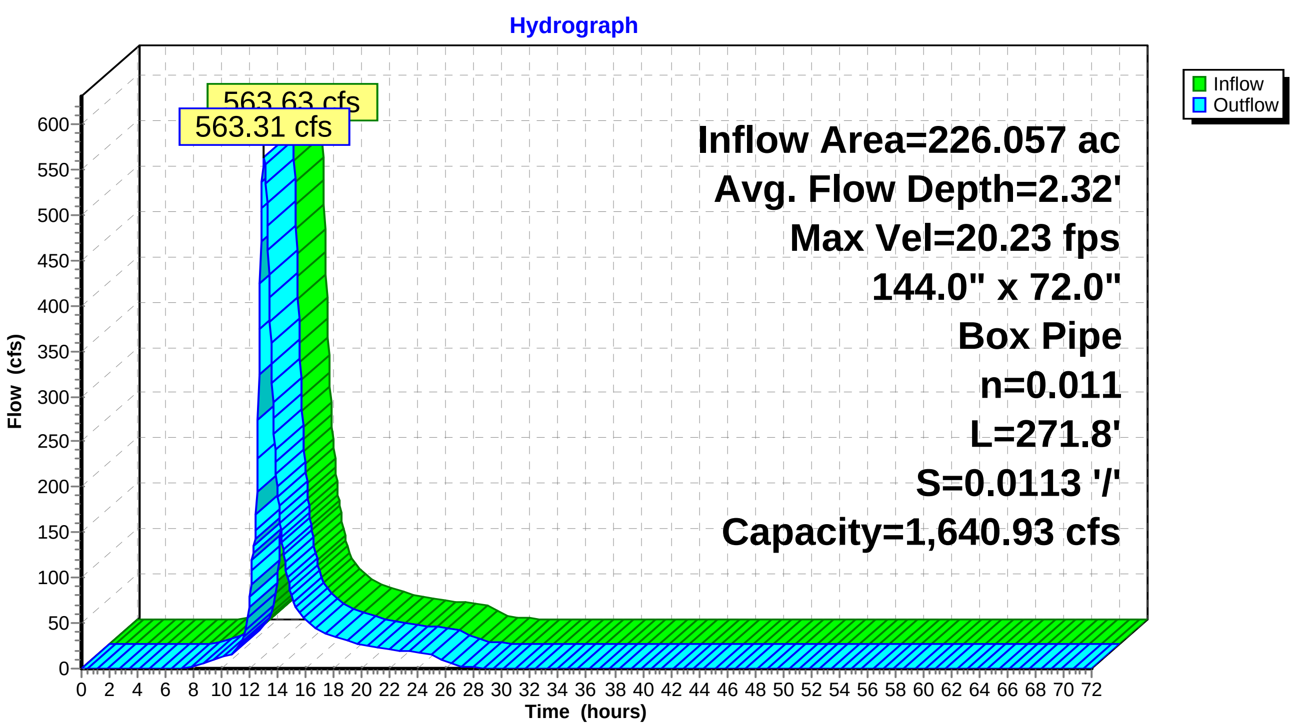
Inflow Area = 226.057 ac, 0.00% Impervious, Inflow Depth = 5.10" for 100-yr, 24-hr event
Inflow = 563.63 cfs @ 13.01 hrs, Volume= 96.113 af
Outflow = 563.31 cfs @ 13.02 hrs, Volume= 96.113 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 20.23 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.19 fps, Avg. Travel Time= 1.1 min

Peak Storage= 7,570 cf @ 13.01 hrs
Average Depth at Peak Storage= 2.32'
Bank-Full Depth= 6.00' Flow Area= 72.0 sf, Capacity= 1,640.93 cfs

144.0" W x 72.0" H Box Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 271.8' Slope= 0.0113 '/'
Inlet Invert= 1,160.50', Outlet Invert= 1,157.43'

Reach NOS: North Outlet Structure



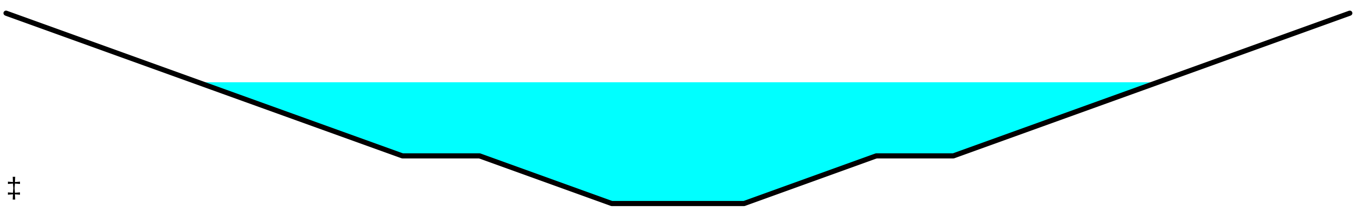
Summary for Reach SDD: South Diversion Ditch

Inflow Area = 282.848 ac, 0.00% Impervious, Inflow Depth = 5.10" for 100-yr, 24-hr event
Inflow = 669.17 cfs @ 12.78 hrs, Volume= 120.260 af
Outflow = 611.17 cfs @ 13.28 hrs, Volume= 120.260 af, Atten= 9%, Lag= 29.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.70 fps, Min. Travel Time= 17.1 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 70.4 min

Peak Storage= 628,939 cf @ 12.99 hrs
Average Depth at Peak Storage= 5.09'
Bank-Full Depth= 8.00' Flow Area= 282.0 sf, Capacity= 1,770.11 cfs

Custom cross-section, Length= 4,836.0' Slope= 0.0030 '/'
Constant n= 0.035
Inlet Invert= 0.00', Outlet Invert= -14.51'

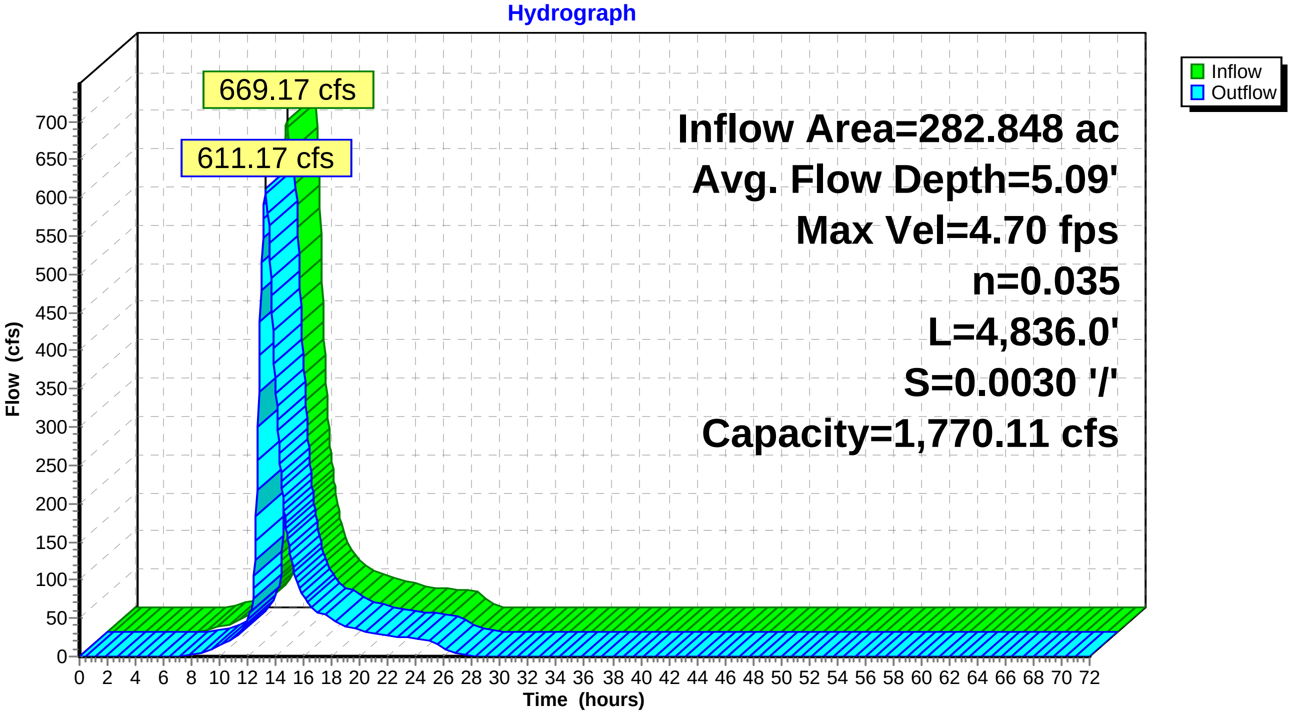


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	8.00	0.00
18.00	2.00	6.00
21.50	2.00	6.00
27.50	0.00	8.00
33.50	0.00	8.00
39.50	2.00	6.00
43.00	2.00	6.00
61.00	8.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	6.0	0	0.00
2.00	24.0	25.6	116,064	53.40
8.00	282.0	63.6	1,363,752	1,770.11

Reach SDD: South Diversion Ditch



Summary for Reach SOS: South Outlet Structure

Inflow Area = 415.756 ac, 4.02% Impervious, Inflow Depth = 5.60" for 100-yr, 24-hr event
Inflow = 743.65 cfs @ 13.20 hrs, Volume= 193.909 af
Outflow = 743.13 cfs @ 13.22 hrs, Volume= 193.904 af, Atten= 0%, Lag= 1.1 min

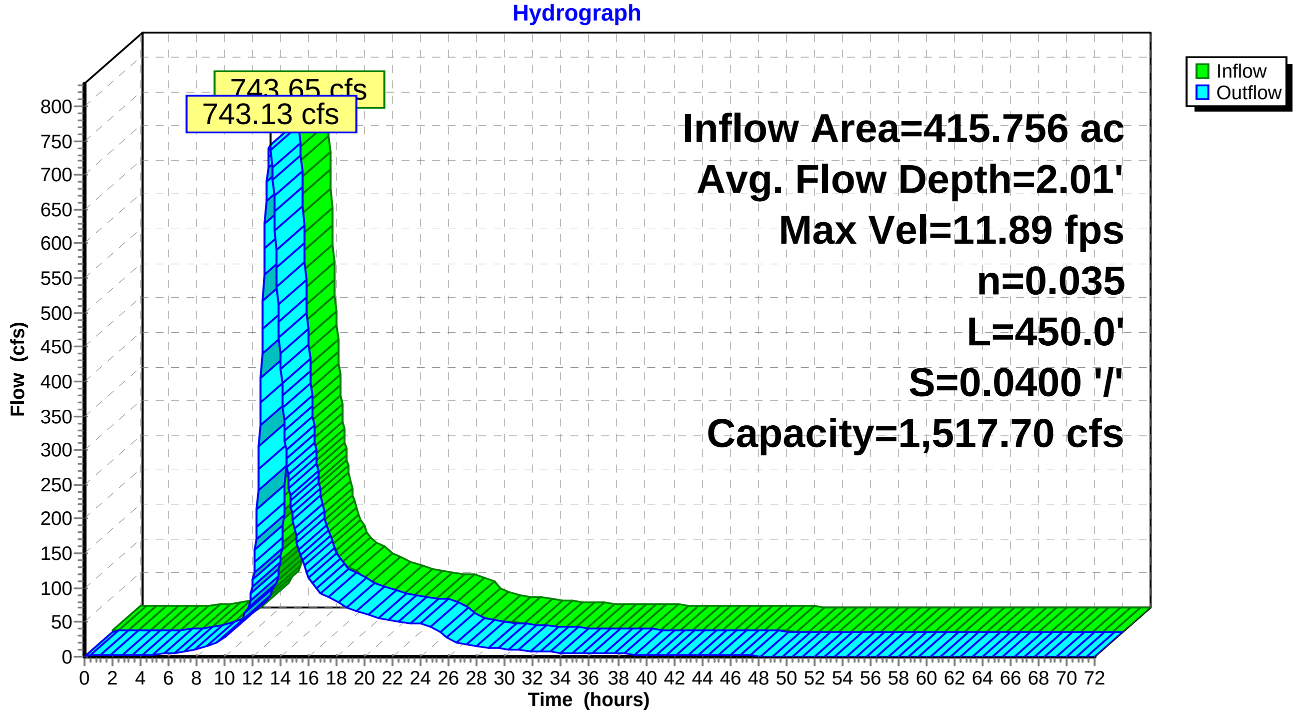
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.89 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.94 fps, Avg. Travel Time= 2.5 min

Peak Storage= 28,141 cf @ 13.21 hrs
Average Depth at Peak Storage= 2.01'
Bank-Full Depth= 3.00' Flow Area= 102.0 sf, Capacity= 1,517.70 cfs

25.00' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 43.00'
Length= 450.0' Slope= 0.0400 '/'
Inlet Invert= 1,165.00', Outlet Invert= 1,147.00'

‡

Reach SOS: South Outlet Structure



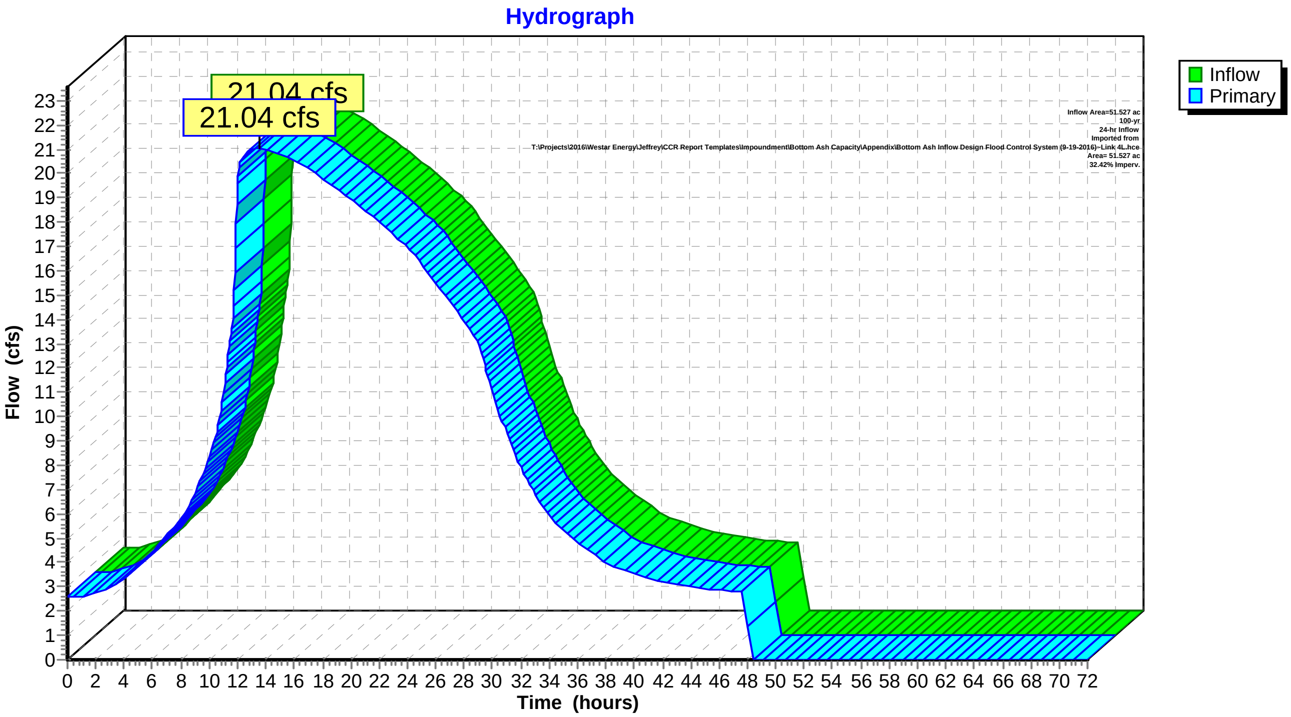
Summary for Link APF: Additional Process Flows

Inflow Area = 51.527 ac, 32.42% Impervious, Inflow Depth = 9.09" for 100-yr, 24-hr event
Inflow = 21.04 cfs @ 13.50 hrs, Volume= 39.049 af
Primary = 21.04 cfs @ 13.50 hrs, Volume= 39.049 af, Atten= 0%, Lag= 0.0 min

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

100-yr, 24-hr Inflow Imported from T:\Projects\2016\Westar Energy\Jeffrey\CCR Report Templates\Impoundment\Bott

Link APF: Additional Process Flows



Summary for Link THL: Tower Hill Lake

Inflow Area = 641.813 ac, 2.60% Impervious, Inflow Depth = 5.42" for 100-yr, 24-hr event
Inflow = 1,278.39 cfs @ 13.10 hrs, Volume= 290.017 af
Primary = 1,278.39 cfs @ 13.10 hrs, Volume= 290.017 af, Atten= 0%, Lag= 0.0 min

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

Link THL: Tower Hill Lake