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HAZARD POTENTIAL CLASSIFICATION ASSESSMENT
ASH SURGE AND BYPASS BASINS
POWERTON STATION
OCTOBER 2016

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), herein referred to as the coal combustion residual (CCR) Rule, § 257.73(a)(2), Geosyntec Consultants (Geosyntec) prepared this initial hazard potential classification assessment (HPCA) for the Ash Surge Basin and Bypass Basin (the Basins) at the Powerton Station (Site) in Pekin, Illinois. The CCR regulations were published in the Federal Register on 17 April 2015 and became effective as of 19 October 2015. The Site is a coal-fired power station, owned and operated by Midwest Generation, LLC (Midwest Generation).

Ms. Jane Soule, P.E., of Geosyntec, prepared this HPCA in accordance with §257.73(a)(2). Mr. Robert White reviewed this report in accordance with Geosyntec's peer review policy.

Summary

Based on the results of the analyses provided in this report, the Ash Surge and Bypass Basins are classified as significant hazard potential CCR surface impoundments because their failure would not result in probable loss of life, but could result in economic and environmental losses.

1. Regulation Requirements - §257.73(a)(2)

According to the Preamble of the CCR regulations (page 21377), "a hazard potential classification provides an indication of the potential for danger to life, development, or the environment in the event of a release of CCR from a surface impoundment." This classification is not an assessment of the likelihood of a release or failure, but rather an evaluation of the potential impacts if one were to occur. Per §257.73(a)(2), "the owner or operator must document the hazard potential of each CCR unit as either a high hazard potential CCR surface impoundment, a significant hazard potential CCR surface impoundment or a low hazard potential surface impoundment." The assessment must include certification from a qualified professional engineer stating that the initial hazard potential classification (and each subsequent periodic classification) was conducted in accordance with these requirements. Section 257.53 provides the following definitions for hazard potential classifications:

- A high hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation will probably cause loss of human life;
- A significant hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life,

but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns; and

- A low hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner's property.

Based on the definitions contained in §257.53, a demonstration that an impoundment does not qualify for either a low or high hazard potential classification results in a hazard classification of significant by default.

2. Site Plan

The Basins are located in the northeastern portion of the Site (see Figure 1), east of the Old Intake Canal[1], northeast of the main power block building and south and west of the coal rail track. A Site Plan identifying the Basins and key site elements, including buildings and other surface impoundments, is shown in Figure 2.

The Ash Surge Basin is located east of the Main Wastewater Building and the Metal Cleaning Basin, west of the inactive Limestone Basin, north of the Bypass Basin and East Roof and Yard Runoff (ERYR) Basin, southeast of the Service Water Basin (SWB), and southwest and west of the Former Ash Basin (FAB). The Bypass Basin is located east of the ERYR Basin and south of the southeast corner of the Ash Surge Basin.

Based on reported site observations and a review of available construction documents, the Basins were constructed with elevated embankments surrounding the Basins. Therefore, run-on to the Basins is limited to the area within the embankment crests. Topographic survey point data from the basin crest indicates a minimum crest elevation of the Basins of approximately 467.6 feet MSL (Aero-Metric, 2008). Topography of the area surrounding the Basins is shown in Figure 3 and 5.

The estimated capacities and maximum depths of the Basins as reported in the History of Construction Report (Geosyntec, 2016a) are shown in Table 1 below:

[1] The outlet structure along the northern boundary of the Old Intake Canal was sealed in 2016.

Table 1: Estimated Basin Capacity and Maximum Depth

	Ash Surge Basin	Bypass Basin
Estimated Capacity[2] (acre-feet)	92.1	5.1
Estimated Maximum Basin Depth (feet)	16	10

3. *Basin Failure Impact Evaluation*

In order to classify the hazard potential of the Basins, impacts of a potential failure must be evaluated. The following sections evaluate the potential for failure or mis-operation to cause loss of human life by examining the proximity of buildings with human occupancy to potential inundation areas. Figure 2 identifies the location of buildings in the vicinity of the Basins, including both occupied and unoccupied buildings.[3] In addition, the potential for offsite economic and/or environmental impacts are evaluated.

3.1 Ash Surge Basin

The following sections describe potential impacts from failure of each of the Ash Surge Basin embankments. Figure 3 presents potential flow paths for discharge from potential embankment failures.

3.1.1 Eastern Embankment

Discharge from a potential failure along the northern half of the eastern embankment would drain eastward toward the FAB. Because no occupied buildings are located between the Ash Surge Basin and the FAB, potential failure of this portion of the eastern embankment is not likely to cause loss of human life. During flood conditions, discharge from the potential failure may overflow along the eastern boundary of the FAB into Lost Creek, resulting in offsite environmental impacts. This excludes the Ash Surge Basin from a low hazard classification.

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[2] Estimated capacity is based on the invert elevation of the emergency spillway for the Ash Surge Basin (466 feet MSL) and the top of the overflow riser pipe (466.75 feet MSL) for the Bypass Basin.

[3] Buildings are assumed to be occupied if there is at least one human occupant a minimum of 12 hours per day.

An inundation map was developed for a potential breach in the southern half of the eastern embankment (south of the Limestone Basin) to evaluate potential impacts to occupied buildings such as the main power block. HEC-HMS Version 4.1 (HEC-HMS, 2013) modeling software was used to estimate the breach hydrographs which are plots of the rate of flow over time. A FLO-2D model (FLO-2D, 2009) was then used to estimates flow depth resulting from the selected hydrograph. The results of the modeling are shown in Figure 4 and indicate that discharge from the potential breach would flow eastward into a depression east of the Bypass Basin and then flow northward into the FAB. Due to increases in topography south of the Bypass Basin, flow is anticipated to extend approximately 200 feet south of the Bypass Basin. If the breach were to occur during flood conditions, flow patterns would remain the same, with minimal storage in the Limestone Basin and localized depression east of the Bypass Basin and could result in increased volume of discharge into the FAB. Potential overflow from the FAB area could enter Lost Creek and flow north to the Illinois River. Flow from the potential breach is not anticipated to extend to the main power block and therefore, a potential failure of the eastern embankment is not anticipated to cause loss of human life. Details of the modeling methods and procedures are presented in Geosyntec (2016b).

3.1.2 Southern Embankment

The Bypass Basin and ERYR Basin are located immediately south of the Ash Surge Basin. Potential failure of the western portion of the southern embankment, with a crest elevation of approximately 467.6 MSL, would result in flow of CCR and CCR laden water into the ERYR Basin. The minimum crest elevation of the ERYR Basin is located at its western embankment at approximately 459 feet MSL. Therefore, surplus discharge into the ERYR from a potential failure of the Ash Surge Basin would flow over the western embankment of the ERYR Basin (at elevation 459 feet) into the Old Intake Canal. Because there are no occupied buildings within the potential impact areas of the Old Intake Canal or ERYR Basin, potential failure of the southern embankment of the Ash Surge Basin is not likely to cause loss of human life.

Failure of the eastern portion of the southern embankment may result in flow of CCR and CCR-laden water into the Bypass Basin. Embankment crest elevations with the Bypass Basin are at approximately the same elevation as those for the Ash Surge Basin. Depending on the rate of failure and existing water levels within the Basins, failure of the southern embankment of the Ash Surge Basin is anticipated to result in equalization of water levels between the Ash Surge and Bypass Basins and no anticipated loss of human life.

3.1.3 Western Embankment

The western embankment of the Ash Surge Basin is limited in height to approximately 9 to 10 feet above surrounding grades along the northern portion of the western embankment and to approximately 12 feet where the Ash Surge Basin is bounded on the west by the Metal Cleaning Basin. Potential failure of this embankment may result in flow of CCR and CCR-laden water into either the Metal Cleaning Basin and/or the Old Intake Canal, located approximately 300 feet west of the Ash Surge Basin. Because no occupied buildings are located between the Ash Surge Basin and the Old Intake Canal, potential failure of this embankment is not likely to cause loss of human life.

3.1.4 Northern Embankment

Discharge from a potential failure of the northern embankment would drain either toward the FAB, located northeast and east of the Ash Surge Basin, or toward the SWB Basin, located northwest of the Ash Surge Basin. Potential overflow from the SWB could drain to the Old Intake Canal or the FAB. As there are no occupied buildings north of the Ash Surge Basin in these areas, a potential failure of the northern embankment is not anticipated to cause loss of human life.

3.2 Bypass Basin

The following sections describe potential impacts from failure of each of the Bypass Basin embankments. The Bypass Basin's capacity is approximately 80% smaller than the capacity of the Ash Surge Basin. With a significantly reduced volume from a potential release, it may be reasonably assumed that the risk to human life due as a result of failure of the Bypass Basin is equally reduced. Figure 5 presents potential flow paths for discharge from potential embankment failures.

3.2.1 Eastern Embankment

Discharge from a potential failure of the eastern embankment would have a similar flow path to flow from a potential breach of the southern half of eastern embankment of the Ash Surge Basin (see Figure 4). Discharge would drain eastward toward a localized depression area directly east of the Bypass Basin. Excess water not contained within this depression would drain northward toward the FAB. Because there are no occupied buildings immediately south or east of the Bypass Basin within the potential inundation area, potential failure of the western embankment of the Bypass Basin is not likely to cause loss of human life. During flood conditions, discharge from the potential failure may overflow along the eastern boundary of the FAB into Lost Creek, resulting in potential offsite environmental impacts. This excludes the Bypass Basin from a low hazard classification.

3.2.2 Southern Embankment

The maximum embankment height along the southern perimeter of the Bypass Basin is approximately 6 feet. A potential breach from the southern embankment is anticipated to have an inundation area similar to that of the eastern embankment of either the Ash Surge or Bypass Basins (see Figure 4). Failure of the southern embankment may result in localized ponding of water directly south of the Bypass Basin and flow of water into the depression area east of the Bypass Basin and into the FAB (if flooding conditions are present at the time of failure). As there are no occupied buildings south and east of the Bypass Basin, a potential failure of the southern embankment is not anticipated to cause loss of human life.

3.2.3 Western Embankment

The ERYR Basin is located directly west of the Bypass Basin. Failure of the western embankment may result in flow of CCR and CCR-laden water into the ERYR Basin, similar to the impacts from a potential failure of the southern embankment of the Ash Surge Basin (see Section 3.1.2). Because there are no occupied buildings within the potential impact areas of the Old Intake Canal or ERYR Basin, potential failure of the western embankment of the Bypass Basin is not likely to cause loss of human life.

3.2.4 Northern Embankment

Discharge from a potential failure of the northern embankment would flow into the Ash Surge Basin. Depending on the rate of failure and existing water levels within the Ash Surge and Bypass Basins, this potential failure is anticipated to result in equalization of water levels within these two basins and no probable loss of human life.

4. Hazard Classification Assessment

Loss of human life resulting from failure of the embankments of the Ash Surge Basin or Bypass Basin is not probable because no occupied buildings are located within the anticipated inundation areas. Potential failure during flood conditions could result in offsite economic or environmental impacts. Therefore, these basins are classified as significant hazard potential CCR surface impoundments as their failure would not be expected to result in probable loss of life, but could result in potential offsite economic loss and environmental damage.

5. Limitations and Certification

This hazard potential classification assessment report was prepared to comply with §257.73(a)(2) of the Code of Federal Regulations Title 40, Part 257, Subpart D, and was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

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Expiration Date: 11/30/2017

6. References

Aero-Metric, 2008. Aerial topography dated 06-19-2008, AeroMetric, Inc.

FLO-2D, 2009. FLO-2D Basic, FLO-2D Software, Inc., Arizona 2009.

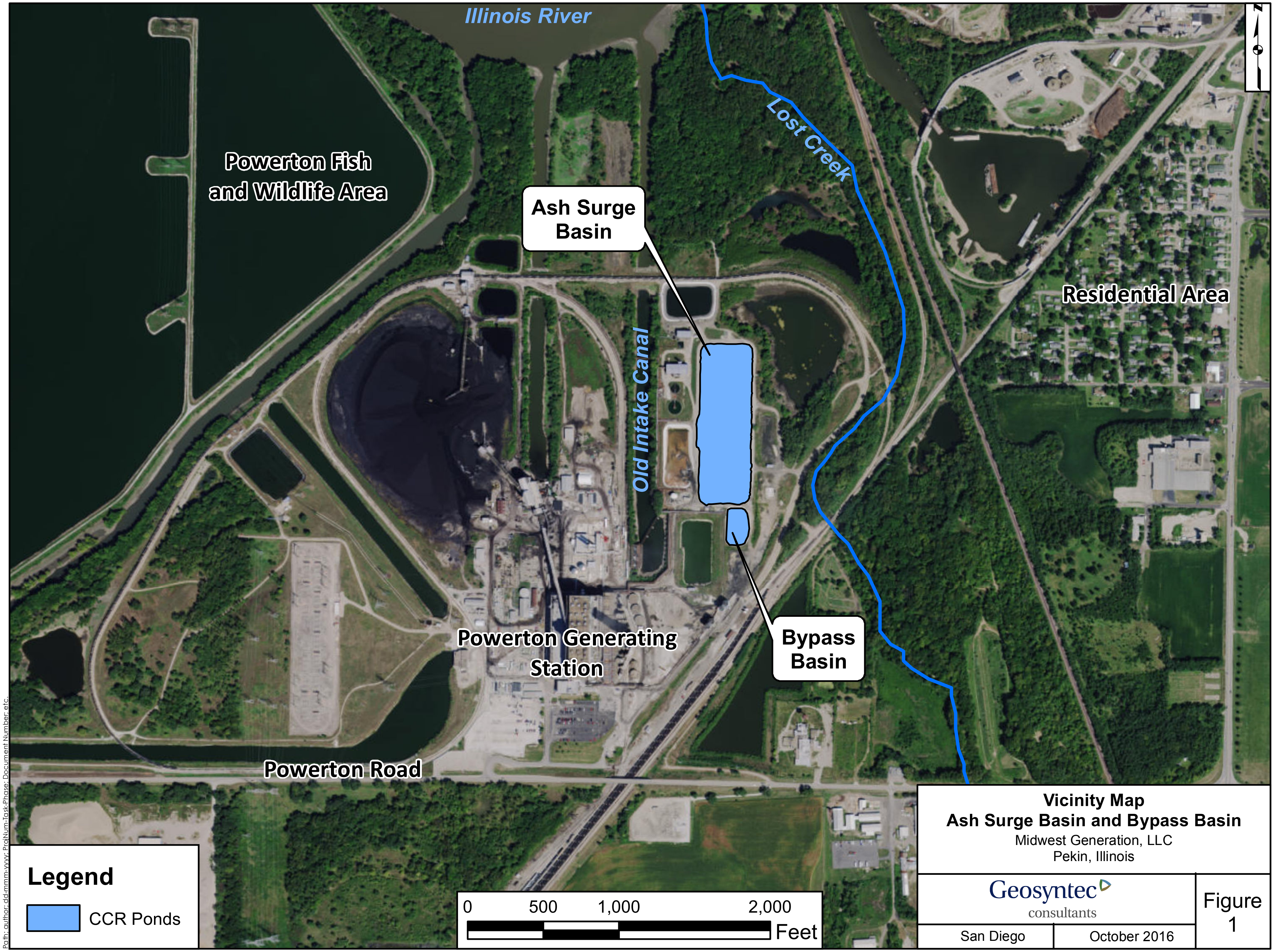
Geosyntec, 2016a. History of Construction Report, Ash Surge Basin and Bypass Basin, Powerton Station, October.

Geosyntec, 2016b. Ash Surge Basin, Hazard Potential Classification Assessment Embankment Breach Analysis, Powerton Station, Pekin, Illinois, October.

HEC-HMS, 2013. HEC-HMS Hydrologic Modeling System – User's Manual, Version 4.0, U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC), Davis, California, December 2013.

Attachments

Figure 1 – Vicinity Map
Figure 2 – Site Plan
Figure 3 – Ash Surge Basin Potential Breach Flowpaths
Figure 4 – Powerton Ash Surge Basin-East Breach Flood Conditions-Maximum Flow Depth
Figure 5 – Bypass Basin Potential Breach Flowpaths



Vicinity Map
Ash Surge Basin and Bypass Basin
Midwest Generation, LLC
Pekin, Illinois

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Figure 1

Path: author: dd-mmm-yyyy; ProjNum-Task-Phase; Document Number, etc.

LEGEND

STRUCTURES

- OCCUPIED
- UNOCCUPIED

AERIAL IMAGE: MICROSOFT CORP. (BING MAPS)
CAPTURE DATE: APRIL 2011

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0 200' 400'
SCALE IN FEET

SITE PLAN

POWERTON STATION
PEKIN, ILLINOIS

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FIGURE 2

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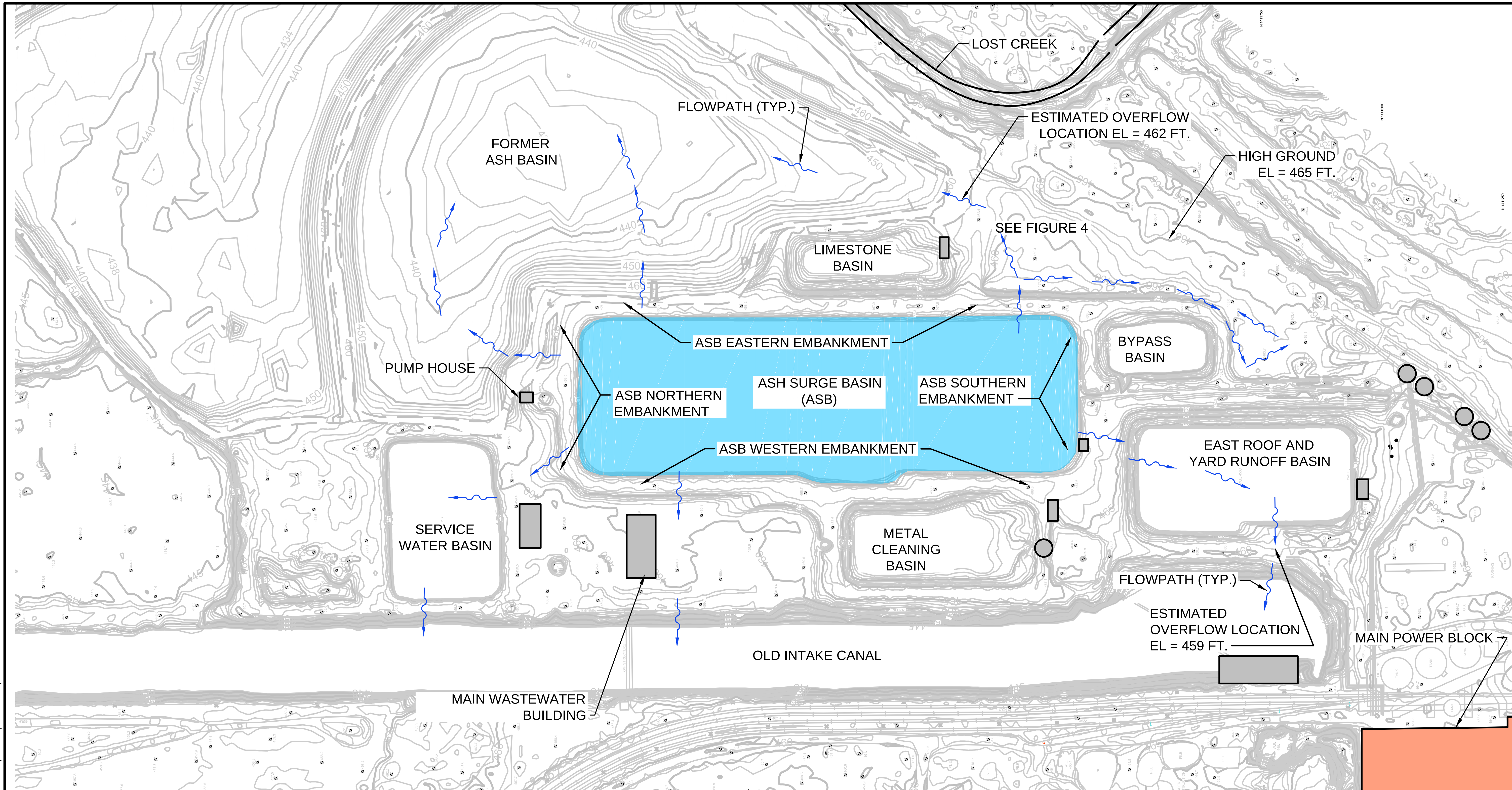

SOURCE OF SURVEY:

TOPOGRAPHY SOUTH OF SECONDARY ASH SETTLING BASIN AND FAB IS BASED ON AERIAL SURVEY PERFORMED BY AEROMETRIC, INC. DATED JUNE 19, 2008. TOPOGRAPHY NORTH OF ASH SURGE BASIN IS BASED ON SURVEY BY RIDGELINE CONSULTANTS PERFORMED IN FEBRUARY AND MARCH 2016.

NOTE:

1. TOPOGRAPHY SHOWN DOES NOT REFLECT MINOR REGRADING OF THE SLOPE EAST OF THE BYPASS BASIN PERFORMED IN FALL 2016.

LEGEND

STRUCTURES

- OCCUPIED
- UNOCCUPIED

ASH SURGE BASIN

POTENTIAL BREACH FLOWPATHS

POWERTON STATION
PEKIN, ILLINOIS

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FIGURE 3

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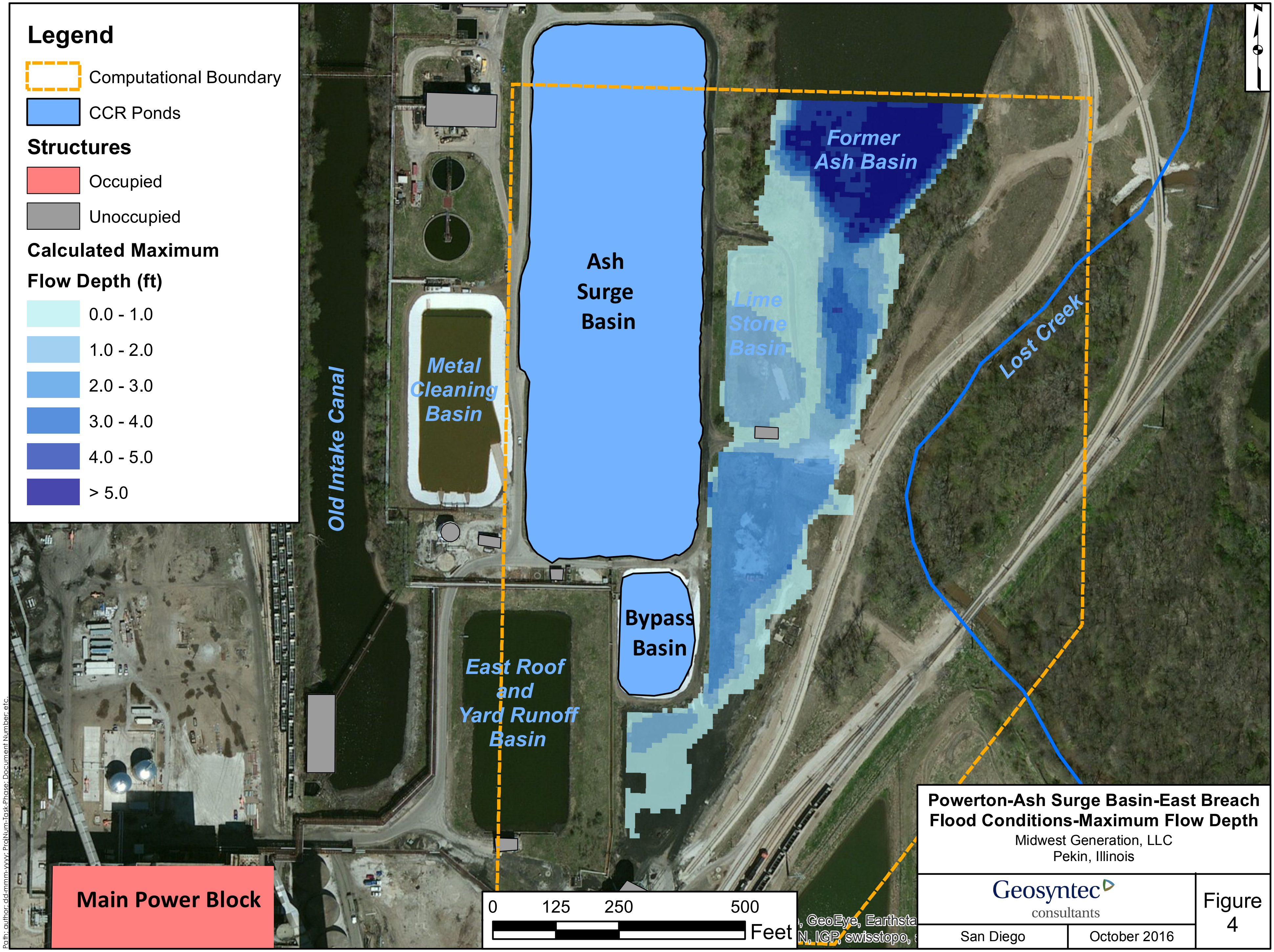
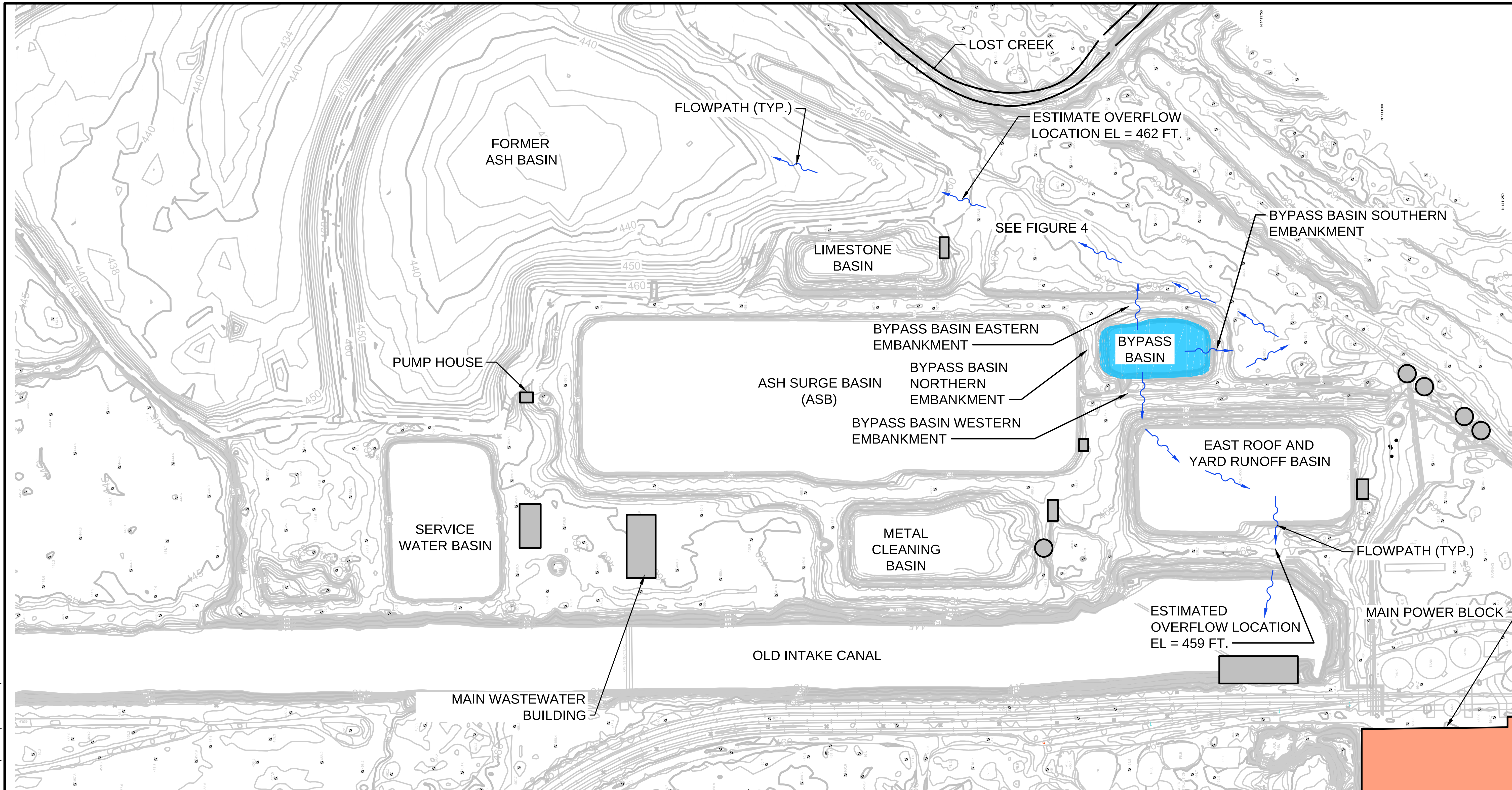


Powerton-Ash Surge Basin-East Breach Flood Conditions-Maximum Flow Depth
Midwest Generation, LLC
Pekin, Illinois

Geosyntec consultants

San Diego	October 2016	Figure 4



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- OCCUPIED
- UNOCCUPIED

N

0 200' 400'

SCALE IN FEET

BYPASS BASIN

POTENTIAL BREACH FLOWPATHS

POWERTON STATION

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FIGURE 5

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