



**Stantec Consulting Services Inc.**  
9200 Shelbyville Road, Suite 800, Louisville, Kentucky 40222-5112

April 13, 2023  
File: let\_004\_175578372  
Revision 0

Tennessee Valley Authority  
1101 Market Street  
Chattanooga, Tennessee 37402

**RE:     Periodic Inflow Design Flood Control System Plan  
          Stilling Pond  
          EPA CCR Rule  
          TVA Kingston Fossil Plant  
          Harriman, Tennessee**

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## **1.0     PURPOSE**

This letter documents certification that the Stilling Pond at the Tennessee Valley Authority (TVA) Kingston Fossil Plant complies with the inflow design flood control system requirements set forth in 40 CFR 257.82(a)&(b) of the EPA CCR Rule. The EPA CCR Rule requires periodic inflow design flood control system plan assessments, certified by a qualified professional engineer, every five years. The initial certification of the inflow design flood control system plan was placed in the operating record on April 17, 2018.

## **2.0     INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN ASSESSMENT**

The initial inflow design flood control system plan (prepared in accordance with 40 CFR 257.82(c)(1)) is attached. The 100-year flood event was selected for the design storm based upon a hazard potential classification of "low". The initial assessment found that the Stilling Pond met the requirements of 40 CFR 257.82(a)&(b).

## **3.0     CURRENT INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN ASSESSMENT**

Stantec reviewed the result of the initial inflow design flood control system plan assessment and the changes in site conditions that have occurred in the past five years at the site. The following operational changes and other factors were considered in this periodic assessment:

1. Closure of the Stilling Pond was completed on May 30, 2018.
2. The hazard classification of the unit (and the resulting inflow design control flood) has not changed.
3. The 100-year, 24-hour precipitation depth has not changed.
4. Watershed areas have not changed.
5. Drainage features (i.e., ditches, flumes, and culverts) have not changed, and these features have been well maintained.

Re: **Periodic Inflow Design Flood Control System Plan  
Stilling Pond  
EPA CCR Rule  
TVA Kingston Fossil Plant  
Harriman, Tennessee**

In the initial assessment conducted in April 2018, the unit was in the process of being closed; therefore, it was evaluated in the closed condition. Closure of the unit was completed per the design. Based on our current review, there are no conditions that have changed in the past five years that would cause the result of the initial inflow design flood control system plan assessment to have changed.

#### 4.0 SUMMARY OF ASSESSMENT

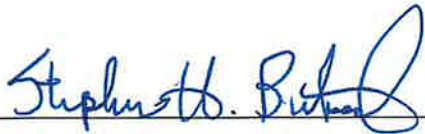
Based on a review of the initial inflow design flood control system plan and the items listed in Section 3.0, the result of this periodic inflow design flood control system plan assessment is that the Stilling Pond at the Kingston Fossil Plant meets the requirements of §257.82(a)&(b) of the EPA CCR Rule.

#### 5.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stephen H. Bickel, being a Professional Engineer in good standing in the State of Tennessee, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;
2. that the information contained herein is accurate as of the date of my signature below; and
3. that this periodic inflow design flood control system plan for the TVA Kingston Fossil Plant's Stilling Pond meets the requirements specified in 40 CFR 257.82(a), (b), and (c)(1).

SIGNATURE



DATE 04/13/2023

ADDRESS: Stantec Consulting Services Inc.  
9200 Shelbyville Road, Suite 800  
Louisville, Kentucky 40222-5112

TELEPHONE: (502) 212-5075

ATTACHMENTS: Initial Inflow Design Flood Control System Plan



**INITIAL INFLOW DESIGN FLOOD  
CONTROL SYSTEM ASSESSMENT**



**Stantec Consulting Services Inc.**  
3052 Beaumont Centre Circle Lexington, Kentucky 40513

March 26, 2018  
File: rpt\_002\_let\_175665013  
Revision 0

Tennessee Valley Authority  
1101 Market Street  
Chattanooga, Tennessee 37402

**RE: Initial Inflow Design Flood Control System Plan  
Stilling Pond  
EPA Final Coal Combustion Residuals (CCR) Rule  
TVA Kingston Fossil Plant  
Harriman, Tennessee**

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## **1.0 PURPOSE**

This letter documents Stantec's certification of the initial inflow design flood control system plan for the TVA Kingston Fossil Plant's Stilling Pond. Based on the assessment, the Stilling Pond complies with the inflow design flood control requirements in the EPA Final CCR Rule at 40 CFR 257.82.

## **2.0 INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN**

On April 17, 2015, the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities (RIN-2050AE81; FRL-9149-4) (EPA Final CCR Rule) was published in the Federal Register. The Stilling Pond is considered an inactive surface impoundment based on the definitions in the EPA Final CCR Rule. A Direct Final Rule in response to a partial vacatur became effective on October 4, 2016. This revision eliminated the exemption for inactive surface impoundments to meet the same requirements as active surface impoundments. An extended timeline was given to inactive surface impoundments with a Notice of Intent (NOI) that complied with §257.105(i)(1), §257.106(i)(1) and §257.107(i)(1).

As described in 40 CFR 257.82(c), an inflow design flood control system plan must be prepared to document how the inflow design flood control system has been designed and constructed to manage the design storm required by the hazard classification. Stantec has assigned the Stilling Pond a low hazard potential classification rating. Thus, the inflow design storm event was selected from §257.82(a)(3) as the 100-year flood event based upon a hazard potential classification of "low".

## **3.0 SUMMARY OF FINDINGS**

The attached plan presents the analysis of the inflow design flood control system for the Kingston Stilling Pond. The resulting water surface elevations are shown in the following table. The plan and results show that the impoundment meets the requirements set forth in 40 CFR 257.82(a) and (b).



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Re: **Initial Inflow Design Flood Control System Plan  
Stilling Pond  
EPA Final Coal Combustion Residuals (CCR) Rule  
TVA Kingston Fossil Plant  
Harriman, Tennessee**

| Plant | Facility      | Inflow Design Storm | Water Surface Elevation (feet) | Minimum Embankment Elevation (feet) |
|-------|---------------|---------------------|--------------------------------|-------------------------------------|
| KIF   | Stilling Pond | 100-year storm      | 751.7                          | 754.5                               |

#### 4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Don W. Fuller II, being a Professional Engineer in good standing in the State of Tennessee do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;
2. that the information contained herein is accurate as of the date of my signature below; and
3. that the inflow design flood control system plan for the TVA Kingston Fossil Plant's Stilling Pond meets the requirements specified in 40 CFR 257.82(a), (b), and (c)(1).

SIGNATURE

DATE 03/26/18

ADDRESS:

Stantec Consulting Services Inc.  
3052 Beaumont Centre Circle  
Lexington, Kentucky 40513

TELEPHONE:

(859) 422-3000

ATTACHMENTS:

Inflow Design Flood Control System Plan



## **Initial Inflow Design Flood Control System Plan**

Kingston – Stilling Pond  
Harriman, Tennessee



Prepared for:  
Tennessee Valley Authority  
Chattanooga, Tennessee

Prepared by:  
Stantec Consulting Services Inc.  
Lexington, Kentucky

March 26, 2018  
Revision 0

**INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN**

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# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Background  
March 26, 2018

## 1.0 BACKGROUND

On April 17, 2015, the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities (RIN-2050AE81; FRL-9149-4) (EPA Final CCR Rule) was published in the Federal Register. A Direct Final Rule in response to a partial vacatur became effective on October 4, 2016. This revision eliminated the exemption for inactive surface impoundments to meet the same requirements as active surface impoundments. An extended timeline was given to inactive surface impoundments with a Notice of Intent (NOI) that complied with §257.105(i)(1), §257.106(i)(1) and §257.107(i)(1). Stantec Consulting Services Inc. (Stantec) was contracted by the Tennessee Valley Authority (TVA) to analyze the inflow design flood for Kingston Fossil Plant's (KIF) Stilling Pond CCR surface impoundment and evaluate compliance with section §257.82 of the Environmental Protection Agency (EPA) Final CCR Rule.

KIF is a coal-fired, electric generating plant located in Roane County, Tennessee, approximately 2.5 miles southeast of Harriman, Tennessee. The plant was constructed adjacent to Watts Bar Lake of the Emory River. Historically, the Stilling Pond was the final collection point for stormwater and process water for the site prior to discharging into the Emory River.

The Stilling Pond is an Inactive CCR Surface Impoundment as defined by the EPA Final CCR Rule that meets the requirements for an extended timeline under the Direct Final Rule and closure activities are expected to be completed in May 2018. The Stilling Pond Closure Project consisted of initial ash subgrade stabilization, structural fill, and final cover consisting of a geomembrane, geocomposite, and soil cover. The Stilling Pond approximate closure limits are shown in Figure 1.

# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Background  
March 26, 2018

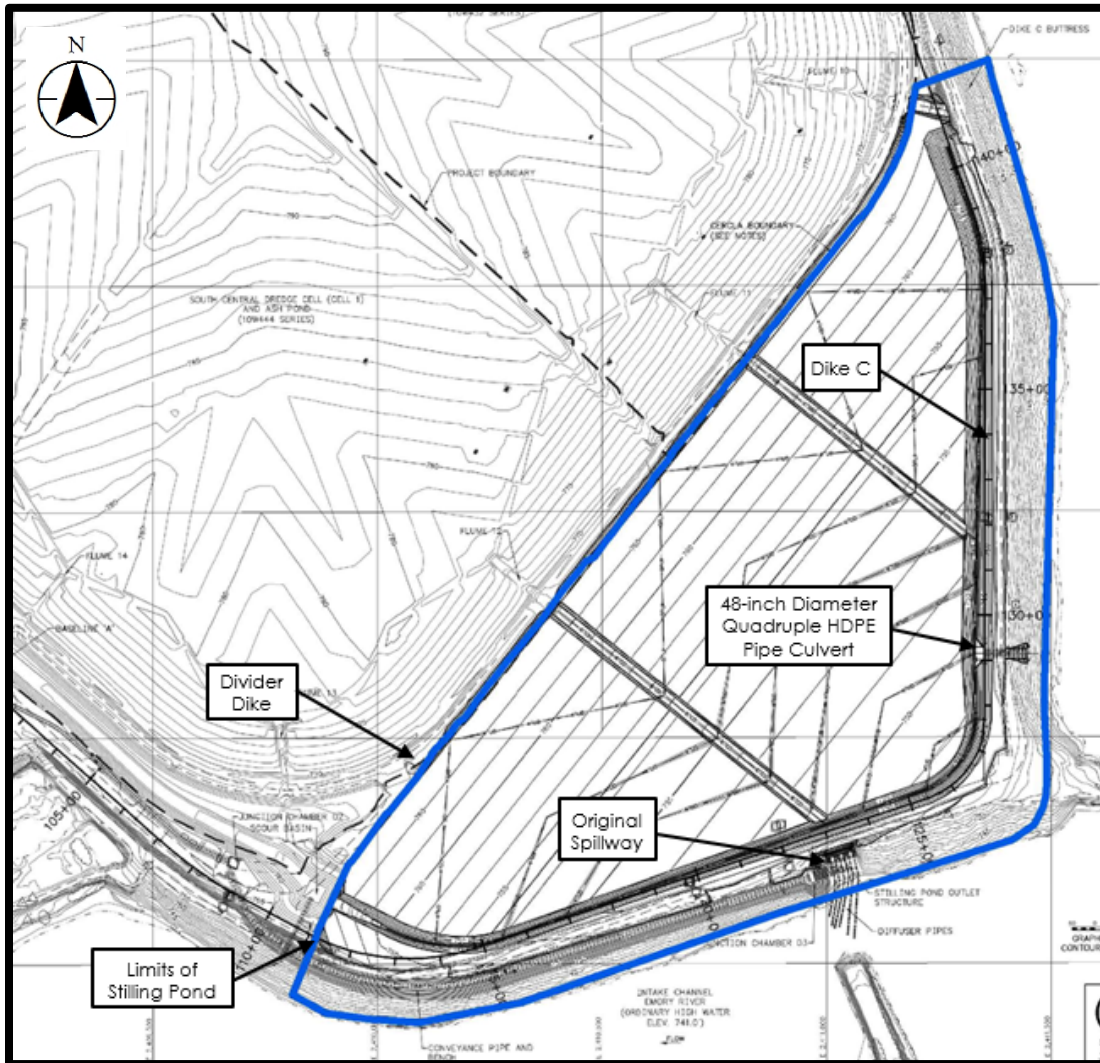


Figure 1 Stilling Pond Limits

# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Existing Conditions  
March 26, 2018

## 2.0 EXISTING CONDITIONS

The Stilling Pond will be closed by placing fill within the pond to establish subgrade and promote positive drainage and then constructing an engineered cap system over the pond.

Stormwater runoff drains to two flumes and a perimeter ditch. The perimeter ditch conveys stormwater to a culvert on the eastern edge of the closed pond. This culvert consists of four 48-inch diameter High Density Polyethylene (HDPE) pipes and discharges to the Emory River.

Figure 2 shows the location of the hydraulic structures for the closed Stilling Pond configuration.

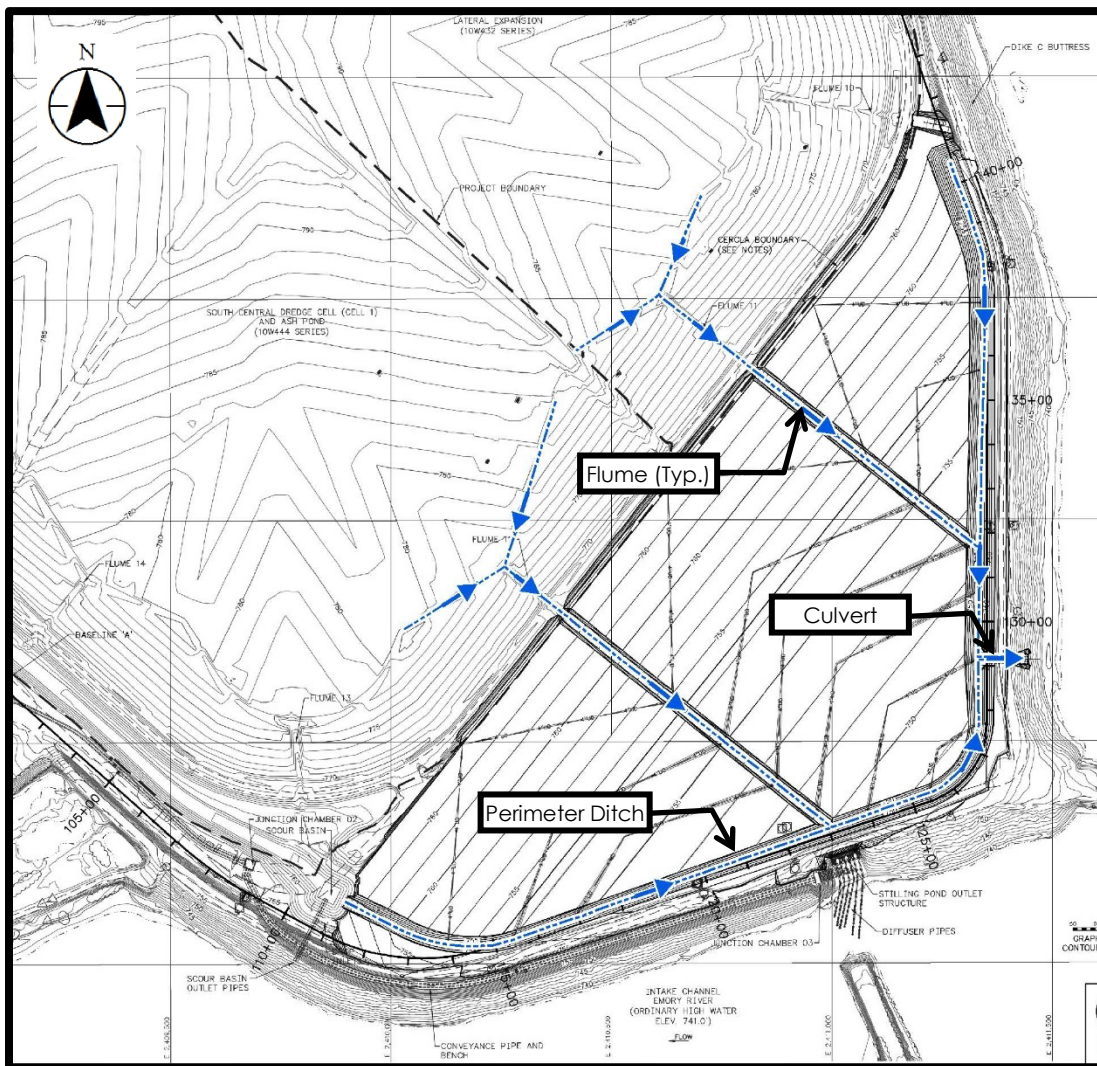


Figure 2 Hydraulic Structures

# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Methods / Design Criteria  
March 26, 2018

## 3.0 METHODS / DESIGN CRITERIA

This Inflow Design Flood Control System Plan has been developed to document how the inflow design flood control system has been designed and constructed to meet the requirements of §257.82. The Stilling Pond was classified as a Low Hazard structure in April, 2018 based on the report from Stantec to TVA dated April 6, 2018. This plan has been developed based on that classification and the following EPA Final CCR Rule criteria apply:

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. (Ref. §257.82(a)(1)),
2. The inflow design flood control system must collect and control flow from the CCR unit during and following the peak discharge of the inflow design flood. (Ref. §257.82(a)(2)),
3. The inflow design flood for a low hazard potential CCR surface impoundment is the 100-year flood. (Ref. §257.82(a)(3)(iii)),
4. Discharge from the CCR Unit must be handled in accordance with the surface water requirements under §257.3-3.
5. The owner or operator must prepare an initial inflow design flood control system plan by April 17, 2018. (Ref. §257.100(e)(3)(v)),
6. The plan must be revised every 5 years, and amendments must be made whenever there is a change in condition(s) that would substantially affect the written plan in effect. (Ref. §257.82)(c)(4) & (2)),
7. This plan will be considered complete upon its placement in the facility's operating record. (Ref. §257.82(c)(1)),
8. 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 §257.82.

The pond will be closed and is designed not to impound stormwater. A culvert controls discharge through the former impoundment. Hydrological calculations were performed as part of the closure design based on Soil Conservation Service Technical Release 55 (TR-55) methods. The Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) software (version 4.0) and the HY-8 Culvert Hydraulic Analysis Program (Version 7.3) were used to analyze the performance of the culvert for the design storm event. A 25-year storm event was used as the design storm event for the closure design. A 100-year storm event is the inflow design flood specified by the CCR Rule for low hazard surface impoundments. The closure design model was

## **INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN**

Methods / Design Criteria  
March 26, 2018

modified and re-run for a 100-year storm event, as described in Section 3.1, in order to evaluate the design against the CCR Rule criteria.

Modeling assumptions and hydrologic parameter inputs are described in the Basis of Design Report prepared by Stantec dated March 29, 2017.

### **3.1 MODELING UPDATES**

The HEC-HMS model was modified for this analysis by changing the precipitation depth from 5.5 inches (25-year, 24-hour storm from NOAA Atlas 14) to 6.8 inches (100-year, 24-hour storm from NOAA Atlas 14). In addition, a constant flowrate of 68.74 cfs was added to the HEC-HMS model. This flowrate was obtained from the Flow Management Downstream Hydraulic Model prepared by AECOM and represents the 100-year, 24-hour peak flow over the emergency weir that discharges into the perimeter ditch. The HY-8 model was modified by changing the tailwater elevation to 748 feet, which represents the 100-year flood elevation of the Emory River. Other parameters in the HEC-HMS model and the HY-8 model are as described in the Basis of Design Report.

The flow computed by the HEC-HMS model at the outfall was compared against the rating curve developed by HY-8 to determine the headwater elevation.

# INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Calculation Results  
March 26, 2018

## 4.0 CALCULATION RESULTS

The hydrologic modeling results were used to determine the performance of the Stilling Pond for the 100-year, 24-hour storm. The HEC-HMS model output is included in Appendix A. The rating curve computed in HY-8 is included in Appendix B.

### 4.1 CAPACITY AND FREEBOARD RESULTS

The peak headwater elevation and outflow is summarized in Table 1. The results show that the Stilling Pond can safely pass the flow from the 100-year 24-hour storm through the culvert without overtopping the crest of Dike C.

**Table 1 Hydrologic and Hydraulic Modeling Results**

| <b>Storm</b>      | <b>Peak Inflow<br/>(cubic feet<br/>per second)</b> | <b>Peak Water<br/>Surface<br/>Elevation<br/>(feet)</b> | <b>Dike Crest<br/>Elevation<br/>(feet)</b> | <b>Freeboard<br/>(feet)</b> |
|-------------------|--|--|--|-----------------------------|
| 100-year, 24-hour | 403  | 751.7  | 754.5                                      | 2.8                         |

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Conclusions  
March 26, 2018

### 5.0 CONCLUSIONS

The calculations included in this report demonstrate that the inflow design flood control system adequately manages flow into and from the to be closed CCR Unit during and following the peak discharge of the inflow design flood (100-year flood). In addition, the closed CCR Unit will discharge to permitted stormwater outfalls, and is therefore handled in accordance with the surface water requirements under §257.3-3. Therefore, the Stilling Pond at KIF meets the requirements of Section §257.82 of the EPA Final CCR Rule.

## INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

References  
March 26, 2018

### 6.0 REFERENCES

Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities (RIN-2050-AE81; FRL-9149-4) (EPA Final CCR Rule) April 2015.

Stantec Consulting Services Inc., "Basis of Design Report (Revision 0) Kingston Fossil Plant Stilling Pond Closure", March 29, 2017.

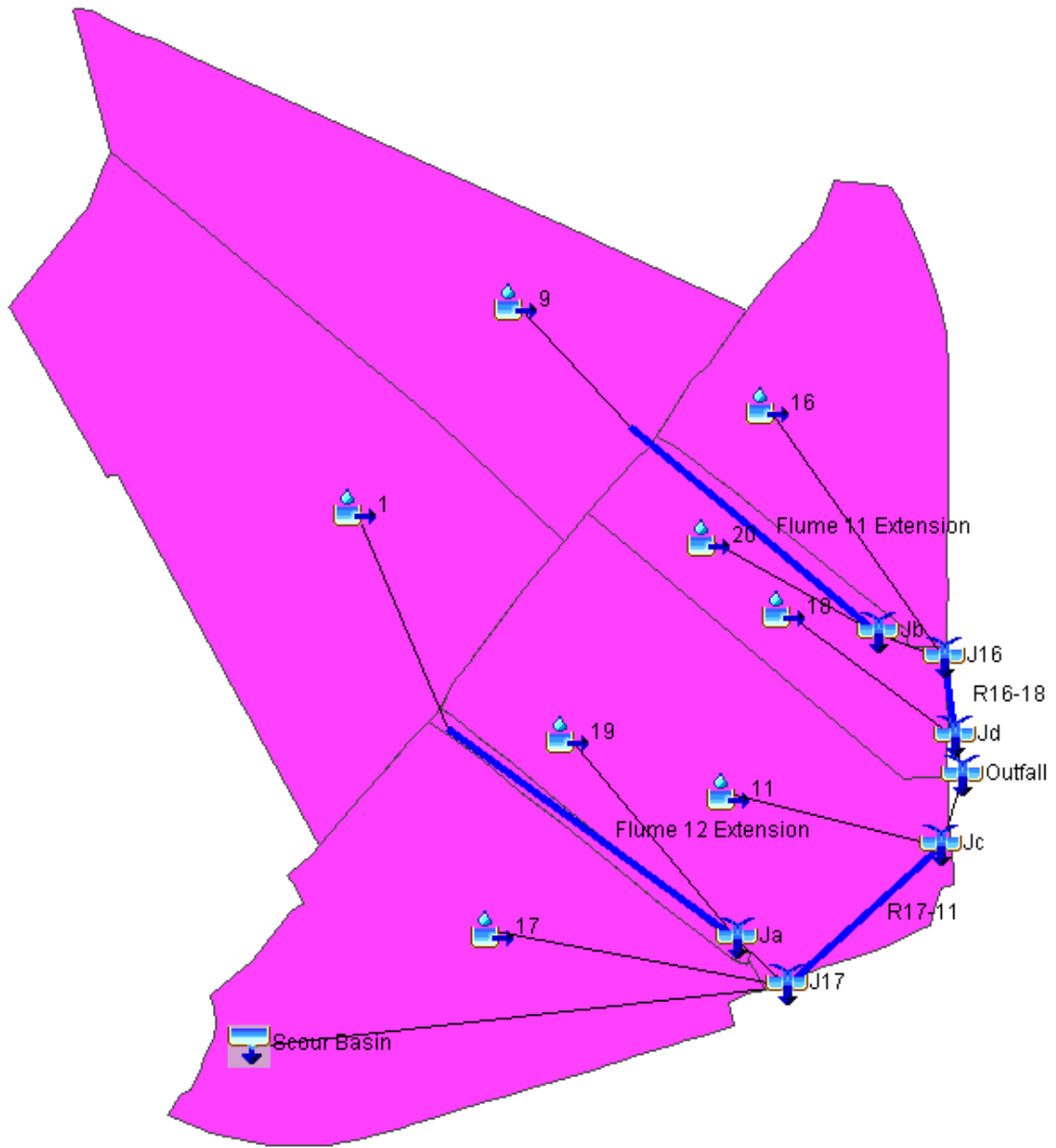
AECOM, June 1, 2016. Polishing Pond Engineering Report – Drainage and Flow Management Project (Downstream), Kingston Fossil Plant.

AECOM, February 22, 2018. Flow Management Downstream Hydraulic Model.

Stantec Consulting Services Inc., "Initial, Hazard Potential Classification Assessment – Stilling Pond", April 2018.

**APPENDIX A**  
**HEC-HMS MODEL OUTPUT**

# Basin Model



## 100-year 24-hour Results

Global Summary Results for Run "100-year, 24-hour"

Project: KIF\_Closure Simulation Run: 100-year, 24-hour

Start of Run: 01Jan2015, 00:00 Basin Model: Proposed Conditions  
 End of Run: 02Jan2015, 00:01 Meteorologic Model: 100-year, 24-hour  
 Compute Time: 22Feb2018, 11:55:04 Control Specifications: 24-hr

Show Elements: All Elements Volume ...  IN  AC-I Sorting: Hydrologic

| Hydrologic Element | Drainage A... (MI2) | Peak Disch... (CFS) | Time of Peak     | Volume (IN) |
|--------------------|---------------------|---------------------|------------------|-------------|
| 1                  | 0.0239              | 85.3                | 01Jan2015, 12:03 | 4.51        |
| Flume 12 Extension | 0.0239              | 85.1                | 01Jan2015, 12:05 | 4.51        |
| 19                 | 0.0009              | 3.9                 | 01Jan2015, 11:58 | 4.52        |
| Ja                 | 0.0248              | 87.4                | 01Jan2015, 12:04 | 4.51        |
| 17                 | 0.0191              | 81.8                | 01Jan2015, 11:59 | 4.63        |
| Scour Basin        | Not Specified       | 68.7                | 01Jan2015, 00:00 | n/a         |
| J17                | Not Specified       | 227.5               | 01Jan2015, 12:02 | n/a         |
| R17-11             | Not Specified       | 222.4               | 01Jan2015, 12:04 | n/a         |
| 11                 | 0.0169              | 60.3                | 01Jan2015, 12:03 | 4.51        |
| Jc                 | Not Specified       | 282.3               | 01Jan2015, 12:04 | n/a         |
| 9                  | 0.0186              | 61.2                | 01Jan2015, 12:05 | 4.51        |
| Flume 11 Extension | 0.0186              | 61.1                | 01Jan2015, 12:06 | 4.51        |
| 20                 | 0.0008              | 3.5                 | 01Jan2015, 11:58 | 4.52        |
| Jb                 | 0.0194              | 62.8                | 01Jan2015, 12:06 | 4.51        |
| 16                 | 0.0111              | 47.5                | 01Jan2015, 11:59 | 4.63        |
| J16                | 0.0305              | 100.4               | 01Jan2015, 12:02 | 4.55        |
| R16-18             | 0.0305              | 100.1               | 01Jan2015, 12:03 | 4.55        |
| 18                 | 0.0058              | 22.4                | 01Jan2015, 12:01 | 4.52        |
| Jd                 | 0.0363              | 121.9               | 01Jan2015, 12:03 | 4.55        |
| Outfall            | Not Specified       | 402.8               | 01Jan2015, 12:03 | n/a         |

# **APPENDIX B RATING CURVE**

# HY-8 Analysis Results

## Culvert Summary Table - Culvert 2\_100yr

Culvert Crossing: Crossing 1

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth(ft) | Outlet Control Depth(ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|-----------------------|-------------------------|--------------------------|-------------------------|--------------------------|-----------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 0.00                  | 0.00                    | 748.00                   | 0.00                    | 2.60                     | 0-NF      | 0.00              | 0.00                | 3.08              | 53.00                | 0.00                   | 0.00                      |
| 50.00                 | 50.00                   | 748.06                   | 1.46                    | 2.66                     | 1-S1t     | 0.93              | 1.06                | 3.08              | 53.00                | 1.35                   | 0.00                      |
| 100.00                | 100.00                  | 748.24                   | 2.18                    | 2.84                     | 1-S1t     | 1.34              | 1.52                | 3.08              | 53.00                | 2.70                   | 0.00                      |
| 150.00                | 150.00                  | 748.53                   | 2.79                    | 3.13                     | 1-S1t     | 1.69              | 1.88                | 3.08              | 53.00                | 4.06                   | 0.00                      |
| 200.00                | 200.00                  | 748.95                   | 3.35                    | 3.55                     | 1-S1t     | 2.00              | 2.19                | 3.08              | 53.00                | 5.41                   | 0.00                      |
| 250.00                | 250.00                  | 749.46                   | 3.92                    | 4.06                     | 1-S1t     | 2.32              | 2.46                | 3.08              | 53.00                | 6.76                   | 0.00                      |
| 300.00                | 300.00                  | 750.03                   | 4.57                    | 4.63                     | 1-S1t     | 2.66              | 2.69                | 3.08              | 53.00                | 8.11                   | 0.00                      |
| 350.00                | 350.00                  | 750.73                   | 5.33~                   | 5.15                     | 3-M2t     | 3.15              | 2.90                | 3.08              | 53.00                | 9.44                   | 0.00                      |
| 400.00                | 400.00                  | 751.61                   | 6.21~                   | 5.77                     | 3-M2t     | 3.60              | 3.07                | 3.08              | 53.00                | 10.78                  | 0.00                      |
| 450.00                | 450.00                  | 752.62                   | 7.22~                   | 6.64                     | 7-M2c     | 3.60              | 3.21                | 3.21              | 53.00                | 11.74                  | 0.00                      |
| 500.00                | 500.00                  | 753.77                   | 8.37~                   | 7.57                     | 7-M2c     | 3.60              | 3.32                | 3.32              | 53.00                | 12.75                  | 0.00                      |