NOTE

Subject: EPA Comments on NRG - Huntley Generating Station, Tonawanda, NY
Round 10 Draft Assessment Report

To: File

Date: March 28, 2012

1. On p. 6, Section 1.4, please correct the double "from the" in the second paragraph, line 7.

2. On p. 26, Section 3.3.1, the following statement made in the report "*Based on our observations and evaluation of the settling pond embankment, it is our opinion that the embankment would have a hazard rating classification of low to remote."* appears to contradict the hazard potential rating for the Sout Ash Pond. *AMEC* provided a hazard potential rating of significant for the South Ash Pond.

3. On p. 7, section 1.4.3 and p. 8, section 1.4.6, please provide clarity on the year of construction for both the South Settling Pond and Pond 3.

4. On p. 17, Section 2.7, first paragraph replace "bothe" with "both."

5. On p. 22, second bullet, "Principal Storm:" replace "sever" with "severe."

6. On p. 31, Section 4.2.2, separate the paragraph beginning with "Drawing C-34738 shows" from the title of the next section: "South Ash Settling Pond."

7. Is there an emergency action plan for the impoundments? If not, this should be stated and there should be a recommendation for the development of one.

8. Appendix A checklist sheet for Pond 1 indicates no liner, however in section 1.4.1 the report states that it has a 2-feet thick clay liner. Please clarify/correct.

NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

September 13, 2012

Mr. Stephen Hoffman
US Environmental Protection Agency
Two Potomac Yard
2733 South Crystal Drive
5th Floor, N-5237
Arlington, VA 22202-2733

Delivered via e-mail to: hoffman.stephen@epa.gov , kohler.james@epa.gov, and englander.jana@epa.gov.

RE: Comment Request on Coal Ash Site Assessment Round 10 Draft Report – NRG Huntley Power, LLC's Huntley Electric Generating Station

Dear Mr. Hoffman:

In accordance with the extension granted by Jana Englander, US EPA on August 10, 2012, NRG is providing comments on the Coal Ash Site Assessment Round 10 Draft Report – NRG Huntley Power, LLC's Huntley Electric Generating Station on the extended deadline of September 14, 2012.

Please find enclosed the following comments as appendices of this letter:

- Appendix A: NRG Comments on Draft Report of Dam Safety Assessment of Coal Combustion Surface Impoundments NRG Energy Huntley Generating Station Tonawanda, NY;
- Appendix B: Current Inspection Report for all Huntley Ponds and Basins by GZA;
- Appendix C: GZA Letter Response to AMEC Dam Safety Assessment Report of Coal Combustion Surface Impoundments NRG Energy Huntley Generating Station Tonawanda, NY including Hydrological and Stability Studies for all Huntley Ponds and Basins; and
- Appendix D: Boring Information from a Geotechnical Report for the Huntley North and South EQ Basins;

NRG requests the opportunity to either discuss or review these changes with the EPA prior to finalization of the report.

Please direct any questions related to this submittal to my attention at (716) 879-3954.

NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

Sincerely,

Joseph J. Pietro
Environmental Coordinator

Enclosures (4)

cc: Thomas Coates, Joseph Schwab (NRG Energy, Inc.)
Paul Leuthauser, Carson Leikam (NRG Huntley Power, LLC)

NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

Appendix A
NRG Comments on
Draft Report of Dam Safety Assessment of Coal Combustion Surface Impoundments
NRG Energy
Huntley Generating Station
Tonawanda, NY

NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

NRG Comments on Draft Report of Dam Safety Assessment of Coal Combustion Surface Impoundments NRG Energy Huntley Generating Station Tonawanda, NY

Section	Proposed Changes to Section
1.1, paragraph 5	Proposed to rewrite sentence as follows: "The ponds no longer receive CCW, still contain CCW and actively receive other waste streams from the plant, including treated effluent from Deminieralizer Neutralization Plant, compressor cooling water, floor and roof drains."
1.2, paragraph 1	Proposed to rewrite sentence as follows: "Ponds 1, 2 and 3 currently have drastically reduced flow from designed flow since they primarily served the retired 60 cycle units and are located to the north of the plant."
1.2, paragraph 2	Proposed to rewrite sentence as follows: "The ash settling ponds at Huntley are not included in the NID, as they do not meet the size, high hazard classification, or significant hazard classification requirements."
1.2.1	NRG takes exception to the hazard classification definitions used for this assessment as they are not consistent with the Army Corps of Engineers definitions of hazard classifications for national dam inspections. Furthermore, the Army Corps of Engineers definition for a significant hazard classification states possible loss of human life and likely significant property or environmental destruction. NRG disagrees with the classification by AMEC of the Huntley impoundments (i.e. Pond 2, Pond 3, North Equalization Pond, South Equalization Pond, and South Settling Pond) as significant hazards. Also, based on the NYS DEC Draft Guidance for Dam Hazard Classification, NRG further believes that a NYS DEC Hazard Class "A", i.e. "Low Hazard", would apply to all Ponds and Basins on the NRG Huntley Property.
1.2.2	Proposed to rewrite sentence as follows: "The required date to file for renewal of the permit was July 4, 2008."
1.4, paragraph 1	Proposed to rewrite word from "Staley" to "Stanley."
1.4, paragraph 1	Proposed to eliminate sentence or rewrite sentence as follows: "Prior to 2010, the North and South EQ Basins and the South Settling Pond were not being inspected or monitored by a professional engineer. Presently, these ponds are inspected annually by a professional engineer."

NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

1.4.1 Proposed to rewrite sentence as follows: "Pond 1 is located on the north side of the plant and is essentially below grade."

1.4.1 Proposed to remove the following incorrect assumption: Delete the following: "It is assumed the former use of the pond system for ash involved directing the flow of sluiced ash to one of the downstream ponds while the other was allowed to dewater, then after ash was removed the flow was switched to repeat the process."

1.4.2 Proposed to rewrite sentence as follows: "The pond is partially below grade and the downstream slopes of the berms are shown to be on 2H:1V slopes with a maximum berm height of 4 feet, except at the outlet."

1:4:3 Proposed to add the following sentence between the sentence that ends in "not available." and the sentence that starts with "A provided plan sheet" : "The pond is below grade on the south and east side and the berm height on the west side is a maximum of four feet."

1.4.6 Proposed to add the following sentence, which would follow directly after the first sentence of the section: "The pond is below grade on three sides and has a 40' dike at the outlet."

1.4.6 Propose to change Table 2 as follows:

Table 2. Pond Size and Storage Data (All values are approimate)

Area	Surface Area (acre)	Maximum Height of Management Unit (feet)	Pond Volume at normal water el. (acre-ft)	Stored Material Volume (cubic yards)
North Ponds[1] (Inactive)				
Pond 1	0.40	5	4.0	Unknown
Pond 2	1.15	7	6.5	Unknown
Pond 3	1.20	7	12.60	Unknown
South Ponds[2] (Active)				
North Equalization	1.58	3[3]	7.76	None
South Equalization	1.58	5[3]	8.16	Unknown
South Ash Settling	7.3	6.75[4]	47.5	7,500[5]

2, Gerenal All vegetation protruding through EQ Basins as been removed. Cracks and damage to EQ Basins have been repaired and basins have been sealed. Vegetation covering embankments have been cut for inspection. See Attached Inspection Report from GZA in Appendix B.

2.2.2 Proposed to rewrite sentence as follows: "Both inlet elevations are 576.1 feet with outlet elevations of 575.7 feet to Pond 3 and 575.4 feet to Pond 2, which controls the water depth in the pond to 10.1 feet."

2.7, paragraph 2 Proposed to rewrite sentence as follows: "The South Pond is used to settle and remove bottom ash on a regular basis."

NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

2.7 paragraph 2	Proposed to rewrite sentence as follows: "The only construction plans and construction drawings available for the South Pond are P.E. Stamped Malcolm Pirnie drawings for the Outlet Structure Modifications."
2.7.1, paragraph 1	Proposed to rewrite sentence as follows: "The north and west sections are incised and the west and south sections are diked. The only outlet is on the diked west side."
3.2.2, General	NRG has provided in Appendix C a hydrological study from GZA for Pond 1, Pond 2, Pond 3, North and South EQ Basins, and South Settling Pond. According to the recommendation of GZA's Report, Page 14, in Appendix C, NRG is considering lowering the elevation of the existing overflow pipe for the North and South EQ Basins from EL. 579.3' to 578.3'. This one foot reduction in the operating level of the Basins will prevent overtopping of the EQ Basins for the ½ PMF event.
3.3.1, General	In regards to the Seismic Analysis – South Ash Pond, NRG has provided in Appendix C a Stability Analysis from GZA to address this deficiency.
3.3.2, General	NRG has provided in Appendix C a Stability Analysis from GZA to address this deficiency.
3.4, last sentence	NRG has provided boring information from a Geotechnical Report for the North and South EQ Basins in Appendix D to address this issue.
4.2, General	NRG has provided in Appendix C hydrological study and stability analyses from GZA, respectively, for Pond 1, Pond 2, Pond3, North and South EQ Basins, and South Settling Pond.
4.2.1	NRG requests documentation showing that the "minimum freeboard of 3 feet" is applicable to all the North and South Ponds.
4.2.2, paragraph 2	Vegetation covering embankments have been cut for inspection. See Attached Inspection Report from GZA in Appendix B.
4.2.2, General	In regards to the South Ash Settling Pond, NRG has provided in Appendix C a Stability Analysis from GZA to address this deficiency.
4.3.2, General	Vegetation covering embankments have been cut for inspection. See Attached Inspection Report from GZA in Appendix B.
Appendix D	Included in Appendix C is a GZA letter in response to the complete AMEC Dam Safety Assessment Report of Coal Combustion Surface Impoundments NRG Energy Huntley Generating Station Tonawanda, NY including Hydrological and Stability Studies for all Huntley Ponds and Basins.
Note:	These comments shall also apply where appropriate throughout the AMEC Report.

NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

Appendix B
Current Inspection Report
for all Huntley Ponds and Basins
by GZA

GZA
GeoEnvironmental
of New York

*Engineers and
Scientists*

September 13, 2012
File: 21.0056662.00

Mr. Joseph P. Schwab
NRG Energy
Joseph.Schwab@nrgenergy.com

Re: GZA Evaluation of Impoundment Embankments
Coal Combustion Surface Impoundments
NRG Energy Huntley Generating Station
Tonawanda, NY

Dear Mr. Schwab:

535 Washington Street
11th Floor
Buffalo, New York
14203
716-685-2300
Fax: 716-685-3629
www.gza.com

GZA GeoEnvironmental of New York (GZA) presents this letter report summarizing our evaluation of the coal combustion surface impoundment embankments at NRG's Huntley Generating Station in Tonawanda, New York (Site). We conducted a visual inspection of the embankments on Wednesday September 12, 2012 in general accordance with the New York State Department of Environmental Conservation (NYSDEC) "An Owners Guidance Manual for the Inspection and Maintenance of Dams in New York State".

GZA conducted this inspection in follow-up to a site reconnaissance conducted on July 6, 2012. The inspections were done on the following impoundments:

- North Basin Nos. 1, 2 and 3(vegetated embankments)
- South Equalization Basin (asphalt-lined bottom and embankments)
- North Equalization Basin (asphalt-lined bottom and embankments)
- South Ash Settling Basin (vegetated embankments)

NRG mowed down the heavy vegetation subsequent to July 6, to allow better inspection on September 16. NRG also patched distressed asphalt areas and applied asphalt sealant on the bottom liners and embankments of the South and North Equalization Basins.

Bart A. Klettke, P.E., of GZA, was accompanied by Joe Schwab, Regional Engineering and Construction Manager for NRG, and Joe Pietro, Environmental Coordinator at the Huntley Plant. Mr. Klettke observed and took photographs of the impoundments and their respective inlet and outlet flow structures. Photographs of the embankments are attached.

Our observance of the embankments showed the physical conditions to be in good to excellent condition, and in general conformance with their original design. The embankments generally had vegetative cover or hardscape protective cover (e.g. concrete matting, riprap, asphalt). We did not observe evidence of:

- Sinkholes caused by internal erosion of embankment via piping.
- Slide, Slump or Slip of the embankment slopes
- Broken Down or Missing Slope Protection

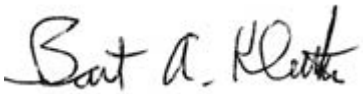
- Erosion
- Rodent Activity and Animal Impact which could create holes, tunnels and caverns.

In our opinion the existing vegetative and/or hardscape cover is sufficient to maintain stability for the impoundment embankments at the Huntley facility. We recommend that the vertical-walled incised embankments located at the north end of the south ash settling basin be sloped back or reinforced with large-size riprap/concrete slabs to provide better stabilization. This recommendation is made mainly for safety purposes for the dredging operations performed there – we do not feel that these embankments pose an environmental concern.

We trust this information satisfies your needs for this project.

Sincerely,

GZA GEOENVIRONMENTAL OF NEW YORK



Bart A. Klettke, P.E.
Associate Principal
(716) 844-7035
bart.klettke@gza.com

Attachments:

North Ponds

Attachment 1 – North Pond No. 1 Photographs
Attachment 2 – North Pond No. 2 Photographs
Attachment 3 – North Pond No. 3 Photographs

South Ponds

Attachment 4 – South Ash Settling Basin Photographs
Attachment 5 – North and South Equalization Basin Photographs

NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

Appendix C
GZA Letter Response to
AMEC Dam Safety Assessment Report of Coal Combustion Surface Impoundments
NRG Energy
Huntley Generating Station
Tonawanda, NY
including Hydrological and Stability Studies for all Huntley Ponds and Basins

GZA
GeoEnvironmental
of New York

*Engineers and
Scientists*

September 13, 2012
File: 21.0056662.00

Mr. Joseph P. Schwab
NRG Energy
Joseph.Schwab@nrgenergy.com

Re: GZA Letter Response to AMEC
Dam Safety Assessment Report of
Coal Combustion Surface Impoundments
NRG Energy Huntley Generating Station
Tonawanda, NY

535 Washington Street
11th Floor
Buffalo, New York
14203
716-685-2300
Fax: 716-685-3629
www.gza.com

Dear Mr. Schwab:

GZA GeoEnvironmental of New York (GZA) presents this letter response to the comments and recommendations presented in a recent Draft Report of Dam Safety Assessment of the coal combustion surface impoundments at NRGs Huntley Generating Station in Tonawanda, New York (Site). The report was issued by the United States Environmental Protection Agency (EPA) from a study conducted by AMEC Earth & Environmental, Inc. (AMEC).

BACKGROUND

The EPA has conducted nation-wide assessments of Coal Combustion Waste (CCW) impoundments at coal combustion energy producers. AMEC was hired by EPA to perform assessments of six (6) ponds at NRG's Huntley Site. AMEC's June 2011 assessment included a site visit to perform visual observations, inventory the CCW surface impoundments, assess the containment dikes, and to collect relevant historical impoundment documentation. Condition assessments, as accepted by the National Dam Safety Review Board (NDSRB), were ascribed by AMEC to each of the 6 impoundments, ranging from: "Satisfactory" – "Fair" – "Poor" – "Unsatisfactory" – "Not Rated" (ratings are defined below). AMEC completed EPA's Coal Combustion Dam Assessment Checklists and CCW Impoundment Assessment Forms. The Impoundment Inspection Forms include a section that assigned a "Hazard Potential" rating ranging from "Less than Low" – "Low" – "Significant" – "High". A summary of AMEC's assessments are presented below in our review of their report.

PURPOSE AND SCOPE OF WORK

NRG requested that GZA review the EPA/AMEC draft report[1] and assist NRG in preparing a response letter to their findings and recommendations, as NRG does not agree with some of EPA/AMEC's statements and conclusions in the report.

[1] "Report of Dam Safety Assessment of Coal Combustion Surface Impoundments, NRG Energy Huntley Generating Station, Tonawanda, NY (AMEC Project No. 3-2106-0194)", prepared by AMEC for U.S. EPA, dated September 2011.

To accomplish NRG's objectives, we performed the following.

- Reviewed the draft EPA/AMEC report;
- Performed reconnaissance of the Site, on July 6, 2012, to check the physical conditions of the impoundments and contributing process inflows and approximate watershed areas to each. GZA also took photographs of the impoundments;
- Reviewed existing available design and/or as-built drawings of the 6 ponds and reports describing inflows and outflows;
- Conducted hydrologic/hydraulic analyses of the 6 ponds for the given inflows of process waters and contributing watersheds, and the possible impact from the flood tailwater on the adjacent Niagara River;
- Reviewed our July 2009 geotechnical evaluation[2] of the South Ash Settling Pond to address specific comments made by EPA/AMEC;
- Conducted slope stability analyses of the north ponds incorporating results of the hydrologic/hydraulic analyses; and
- Prepared this draft response letter summarizing our general engineering judgments given the current site conditions. We provide our opinion as to what the appropriate classification should be for the 6 impoundments, based on accepted EPA qualifiers or rankings.

[2] "(South Ash) Settling Pond Outlet Embankment Evaluation", Huntley Generation Plant, Tonawanda, NY, by GZA GeoEnvironmental of New York, July 1, 2009.

REVIEW OF AMEC/EPA DRAFT REPORT

The following table summarizes AMEC's Condition Assessment and Hazard Potential for each pond/basin, and their rationale for the assigned Assessment and Hazard Rating. The Condition Assessment and Hazard Potential rating systems are defined in the sections presented below the table.

POND	NDSRB Condition Assessment	AMEC Rationale in Assigning Condition Assessment	EPA Hazard Potential Rating	AMEC Rationale in Assigning Hazard Potential
Pond 1	Poor	Lack of Hydrologic and Static and Stability Analysis Documentation	Low	Small pond where unlikely failure would have discharge with little impact to adjacent Ponds 2 and 3.
Pond 2	Poor	Lack of Hydrologic and Static and Stability Analysis Documentation	Significant	Release from Pond 2 outlet to ditch discharging to Niagara River would cause economic and/or environmental damage.
Pond 3	Poor	Lack of Hydrologic and Static and Stability Analysis Documentation	Significant	Release from Pond 3 outlet to ditch discharging to Niagara River would cause economic and/or environmental damage.
North Equalization Basin	Poor	Lack of Hydrologic and Static and Stability Analysis Documentation	Significant	Release from Basin would discharge to Niagara River causing economic and/or environmental damage.
South Equalization Basin	Poor	Lack of Hydrologic and Static and Stability Analysis Documentation	Significant	Release from Basin would discharge to Niagara River causing economic and/or environmental damage.
South Ash Settling Basin	Poor	Lack of Hydrologic and More Complete Stability Analysis Documentation*	Significant	Release from Basin would discharge directly to Niagara River causing economic and/or environmental damage.

*Specific to the South Ash Settling Pond, AMEC's review included a review of GZA's "Settling Pond Outlet Embankment Evaluation" report of July 2009, where our general opinion was that the embankment would have a hazard rating classification of low to remote. EPA/AMEC stated that the South Ash Settling Pond was rated "Poor" due to lack of a hydrologic/hydraulic study and a more complete stability analysis (seismic evaluation and re-consideration of friction angle parameters used in our study).

GZA reviewed the draft report prepared by AMEC. AMEC assigned a Condition Assessment of each pond using the following rating system acceptable by the NDSRB.

SATISFACTORY

No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines.

FAIR

No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action.

POOR

A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. POOR may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary.

UNSATISFACTORY

A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

NOT RATED

The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated.

AMEC completed EPA's Coal Combustion Dam Assessment Checklists and CCW Impoundment Assessment Forms. The Impoundment Assessment Forms include a section that assigns a "Hazard Potential" that is used to indicate what would likely occur following failure of an impoundment. "Hazard Potential" definitions are as follows.

LESS THAN LOW HAZARD POTENTIAL

Failure or mis-operation of the dam results in no probable loss of human life or economic or environmental losses.

LOW HAZARD POTENTIAL

Dams assigned the low hazard potential classification are those 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 owner's property.

SIGNIFICANT HAZARD POTENTIAL

Dams assigned the significant hazard potential classification are those dams 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 can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

LOW HAZARD POTENTIAL

Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

GZA SITE RECONNAISSANCE AND REVIEW OF EXISTING DRAWINGS AND REPORTS

GZA conducted a site reconnaissance on July 6, 2012. Bart A. Klettke, P.E., of GZA, was accompanied by Joe Schwab, Regional Engineering and Construction Manager for NRG. Mr. Klettke observed and took photographs of the impoundments, their respective inlet and outlet flow structures, and contributory watershed areas.
Available existing drawings and reports were provided by Mr. Schwab. The drawing and report information was used to develop the figures presented herein and to perform the hydrologic/hydraulic analyses described below.

General descriptions of the waste flows into the North and South Basins are as follows.

North Basins

The North Basins (Ponds 1, 2 and 3) no longer receive Coal Combustion Waste (CCW), but may contain residual ash from their former use. The ponds currently receive flows from drainage from the north wastewater collection system, which includes sub-basement sump pumps, roof and floor drains, auxiliary cooling system drains and de-mineralized water production wastes.

A plan view of the North Basins is presented on attached Figure 1. Basin and drainage pipe information is provided on the figure. Figure 2 shows cross-sections of the outlet drainage pipes from Ponds 2 and 3 draining into the adjacent drainage ditch.

South Basins

The North and South Equalization Basins receive flows from wastewater associated with the air pre-heater washes and coal pile runoff sump pumps. The North and South Equalization basins are treated by an on-site Wastewater Treatment Facility which discharges into the plant's Low Level Waste Water Pit through internal SPDES Outfall 007A and ultimately to the Niagara River through the South Ash Settling Basin and SPDES Outfall 008. The South Ash Settling Pond receives flow from sluice waters and suspended solids from Unit 67 and Unit 68 bottom ash and economizer ash systems and discharge from the Low Level Waste Water Pit. The Low Level Pit discharge includes rain

water from roadway drains, sub basement sump drains, boiler water releases, Huntley 1 roof and floor drains, auxiliary cooling systems drains and discharge from the Wastewater Treatment facility from treating the North and South Equalization basin water.

A plan view of the South Basins is presented on attached Figure 3. Basin and drainage pipe information is provided on the figure. Figure 4 presents a cross-sectional photograph of the southwest corner of the South Equalization Basin, showing dimensions for discussion purposes presented in our Conclusions section below.

HYDROLOGIC/HYDRAULIC ANALYSES

Pond 1, Pond 2, Pond 3, the North Equalization Basin, the South Equalization Basin and the South Ash Settling Pond have been rated to be in Poor condition primarily due to the lack of hydrologic and hydrologic documentation for the ponds. This condition rating was recommended by AMEC. AMEC, therefore, recommended that the design flood for these ponds be the ½ Probable Maximum Flood (½ PMF). The objective of our analysis was to calculate and document maximum water surface elevations under ½ PMF conditions.

The inputs for this analysis were based on the information gathered by GZA, upon reviewing historical drawings and other design documents made available to GZA by NRG Energy. The computer software of BOSS HMR52 (v.1.10) developed by BOSS International and HEC-HMS (v.3.5) developed by US Army Corps of Engineers Hydrologic Engineering Center were utilized for the analysis.

All elevations refer to the vertical datum of IGLD 1955 to be consistent with previous design drawings and documents, unless otherwise noted.

1/2 Probable Maximum Flood Analysis

The Probable Maximum Precipitation (PMP) for the project site was estimated using the BOSS HMR52 computer software, developed by BOSS International, based on National Oceanic and Atmospheric Administration (NOAA) Hydrometeorological Report Nos. 51 and 52 (Probable Maximum Precipitation Estimates, United States East of the 105th Meridian, 1978 and 1982). We adjusted storm orientation, centroid, and temporal distribution of rainfall to optimize/maximize the total volume of the 72-hour PMP. The ten-square-mile PMP for the project site was calculated to be 33.0 inches over a 72-hour duration, 22.4 inches of which occurs within a 6-hour period. The temporal distribution of the PMP calculated by BOSS HMR52 was then applied to the stormwater contributory areas of North and South Ponds in the HEC-HMS models. The 10-minute incremental output data file is attached.

The ½ PMF was selected to be the design flood for North Ponds and South Ponds, based on the hazard potential of the ponds being significant/moderate, per Mine Safety and Health Administration (MSHA) Minimum Long Term Hydrologic Design Criteria. In HMS a ratio of 50 percent was applied to the calculated discharge from application of the full PMP to each watershed.

500-year Flood in Niagara River

The North and South Ponds ultimately discharge to the Niagara River. The analysis assumes a 500-year flood elevation in the river. The 500-year flood elevation between "Interstate Route 190" and "Limit of Detailed Study" was estimated to be approximately El.571.5 in NGVD 1929 Datum, based on "Flood Profiles / Niagara River – Tonawanda Channel" included in the FEMA Flood Insurance Study for Town of Tonawanda, New York, dated February 1981. The conversion between NGVD 1929 and IGLD 1955 for the site location was estimated to be:

IGLD 1955 (ft) = NGVD 1929 (ft) – 0.85 ft

Therefore, the 500-year flood elevation in Niagara River was calculated to be El.570.65 in the IGLD 1955 Datum, and represents the tailwater level from subsequent hydraulic routing computations from the basins.

HMS Analysis

The North Ponds and South Ponds were analyzed as two independent hydrologic systems in HEC-HMS. Setup schematics for the two basin models are attached. A summary of the hydrologic elements used for the analysis is given below.

Inputs for North Ponds

The North Ponds consist of three inter-connected ponds, Pond 1 through Pond 3. Pond 1 receives a maximum process inflow of about 1,950 gpm (4.34 cfs) at its southwest corner and discharges to Ponds 2 and 3 through two, 43-in by 27-in galvanized arched pipes to the north, while Ponds 2 and 3 each discharge to a drainage channel through a 24-in and 18-in diameter Corrugated Metal Pipe (CMP), respectively. The drainage channel conveys flow to the Niagara River through a 36-in diameter CMP.

Key elevations and dimensions are as follows:

	Dimension or Elevation (ft, IGLD 1955)
Pond 1	
Crest	579.0
In Invert of 43"x27" Outflow Pipe to Pond 2	576.1
Out Invert of 43"x27" Outflow Pipe to Pond 2	575.4
Length of 43"x27" Outflow Pipe to Pond 2	70
In Invert of 43"x27" Outflow Pipe to Pond 3	576.1
Out Invert of 43"x27" Outflow Pipe to Pond 3	575.7
Length of 43"x27" Outflow Pipe to Pond 3	40
Pond 2	
Crest	579.0
In Invert of 24"Ø Outflow Pipe to Drainage Channel	575.3
Out Invert of 24"Ø Outflow Pipe to Drainage Channel	575.0±
Length of 24"Ø Outflow Pipe to Drainage channel	50±

Pond 3	
Crest	579.0
In Invert of 18"Ø Outflow Pipe to Drainage Channel	574.35
Out Invert of 18"Ø Outflow Pipe to Drainage Channel	573.4±
Length of 18"Ø Outflow Pipe to Drainage Channel	65±

The SCS (Soil Conservation Service, now known as Natural Resources Conservation Service, i.e. NRCS) Dimensionless Unit Hydrograph method was used in this analysis. Input parameters estimated by GZA for the watershed areas for North Ponds used in the HEC-HMS Model are summarized in **Table 1** below.

Table 1: HEC-HMS Watershed Input – North Ponds

HEC-HMS Model	Subbasin	Drainage Area		Runoff Potential (SCS Curve Number) *	Watershed Lag Time (min)
		(sq mi)	(sq ft)		
North Ponds	Pond 1	0.001159	32,300	94	6
	Pond 2	0.001865	52,000	99	6
	Pond 3	0.001998	55,700	95	6

*Note: Composite curve numbers with CN of 99 for water and 89 for land.
Tables 2 through **4** present the elevation-area and elevation-storage relationships that GZA developed for the subbasins for the North Ponds.

Table 2: Reservoir Elevation-Area Function for Pond 1

Elevation (ft, IGLD 1955)	Area		Storage (acre-ft)
	(sq ft)	(ac)	
575	8,000	0.184	0
576.1	17,500	0.402	0.3
579	32,300	0.742	1.9

Table 3: Reservoir Elevation-Area Function for Pond 2

Elevation (ft, IGLD 1955)	Area		Storage (acre-ft)
	(sq ft)	(ac)	
575	35,000	0.803	0
576.1	51,500	1.182	0.3
579	52,000	1.194	4.7

Table 4: Reservoir Elevation-Area Function for Pond 3

Elevation (ft, IGLD 1955)	Area		Storage (acre-ft)
	(sq ft)	(ac)	
574	16,300	0.374	0
574.35	35,300	0.810	0.2
579	55,700	1.279	5.0

Initial Water Surface Elevation

For North Ponds, the initial water surface elevations in the ponds were assumed to coincide with the invert elevations of the outflow structures, i.e. El.576.1, El.575.3 and El.574.35 for Ponds 1, 2 and 3, respectively.

Tailwater Conditions

Under the ½ PMF to the ponds, the water surface elevations are going to rise in all these ponds. Based on the invert elevations and pool elevations, the two 43'' by 27'' outflow pipes that convey flows from Pond 1 to Ponds 2 and 3 will be under the influence of the downstream water levels in Ponds 2 and 3. GZA adopted a simplified approach to the "pond in series" configuration and thus analyzed two separate cases. In Case A, the tailwater elevations were assumed not to affect discharge through the two pipe arches. Case A therefore assumes the highest capacity through the pipes between Pond 1 and Ponds 2 and 3 with no restrictions from tailwater. In Case B, the calculated peak water elevations in Ponds 2 and 3 from Case A were used as the tailwaters for the same outflow pipe arches above. Case B represents a lower pipe capacity per unit head.

The tailwater elevation at the drainage channel is assumed to be at El.570.65, representing the 500-year peak flood level in Niagara River. Tailwater for Ponds 2 and 3 was assumed to be constant at El.570.65, the 500-year flood elevation in the Niagara River and the elevation in the discharge channel.

Inputs for South Ponds

The South Ponds consist of three basins- the North and South EQ Basins and the South Ash Settling Basin. The North and South EQ Basins receive a maximum process inflow of 500 gpm (1.11 cfs) from the plant and share a 12-in diameter outflow pipe to the South Ash Settling Basin. Because the EQ basins share a single outflow pipe they were modeled as a single reservoir element in HEC-HMS. The water levels in the EQ basins are also controlled by an outflow pump. Pump specifics and operational rules were not available therefore the outflow pump was not included in the analysis. The South Ash Settling Basin receives a maximum inflow of about +-6,800 gpm (15.15 cfs) at the north end and discharges to the Niagara River through a 92-in by 65-in steel pipe arch at the southwest corner. The modeling effort included a sensitivity analysis to evaluate the impact of varying the process inflows.

Key elevations and dimensions are as follows:

	Dimension or Elevation (ft, IGLD 1955)
North & South EQ Basins	
Crest	580.3
In Invert of 12''Ø Outflow Pipe to South Settling Basin	579.3
Out Invert of 12''Ø Outflow Pipe to South Settling Basin	570±
Length of 12''Ø Outflow Pipe to South Settling Basin	120±
South Ash Settling Basin	
Crest	580.3
In Invert of 92"x65" Outflow Pipe to Niagara River	568.94
Out Invert of 92"x65" Outflow Pipe to Niagara River	568.04
Length of 92"x65" Outflow Pipe to Niagara River	55±

Key input parameters for the watershed areas in the HEC-HMS model are summarized in **Table 5** below:

Table 5: HEC-HMS Watershed Input – South Ponds

HEC-HMS Model	Subbasin	Drainage Area		Runoff Potential (SCS Curve Number) *	Watershed Lag Time (min)
		(sq mi)	(sq ft)		
South Ponds	North and South EQ Basin	0.00475	132,400	99	6
	South Ash Settling Basin	0.012329	343,700	95	6

*Note: Composite curve numbers with CN of 99 for water and 89 for land.

Tables 6 and **7** present the elevation-area and elevation-storage relationships that GZA developed for the subbasins for the South Ponds.

Table 6: Reservoir Elevation-Area Function for North & South EQ Basins (Combined)

Elevation (ft, IGLD 1955)	Area		Storage (acre-ft)
	(sq ft)	(ac)	
572	66,320	1.522	0
580.3	132,400	3.039	18.6

Table 7: Reservoir Elevation-Area Function for South Ash Settling Basin

Elevation (ft, IGLD 1955)	Area		Storage (acre-ft)
	(sq ft)	(ac)	
563	114,000	2.617	0
575	200,000	4.951	42.7

Initial Water Surface

The initial water surface elevation for the North and South EQ Basins are assumed to be at the elevation of the overflow structure, El.579.3. The EQ Basins are typically maintained at lower elevations by utilizing the outflow pump. A sensitivity study was performed to evaluate the influence of varying the initial water surface elevation.

The initial water surface elevation in the South Ash Settling Pond is assumed to be coincident with the Niagara River, El.570.65, because the invert of the outflow pipe is at El.568.94.

Tailwater Conditions

Tailwater for the pipe from the EQ Basins to the South Ash Settling Pond was set at El.571.5 for the runs for South Ponds. The tailwater for South Ash Settling Basin was constantly set at El.570.65, the 500-year flood in Niagara River.

RESULTS

North Ponds

The results for North Ponds are summarized in **Table 8** below. Case A assumes a low tailwater condition (i.e. outlet capacity is not impacted by the tailwater elevation). Case B assumes a high tailwater condition (i.e. outlet capacity is impacted by the tailwater elevation).

Table 8: HEC-HMS Results for North Ponds (1/2 PMF)

Case	Pond	Watershed Runoff (in)	Peak Inflow (cfs)	Peak Outflow (cfs)	**Max WSEL (ft)**	Min Freeboard[1] (ft)	Tailwater Elev. (ft)
A[2]	1	16.1	11	5	**576.8**	2.2	None / None[2]
	2	16.4	14	7	**576.8**	2.2	570.65
	3	16.2	15	7	**576.1**	2.9	570.65
B[3]	1	16.1	11	5	**576.9**	2.1	576.8 / 576.1[3]
	2	16.4	14	4	**576.4**	2.6	570.65
	3	16.2	17	8	**576.5**	2.5	570.65

Notes:

1. Assumed top of berm at El.579.0 for Ponds 1 through 3.
2. Tailwater elevations for Pond 1 assumed not to affect the discharges from the outflow pipes.
3. Tailwater elevations for Pond 1 assumed to be fixed at the peak water levels of Ponds 2 and 3 that was estimated for Case A.

The results indicate that the North Ponds have the ability to safely pass the ½ PMF. The calculated minimum freeboard ranges from 2.1 to 2.9 feet.

South Ponds

The results for South Ponds are summarized in **Table 9** below. The sensitivity analysis included evaluating the impact of varying the initial water surface elevations for the EQ Basins. The analysis also included evaluating the impact of both including the 500 gpm inflow to the EQ Basins and assuming no pumped inflows to the EQ Basins.

Table 9: HEC-HMS Results for South Ponds (1/2 PMF)

Case	Pond	Initial WSEL (ft)	Process Inflow (gpm)	Watershed Runoff (in)	Peak Inflow (cfs)	Peak Outflow (cfs)	Max WSEL (ft)	Freeboard[1] (ft)
C	N. EQ	579.3	500	16.4	27	27	580.3	**OT**[2]
	S. EQ			16.4				
	S. Set.	570.65	6,800	16.2	106	72	571.5	**3.5**
D	N. EQ	578	500	16.4	27	27	580.3	**OT**[2]
	S. EQ			16.4				
	S. Set.	570.65	6,800	16.2	81	58	571.3	**3.7**
E	N. EQ	576	500	16.4	27	2	580	**0.3**
	S. EQ			16.4				
	S. Set.	570.65	6,800	16.2	81	58	571.3	**3.7**
F	N. EQ	579.3	0	16.4	26	21	580.3	**OT**[2]
	S. EQ			16.4				
	S. Set.	570.65	6,800	16.2	87	63	571.4	**3.6**
G	N. EQ	578	0	16.4	26	1	579.7	**0.6**
	S. EQ			16.4				
	S. Set.	570.65	6,800	16.2	81	58	571.3	**3.7**
H	N. EQ	576	0	16.4	26	0.0	577.9	**2.4**
	S. EQ			16.4				
	S. Set.	570.65	6,800	16.2	81	58	571.2	**3.8**

Notes:

1. Assumed top of berm at El.580.3 for North and South EQ Basins; assumed top of berm at El. 575.0 for South Ash Settling Basin.
2. "OT" denotes overtopping.
3. To alleviate the overtopping of the equalization basins, GZA analyzed an alternate condition for the north and south equalization basins to determine a revised elevation for the top of the overflow pipe in the basin's outflow structure. The analysis was run with the top of overflow pipe elevation established at 578.3' (1.0' below the existing 579.3'), tabulated as follows.

Case	Pond	Initial WSEL (ft)	Process Inflow (gpm)	Watershed Runoff (in)	Peak Inflow (cfs)	Peak Outflow (cfs)	Max WSEL (ft)	Freeboard[1] (ft)
Alter-nate	N. EQ	578.3	500	16.4	26	4	580.1	**0.2**
	S. EQ			16.4				
	S. Set.	570.65	6,800	16.2	84	60	571.5	**3.7**

Based on the above alternate case, NRG can lower the top of the existing overflow pipe, and associated maximum operating level, from Elevation 579.3' to 578.3', to prevent over-topping of the equalization basins for the ½-PMF event.

The results of the analysis are as follows:

- If NRG lowers the top of the existing overflow pipe, and associated maximum operating level, from Elevation 579.3' to 578.3', that will prevent over-topping of the equalization basins for the ½-PMF event.

- The water level in the South Ash Settling Basin is fairly stable under various scenarios. The water level rises between 0.6 and 0.8 feet from its initial water level, El.570.65. The minimum freeboard for the settling basin is greater than 3 feet under the ½ PMF event.

Based on the results presented above, GZA presents the following conclusions concerning our hydrological study:

1. For North Ponds 1, 2 and 3, the ½ PMF does not cause overtopping in any of the ponds. The calculated freeboard of 2.1 to 2.9 feet is adequate, in our opinion, to protect the berms from wave run-up given the overall small area of the impoundments.
2. For the North and South EQ Basins, the dominant factor impacting the potential for overtopping is the initial water surface elevations (and thus available surcharge storage).
3. The North and South EQ Basins will be overtopped during the ½ PMF when the initial water surface is below El.578.7 with no process inflow or below El.577.7 with a maximum process inflow of 500 gpm) regardless of whether process inflows are discharged to the basins. However, the North and South EQ Basins will not be overtopped during the ½ PMF, under either condition, if NRG lowers the top of the existing overflow pipe, and associated maximum operating level, from Elevation 579.3' to 578.3'.
4. The outflow pipe for South Ash Settling Basin can pass the ½ PMF with a freeboard greater than 3 feet, regardless of the conditions in the EQ Basins.

REVIEW OF GZA 2009 GEOTECHNICAL REPORT FOR SOUTH ASH SETTLING BASIN

In reviewing GZA's July 2009 geotechnical report, AMEC noted the following.

1. The friction angle used for the fill (30 degrees) may be high due to the presence of soft zones and debris noted in the boring.

2. Although the GZA report provided comments on liquefaction due to seismic activity, a seismic stability is not presented. AMEC recommends that the analysis be revised to include a seismic analysis. The analysis should be reviewed after completion of the recommended hydraulic study to evaluate elevated phreatic conditions and the need for a rapid drawdown analysis based on flood and receding waters of the Niagara River.

GZA assigned a friction of 30 degrees to the fill based upon the following.

- Typical range of internal friction angle values published for silty-sand fill by Joseph E. Bowles, "Physical and Geotechnical Properties of Soils", 1979: Loose Silty Sand: 25-35 degrees; Dense Silty Sand: 30 – 36 degrees.

- Due to the presence of gravel, slag, concrete, brick, cobbles and wood debris in the fill soils, plus the presence of the 65" x 92" steel arch pipe providing reinforcement, it is GZA's opinion that the debris and pipe gives greater interlocking and a higher shear strength that warranted assigning a mid-range friction angle of 30 degrees to the fill layer.

- We note that the critical failure surface, shown on the attached stability analyses, occurs at a shallow depth where denser soils exist. Less critical failure surfaces, having higher factors of safety, occur at greater depth through the loose fill soils.

To address AMEC's comments, GZA did additional evaluation of the South Ash Settling Basin embankment stability to:

- Conduct a seismic analysis; and
- Conduct a rapid drawdown analysis to evaluate the elevated phreatic conditions based on the hydrologic study completed.

The following factors of safety were calculated.

Loading Condition	Calculated F. S.	EPA Minimum Required F. S.
Long-Term Steady Seepage (Static)	1.8	1.5
Rapid Drawdown	1.8	1.3
Seismic Loading*	1.1	1.0

*For the seismic analysis, GZA applied a maximum horizontal acceleration (MHA) of 0.2g (90 percent probability of not being exceeded in 250 years), based on "Probabilistic

Earthquake Acceleration and Velocity Maps for the United States and Puerto Rico", U.S. Geologic Survey, Map MF-2120. This is a conservative value based on published information. More recent published data, which has catalogued earthquake activity, indicates lower MHA values.

The calculated factors of safety exceed the EPA minimum required safety factors for the 3 loading conditions. GZA considers the South Ash Settling Basin embankment along the Niagara River to be stable for all conditions.

SLOPE STABILITY ANALYSES OF NORTH BASINS

GZA conducted slope stability analyses of the following North Basin impoundment embankments.

- Embankment between Pond 3 and the existing drainage channel to the north.
- Embankment between Pond 2 and the existing drainage channel to the north.
- Embankment between Pond 2 and the low lying area located between Ponds 2 and 3.

Analyses were done for static and seismic conditions assigning a conservative internal friction angle of 30 degrees for the general berm fill and a friction angle of 35 degrees for the surficial layer where concrete matting exists along the embankment slopes. The static analyses were done with a phreatic surface representing the ½-PMF rain event, and the seismic analyses were done with a phreatic surface representing normal pool elevations. Rapid drawdown analyses were not done since we consider the change in water level negligible for the given conditions.

The following factors of safety were calculated.

Loading Condition	Calculated F. S.	EPA Minimum Required F. S.
20-FT.+/- WIDE POND 3/DRAINAGE CHANNEL EMBANKMENT*		
Long-Term Steady Seepage (Static)	1.8	1.5
Seismic Loading	1.1	1.0
40-FT.+/- WIDE POND 2/DRAINAGE CHANNEL EMBANKMENT		
Long-Term Steady Seepage (Static)	2.1	1.5
Seismic Loading	1.2	1.0
POND 2/INTERNAL LOW-LYING AREA		
Long-Term Steady Seepage (Static)	2.7	1.5
Seismic Loading	1.4	1.0

*Stability analyses for the 20-ft. wide embankment between Pond 3 and the drainage channel embankment, did not incorporate the reinforcement effects of the 5 drainage pipes spanning the embankment, in addition to the 16-feet wide x 12-feet deep concrete retaining headwall.

CONCLUSIONS

The shallow embankments that partially surround the basins should not be considered "dams". NDSRB defines a dam as having an embankment height ≥ 25 feet in height, providing impoundment capacity ≥ 50 acre-feet. The highest embankment height of NRG Huntley's six basins is 6 feet at an isolated location at the southwest corner of the South Equalization Basin, and 10 feet at the outfall point of the South Ash Settling Basin. Otherwise, embankment heights are generally 2 to 3 feet above existing grade, or incised. The largest impoundment, the South Ash Settling Basin, has a capacity of about 43 acre-feet.

It is GZA's professional opinion that AMEC's Condition Assessment and Hazard Potential ratings assigned to each pond are overly conservative. In general, the NRG Huntley basins have functioned properly and as designed for the past 30+ years with widely varying loading conditions. Specific discussion for each basin follows.

North Basins

Pond 1 – This pond is small, covering an area less than ½-acre, with partial embankments (Top El. 579.0' ±) between itself and Ponds 2 and 3. The hydrologic analysis indicates that the ½ PMF event would result in a peak storm water elevation of 577.0' providing about 2.0 feet of freeboard height. The surrounding soils are coarse-grained coal ash. In the unlikely event of embankment failure, decant water would percolate into the site soils or drain into Ponds 2 or 3. Pond 1 does not require a stability analysis. Therefore, Pond 1 should have a NDSRB condition assessment of "Satisfactory" in that no existing or potential embankment safety deficiencies are recognized, and acceptable performance is expected under all loading conditions (static, hydrologic, seismic). We also believe that Pond 1 should have a "Less than Low Hazard Potential" since failure or mis-operation of the impoundment results in no probable loss of human life or economic or environmental losses; NRG would not experience economic or environmental loss on their property.

Pond 2 – This pond has a full surrounding embankment (Top El. 579.0' ±). The hydrologic analysis indicates that the ½ PMF event would result in a peak storm water elevation of 577.2' providing about 1.8 feet of freeboard height. The surrounding soils are coarse-grained coal ash. In the unlikely event of embankment failure along the south, east and west embankments, decant water would percolate into the site soils or drain into Pond 1. The stability analyses done for the Pond 2 north embankment, adjacent to the drainage ditch, shows stable conditions for static and seismic conditions, given the following:

- The analyses ascribed a conservative internal friction angle of 30 degrees for the berm fill.

- The analyses did not incorporate: the reinforcing elements of the 16-feet wide concrete retaining headwall with a depth of 12 feet (see cross-section on Figure 2); the 5 drainage pipes spanning the narrowest section (about 20 feet across the top)

of the embankment, from the pond to the drainage ditch, providing additional reinforcement of the embankment.

A stability analyses, also done for the internal berm between Pond 2 and the low-lying area between Ponds 2 and 3, shows stable conditions for static and seismic conditions.

We believe Pond 2 should have a NDSRB condition assessment of "Fair" in that no existing embankment safety deficiencies are recognized for normal loading conditions, evidenced by 35 years of safe and stable operation. In the unlikely event of a rare or extreme hydrologic and/or seismic event resulting in an embankment deficiency, the resultant risk of uncontrolled flow to the adjacent drainage ditch could be quickly mitigated by the following procedure.

1. Shutting off the process water influent to upstream Pond 1.
2. Temporarily damming off the narrow ditch downstream of Pond 1 via a few tandem truck loads of clay readily available in the area.
3. Establishing a temporary process water bypass system (either diverting flow to Pond 3 or setting up a series of portable holding tanks) to decant the water to the drainage ditch downstream of temporary dam.
4. Repairing the embankment and restoring normal pond operations.

We also believe that Pond 2 should have a "Low Hazard Potential" since failure or mis-operation of the impoundment results in no probable loss of human life and low economic and/or environmental losses. NRG would experience only the economic loss of repairing the embankment deficiency; low environmental loss may be experienced for the short duration in shutting off the process water feeding upstream Pond 1 and establishing a temporary dam and bypass system described above.

Pond 3 - This pond has partial embankments (Top El. 579.0' ±) along the west and north edges, with the east and south sides incised. The hydrologic analysis indicates that the ½ PMF would result in a peak storm water elevation of 577.4' providing about 1.6 feet of freeboard height. The surrounding soils are coarse-grained coal ash. In the unlikely event of embankment failure along the west embankment, decant water would percolate into the site soils or drain into Pond 1 or Pond 2.

The stability analyses done for the Pond 3 north embankment, adjacent to the drainage ditch, shows stable conditions for static and seismic conditions.

In our opinion, Pond 3 should have a NDSRB condition assessment of "Fair" in that no existing embankment safety deficiencies are recognized for normal loading conditions, evidenced by 35 years of safe and stable operation. In the unlikely event of a rare or extreme hydrologic and/or seismic event resulting in an embankment deficiency, the resultant risk of uncontrolled flow to the adjacent drainage ditch could be quickly mitigated similar to the procedure described for Pond 2 above.

We also believe that Pond 3 should have a "Low Hazard Potential" since failure or mis-operation of the impoundment results in no probable loss of human life and low economic and/or environmental losses. NRG would experience only the economic loss of repairing the embankment deficiency; low environmental loss may be experienced for the short duration in shutting off the process water feeding upstream Pond 1 and establishing a temporary dam and bypass system described above.

South Basins

North and South Equalization Basins – Both basins are lined on the interior, as well as the exterior slopes of the embankments, with asphalt having 2 inches of binder course overlaid with 2 inches of surface course. The asphalt surface was observed by GZA to be in good to excellent condition, with some vegetation located mainly on the exterior slopes of the embankments, with isolated protrusions of vegetation on the interior slopes. The embankment interior slopes are at 5H:1V and the exterior slopes are at 3H:1V.

We do not believe that a stability analysis is required for these basins for the following reasons.

- The majority of the basins embankments are shallow ranging from about 0 to less than 5 feet high on the outside slopes, with the interior slopes having shallow 5H:1V slopes. The highest embankment, about 5 feet high, is located in the southwest corner of the South Eq. Basin, where the embankment is curved providing radial reinforcement. Attached Figure 4 shows a photograph of this corner with dimensions shown.

- NRG typically alternates filling these basins so that one of the basins is empty or near empty while the other basin is filled or partially filled. Given that water in each basin has a low occupancy period, and that the pond interior is constructed with highly impermeable asphalt, it is our opinion that an elevated phreatic condition is highly unlikely to occur through the embankment section.

In our opinion, the North and South Equalization Basins should have a NDSRB condition assessment of "Fair" in that no existing embankment safety deficiencies are recognized for normal loading conditions, evidenced by over 25 years of safe and stable operation. In the highly unlikely event of a rare or extreme hydrologic and/or seismic event resulting in an embankment deficiency, the resultant risk of uncontrolled flow to the adjacent Niagara River could be quickly mitigated by emptying out both ponds via pumps inside the outlet control structure and diverting pumped flow, from the plant, to the South Ash Settling Basin.

It is our opinion that the North and South Equalization Basins should have a "Low Hazard Potential" since unlikely failure or mis-operation of the impoundment results in no probable loss of human life and low economic and/or environmental losses. Low environmental loss may be experienced for the short duration in temporarily diverting the

process water from the plant to the South Ash Settling Basin until the embankment is repaired.

South Ash Settling Basin –The static, hydrologic and seismic stability analyses discussed above, shows the south embankment, at the outfall to the Niagara River, to be stable for all 3 conditions. Therefore, we believe this basin should have a NDSRB condition assessment of "Fair" in that no existing embankment safety deficiencies are recognized for normal loading conditions, evidenced by 25+ years of safe and stable operation.

In the highly unlikely event of a rare or extreme hydrologic and/or seismic event resulting in an embankment deficiency, the resultant risk of uncontrolled flow to the Niagara River could be quickly mitigated by the following procedure.

1. Shutting off the process water influent to the Basin.
2. Temporarily damming off the narrow section (about 60 feet wide) of the Basin immediately upstream of the outlet pipe using clay readily available in the area.
3. Establishing a temporary process water bypass system to decant the water to the Niagara River downstream of the temporary dam.
4. Repairing the embankment and restoring normal Basin operations.

We also believe that the South Ash Settling Basin should have a "Low Hazard Potential" since an improbable failure or mis-operation of the impoundment results in no probable loss of human life and low economic and/or environmental losses. NRG would experience the economic loss of repairing the embankment deficiency; low environmental loss may be experienced for the short duration in shutting off the process water feeding the Basin and establishing a temporary dam and bypass system described above. Low environmental loss would also be attributed to the fact that NRG dredges the majority of CCW sediment at the north-side inlet end of the South Ash Settling Basin about 1,200 feet upstream of the Basin outlet to the Niagara River. Transport of significant amounts of CCW sediment over that distance is unlikely to take place when NRG would immediately implement process inflow shut-off, temporary damming and bypass operations described above.

We trust this information satisfies your needs for this project.

Sincerely,

GZA GEOENVIRONMENTAL OF NEW YORK

Bart A. Klettke, P.E.
Associate Principal
(716) 844-7035
bart.klettke@gza.com

Daniel J. Troy, P.E.
Consultant Reviewer
(716) 844-7034
daniel.troy@gza.com

Attachments:

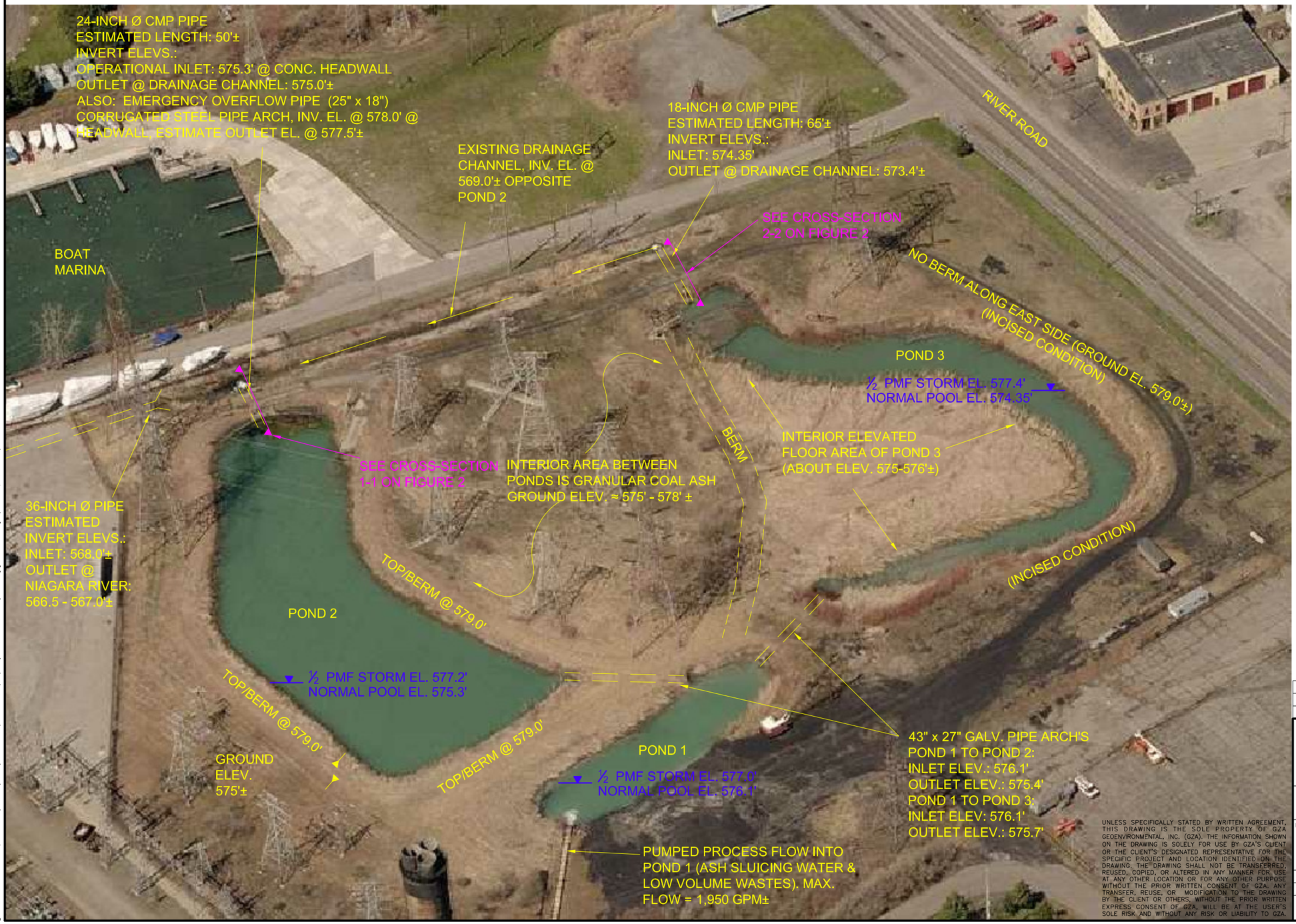
Figure 1 – North Ponds 1-3 Site Plan
Figure 2 – North Ponds 2 & 3 Cross Sections @ Pond Outlets
Figure 3 – South Ponds Plan
Figure 4 – South Equalization Basin Photographic Cross-Section

Slope Stability Analyses of South Ash Settling Basin

Slope Stability Analyses of North Basins

10-Minute Incremental Output Data File for ½ Probable Maximum Flood Analysis

Setup Schematics for Two Basin Models



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NOT TO SCALE

NO.	ISSUE/DESCRIPTION	BY	DATE

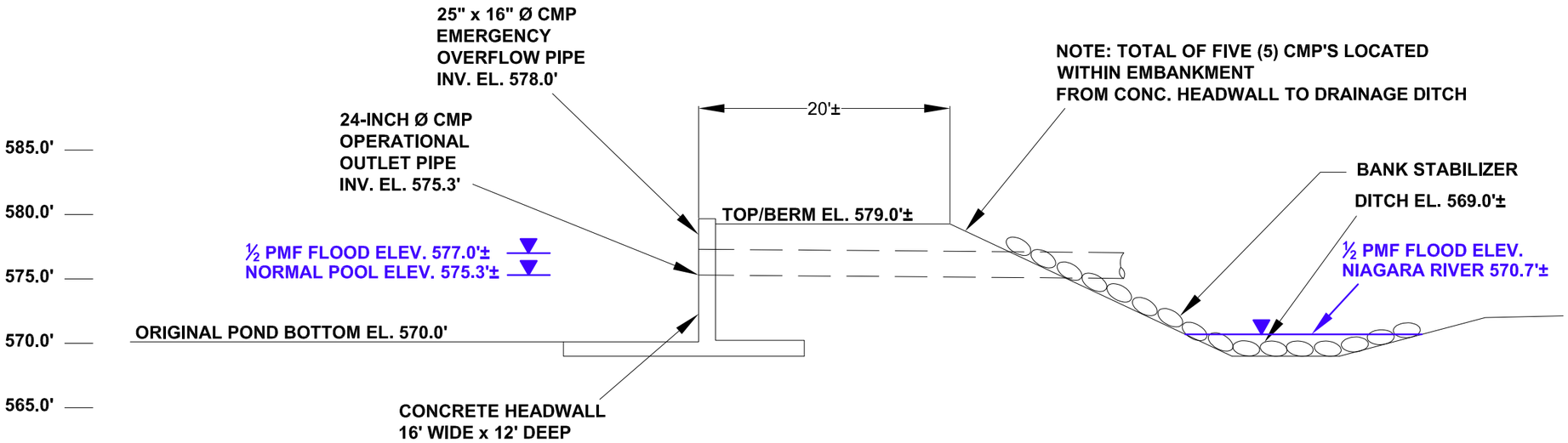
NRG RESPONSE TO EPA REPORT
NRG HUNTLEY PLANT
TONAWANDA, NEW YORK

NORTH PONDS 1-3
SITE PLAN

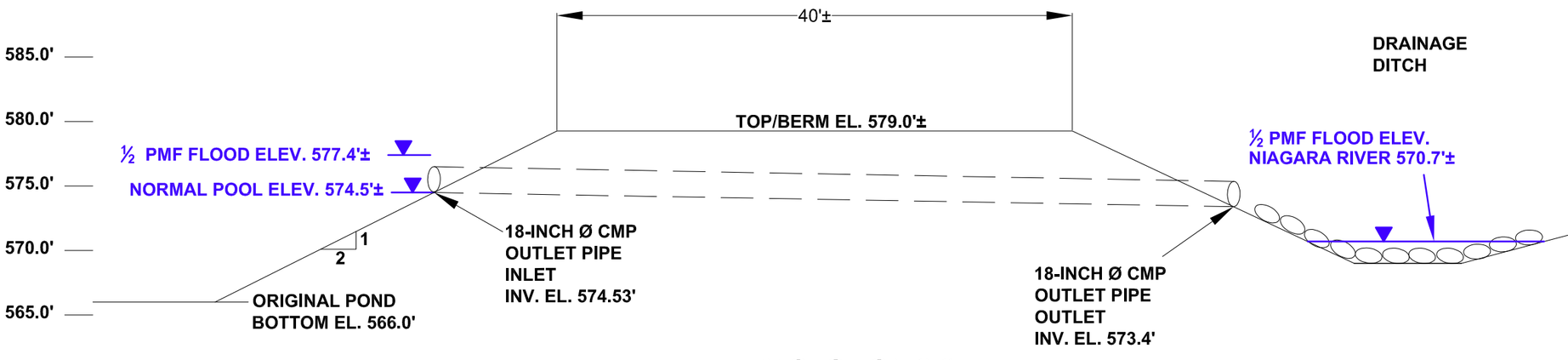
PREPARED BY:
GZA GeoEnvironmental Inc.
Engineers and Scientists
535 WASHINGTON STREET 11th FLOOR
BUFFALO, NEW YORK 14203
(716) 685-2300

PREPARED FOR:
NRG ENERGY

PROJ MGR: BAK	REVIEWED BY: BAK	CHECKED BY: DJT	FIGURE 1
DESIGNED BY:	DRAWN BY: DEW	SCALE: AS SHOWN	
DATE SEPTEMBER 2012	PROJECT NO. 21.0056662.00	REVISION NO.	



X-SECTION 1-1
THRU NORTH POND 2 OUTLET
EMBANKMENT



X-SECTION 2-2
THRU NORTH POND 3 OUTLET
EMBANKMENT

NO.	ISSUE/DESCRIPTION	BY	DATE

NRG RESPONSE TO EPA REPORT
NRG HUNTLEY PLANT
TONAWANDA, NEW YORK

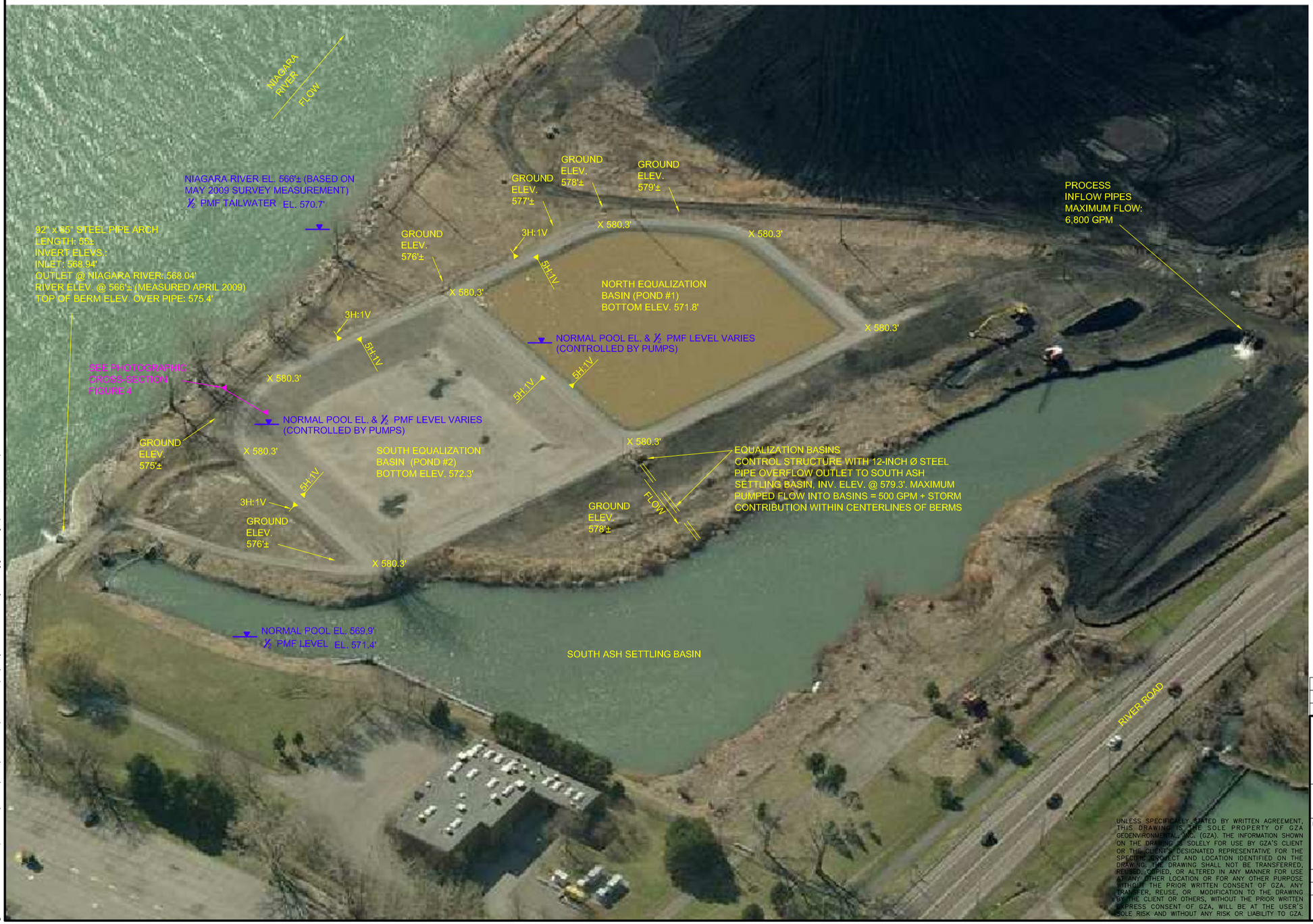
NORTH PONDS 2 & 3
CROSS-SECTIONS @ POND OUTLETS

PREPARED BY:
GZA GeoEnvironmental Inc.
Engineers and Scientists
535 WASHINGTON STREET 11th FLOOR
BUFFALO, NEW YORK 14203
(716) 685-2300

PREPARED FOR:
NRG ENERGY

PROJ MGR: BAK	REVIEWED BY: BAK	CHECKED BY: DJT	FIGURE 2
DESIGNED BY:	DRAWN BY: DEW	SCALE: AS SHOWN	
DATE SEPTEMBER 2012	PROJECT NO. 21.0056662.00	REVISION NO.	

LEGEND



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NOT TO SCALE

NO.	ISSUE/DESCRIPTION	BY	DATE

NRG RESPONSE TO EPA REPORT
NRG HUNTLEY PLANT
TONAWANDA, NEW YORK

SOUTH PONDS
SITE PLAN

PREPARED BY:
GZA GeoEnvironmental Inc.
Engineers and Scientists
535 WASHINGTON STREET 11th FLOOR
BUFFALO, NEW YORK 14203
(716) 685-2300

PREPARED FOR:
NRG ENERGY

PROJ MGR: BAK	REVIEWED BY: BAK	CHECKED BY: DJT	FIGURE 3
DESIGNED BY:	DRAWN BY: DEW	SCALE: AS SHOWN	
DATE SEPTEMBER 2012	PROJECT NO. 21.0056662.00	REVISION NO.	

LEGEND

0 X X

NOT TO SCALE

NO.	ISSUE/DESCRIPTION	BY	DATE

NRG RESPONSE TO EPA REPORT
NRG HUNTLEY PLANT
TONAWANDA, NEW YORK

SOUTH EQUALIZATION BASIN
PHOTOGRAPH CROSS-SECTION @ SW CORNER

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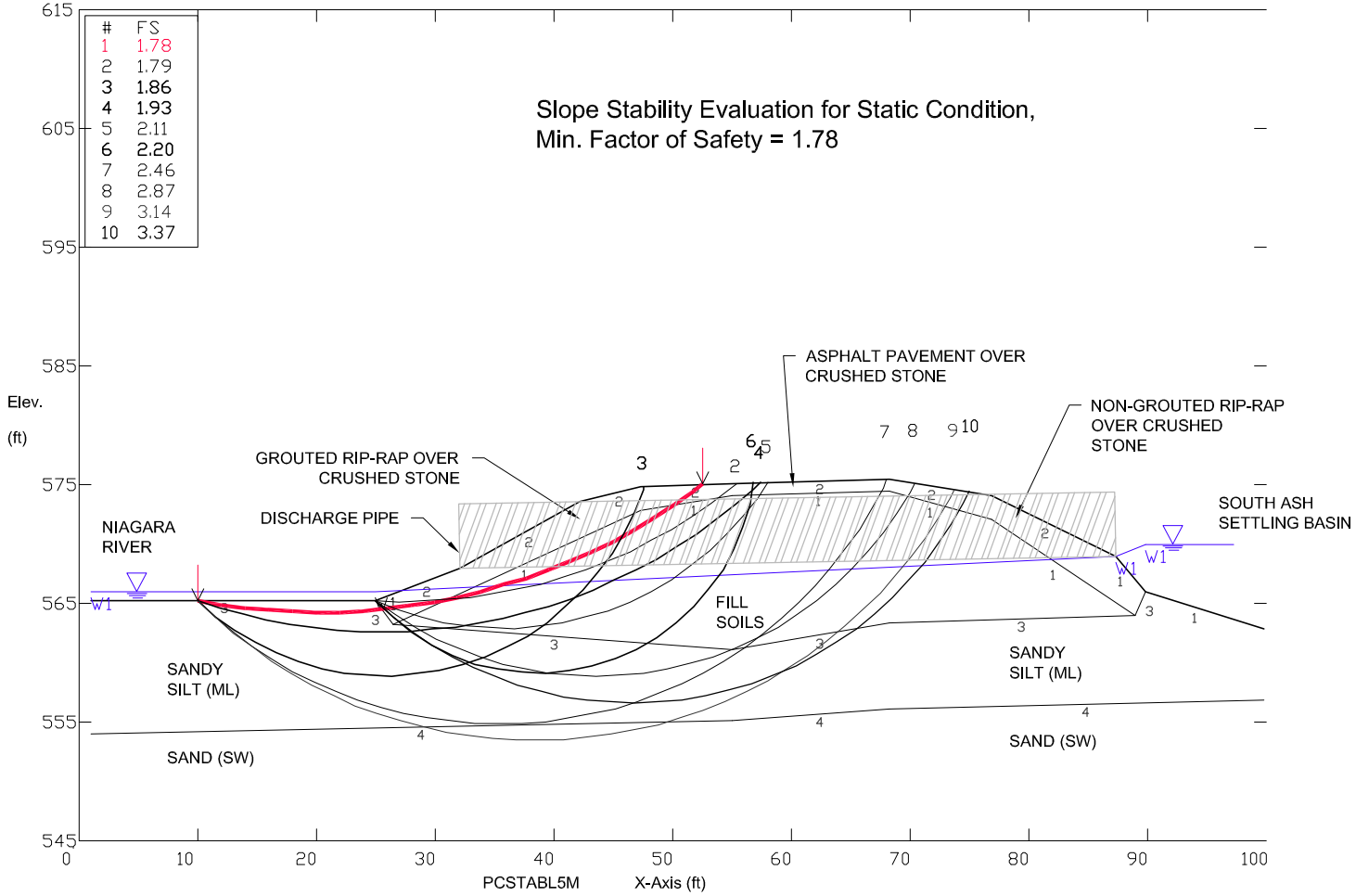
NRG ENERGY

PROJ MGR: BAK	REVIEWED BY: BAK	CHECKED BY: DJT	FIGURE 4
DESIGNED BY:	DRAWN BY: DEW	SCALE: AS SHOWN	
DATE SEPTEMBER 2012	PROJECT NO. 21.0056662.00	REVISION NO.	

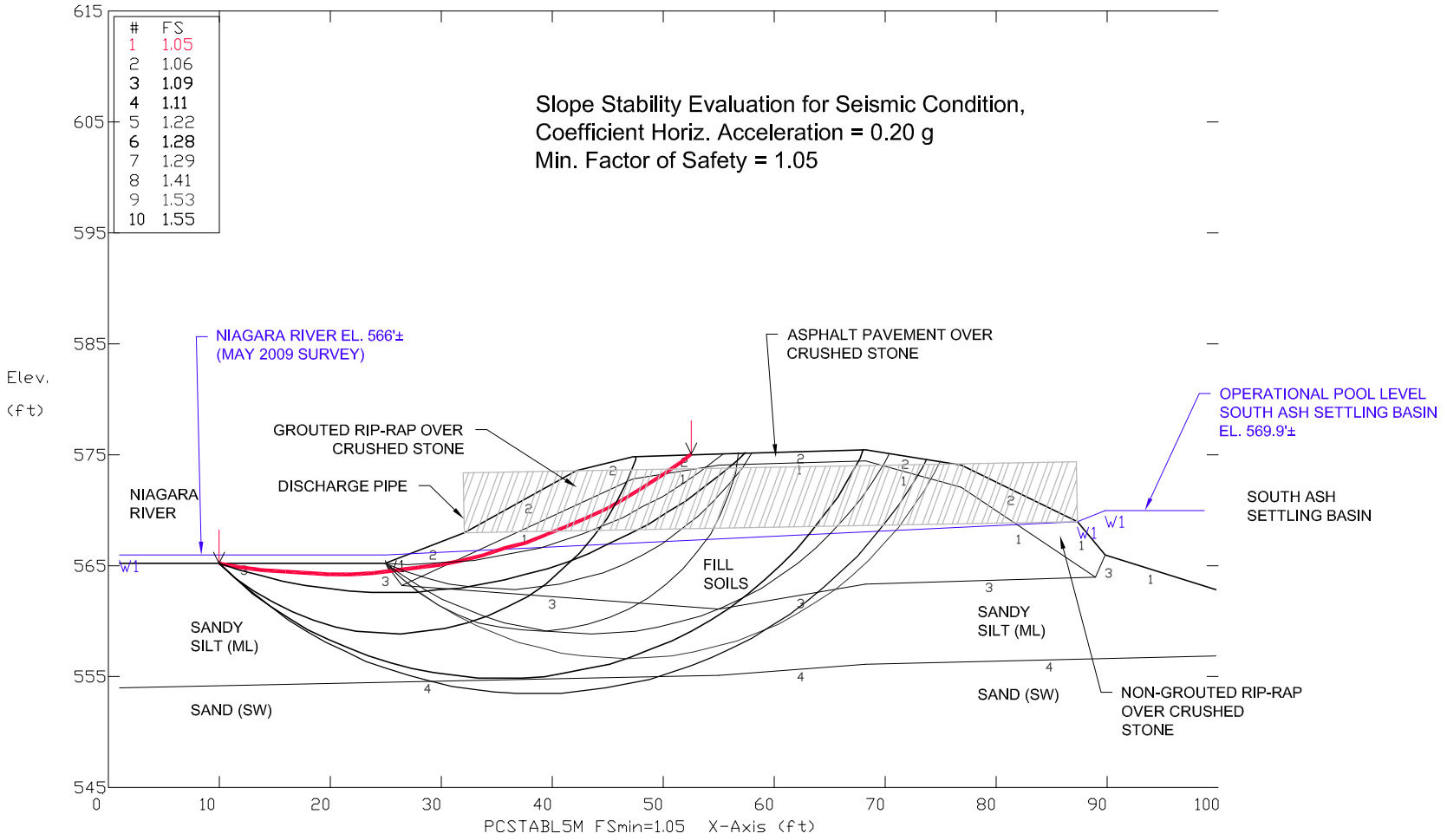
NRG Embankment Evaluation, Static Condition @ South Ash Settling Basin

Ten Most Critical. C:NRG1.PLT By: djt 07-19-12 1:16pm



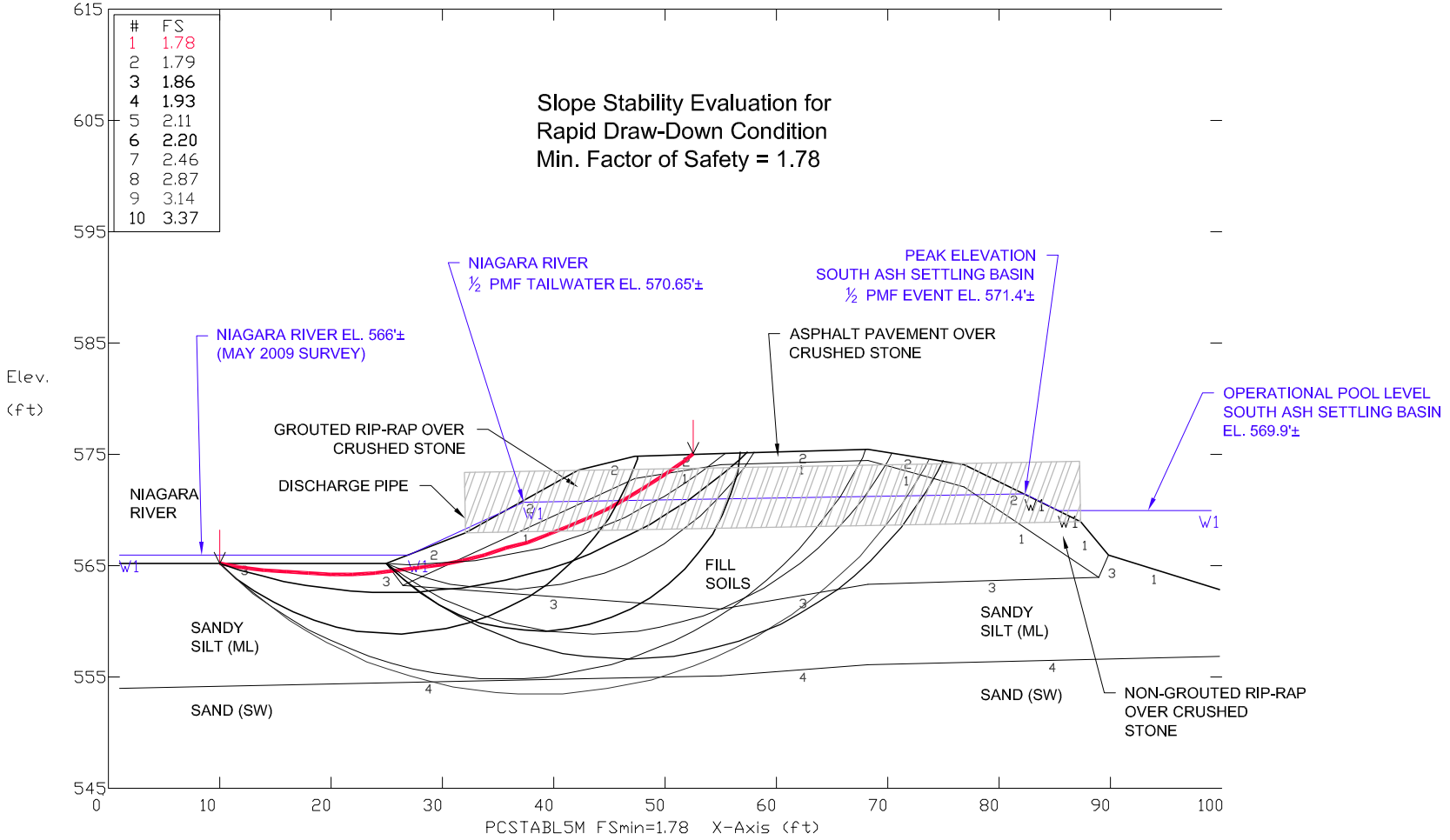
Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1 FILL	128	130	0	30	0	0	0
2 RIP-RAP	140	140	0	40	0	0	0
3 SANDY SILT	120.5	124.5	0	25	0	0	0
4 SAND	130	132	0	32	0	0	0

NRG Embankment Seismic Evaluation @ South Ash Settling Basin
Ten Most Critical. C:NRG1E.PLT By: bak 07-20-12 7:51am



Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	128	130	0	30	0	0	0
2	140	140	0	40	0	0	0
3	120.5	124.5	0	25	0	0	0
4	130	132	0	32	0	0	0

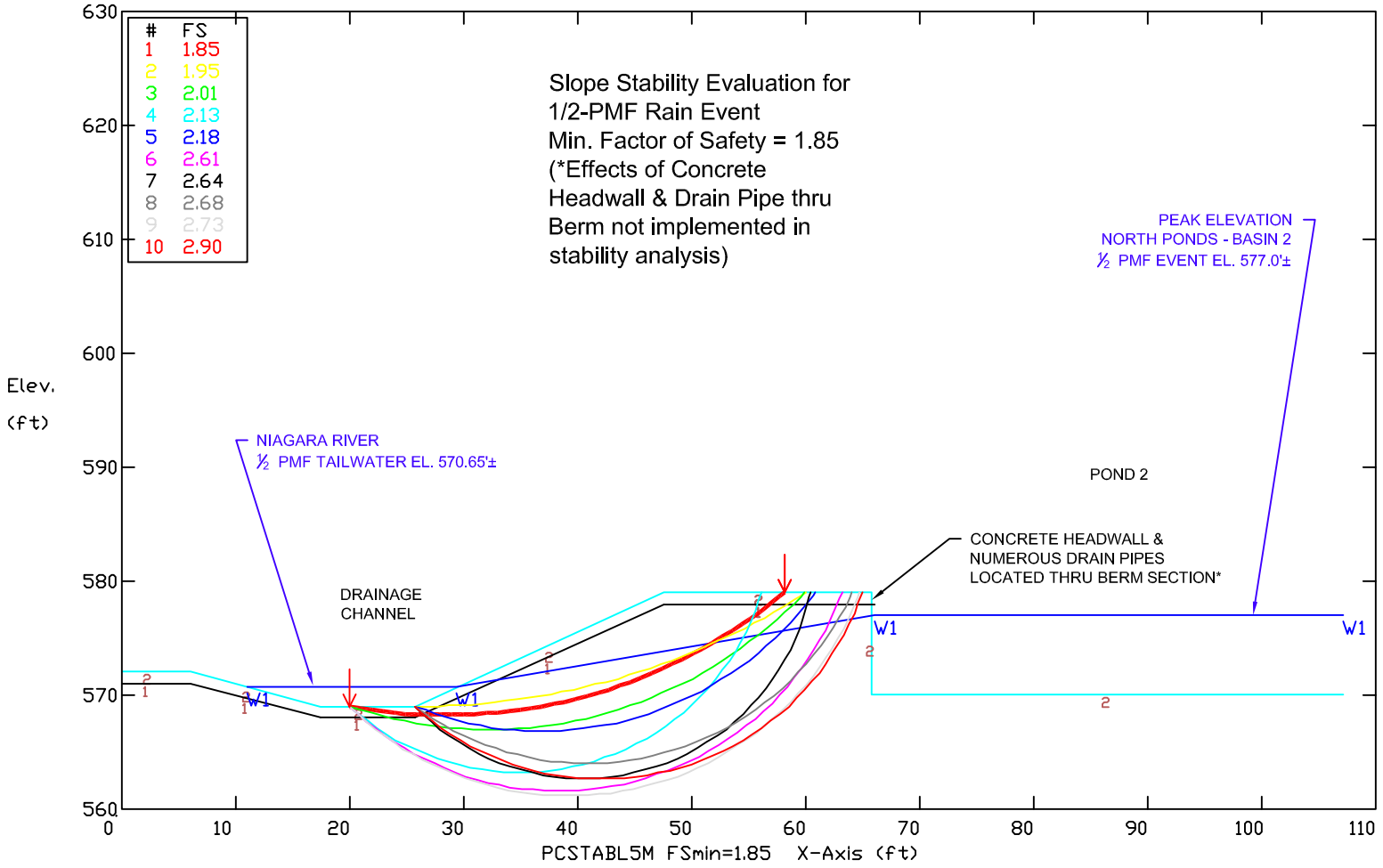
NRG Embankment with One-Half PMF Event @ South Ash Settling Basin
Ten Most Critical. C:NRG1PMF.PLT By: bak 07-20-12 6:50am



Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	128	130	0	30	0	0	0
2	140	140	0	40	0	0	0
3	120.5	124.5	0	25	0	0	0
4	130	132	0	32	0	0	0

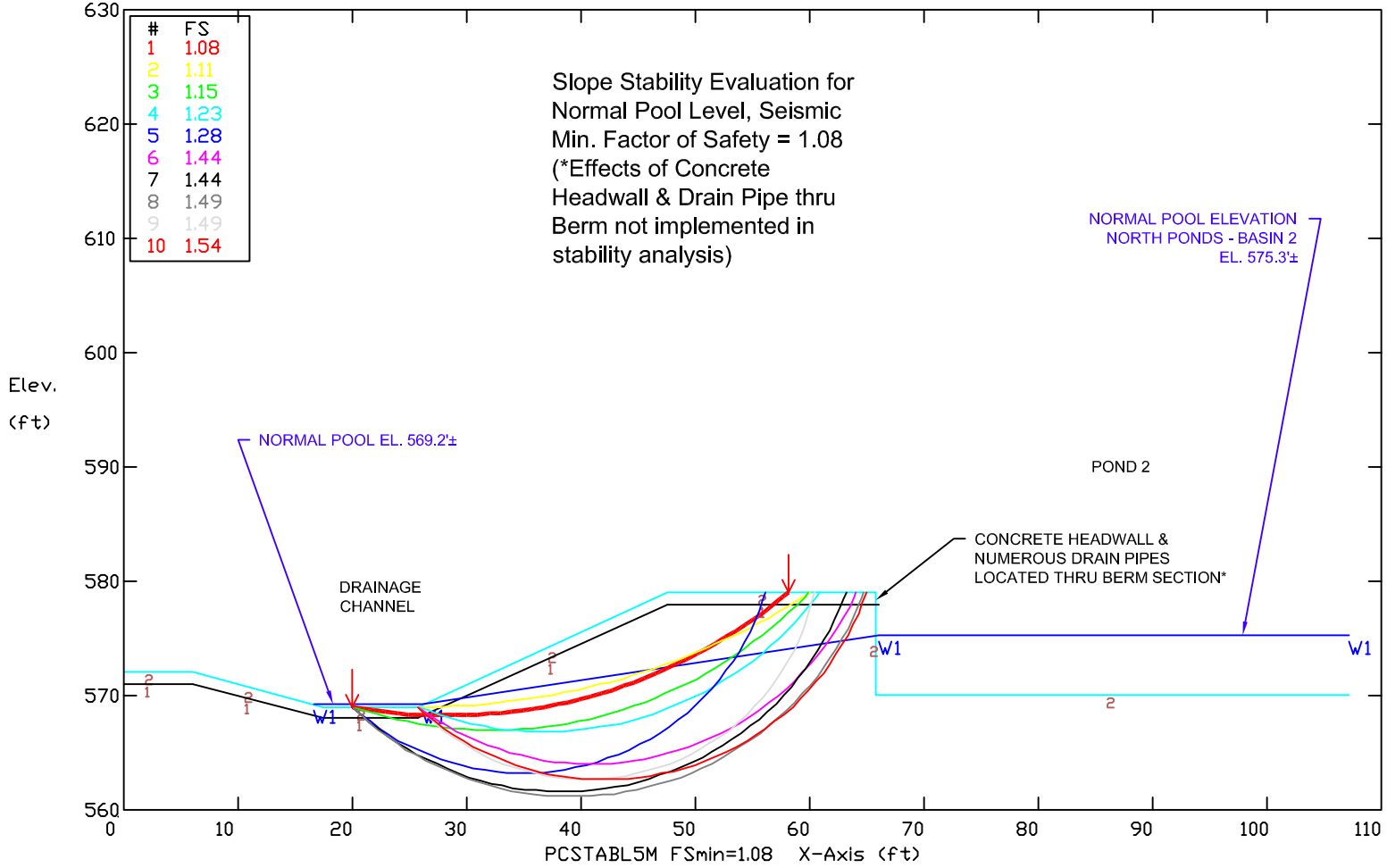
NRG POND 2 EVALUATION AT OUTFALL

Ten Most Critical. C:NRG20FT.PLT



Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125	130	0	30	0	0	0
2	130	135	0	35	0	0	0

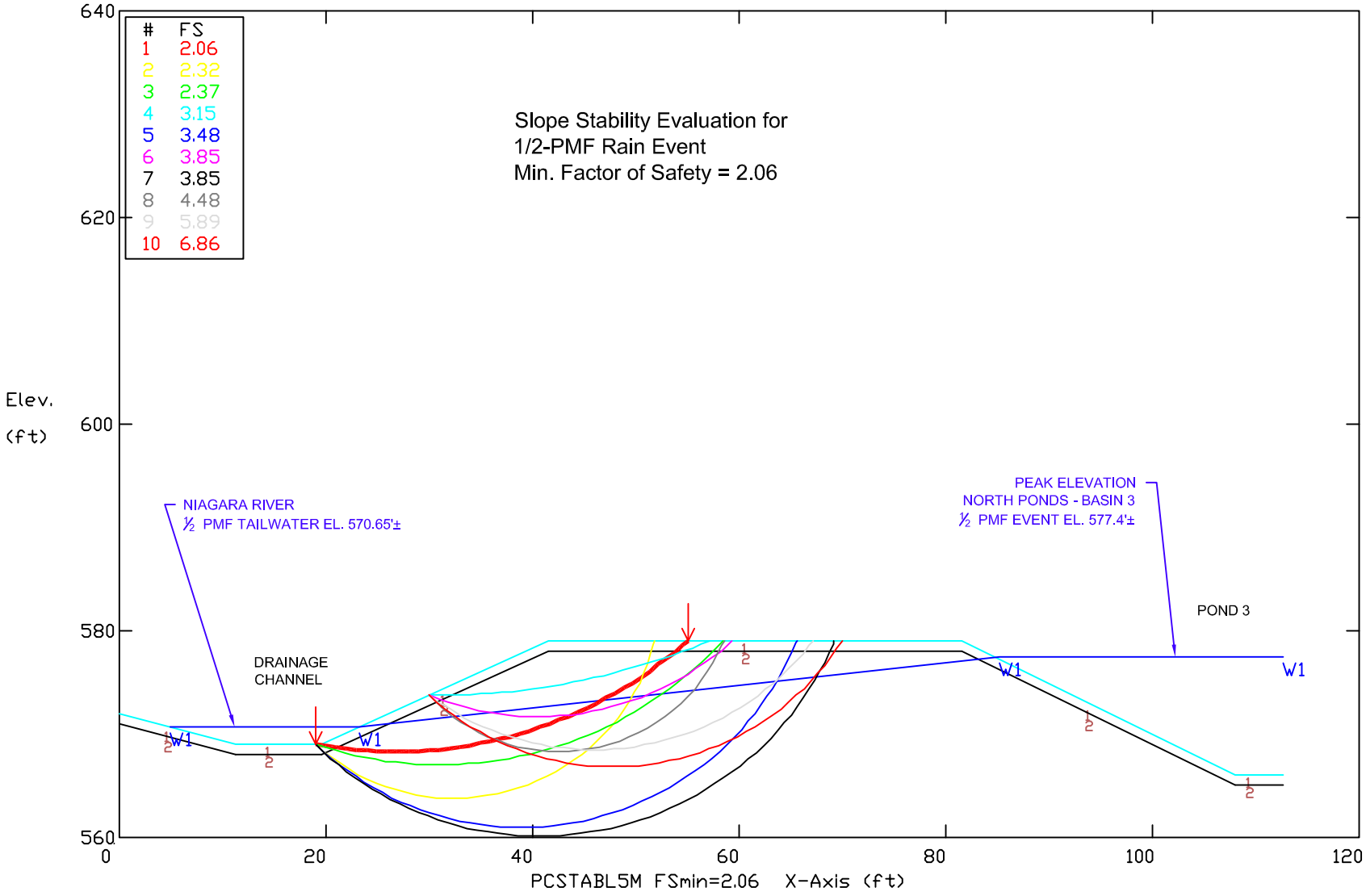
NRG POND 2 EVALUATION AT OUTFALL (with Seismic)
Ten Most Critical. C:\20FTSEIS.PLT



Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125	130	0	30	0	0	0
2	130	135	0	35	0	0	0

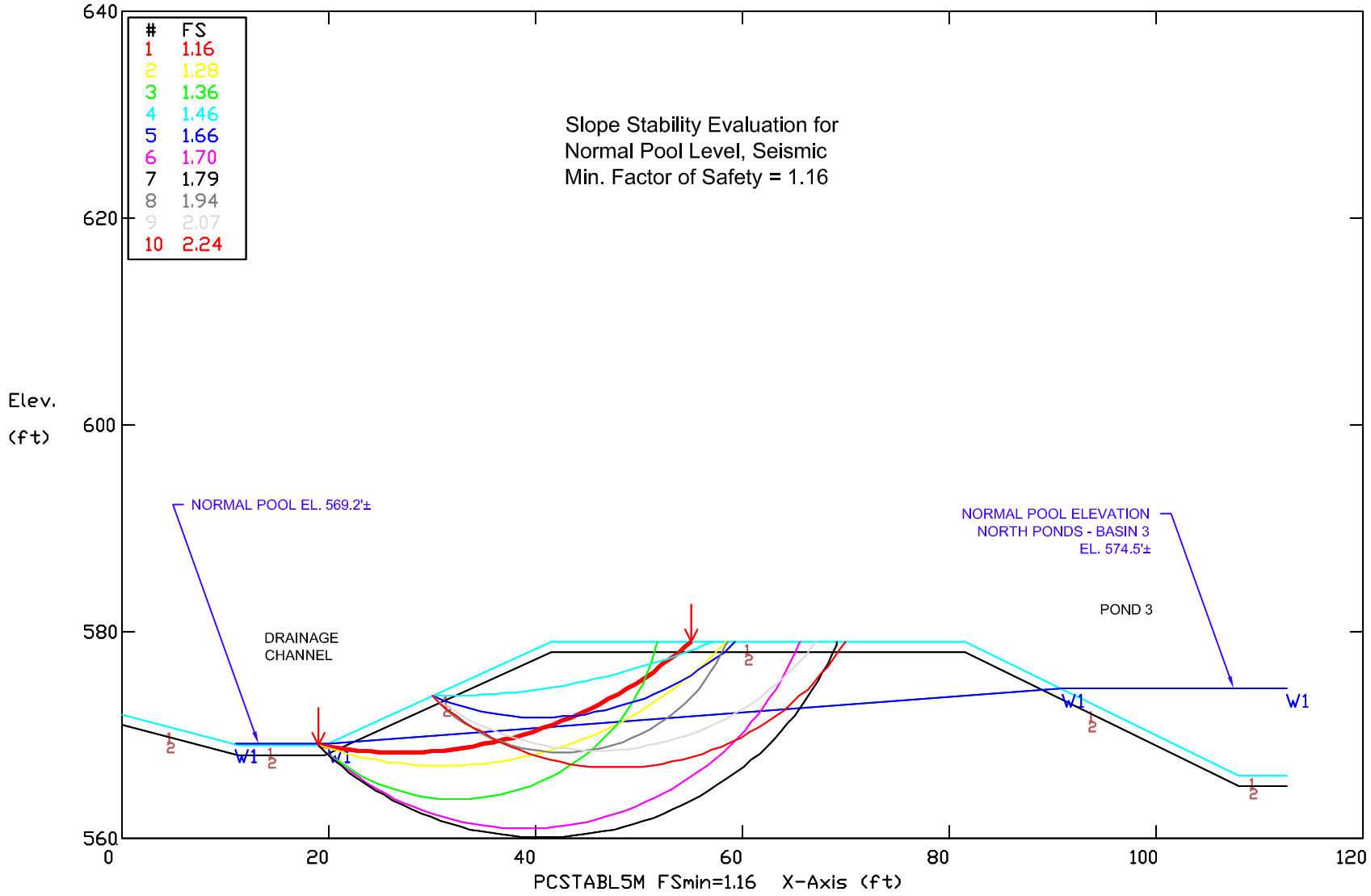
NRG IMPOUNDMENT EMBANKMENT EVALUATION POND 3 AT 1/2 PMF RAIN EVENT

Ten Most Critical. C:NRG40FT.PLT



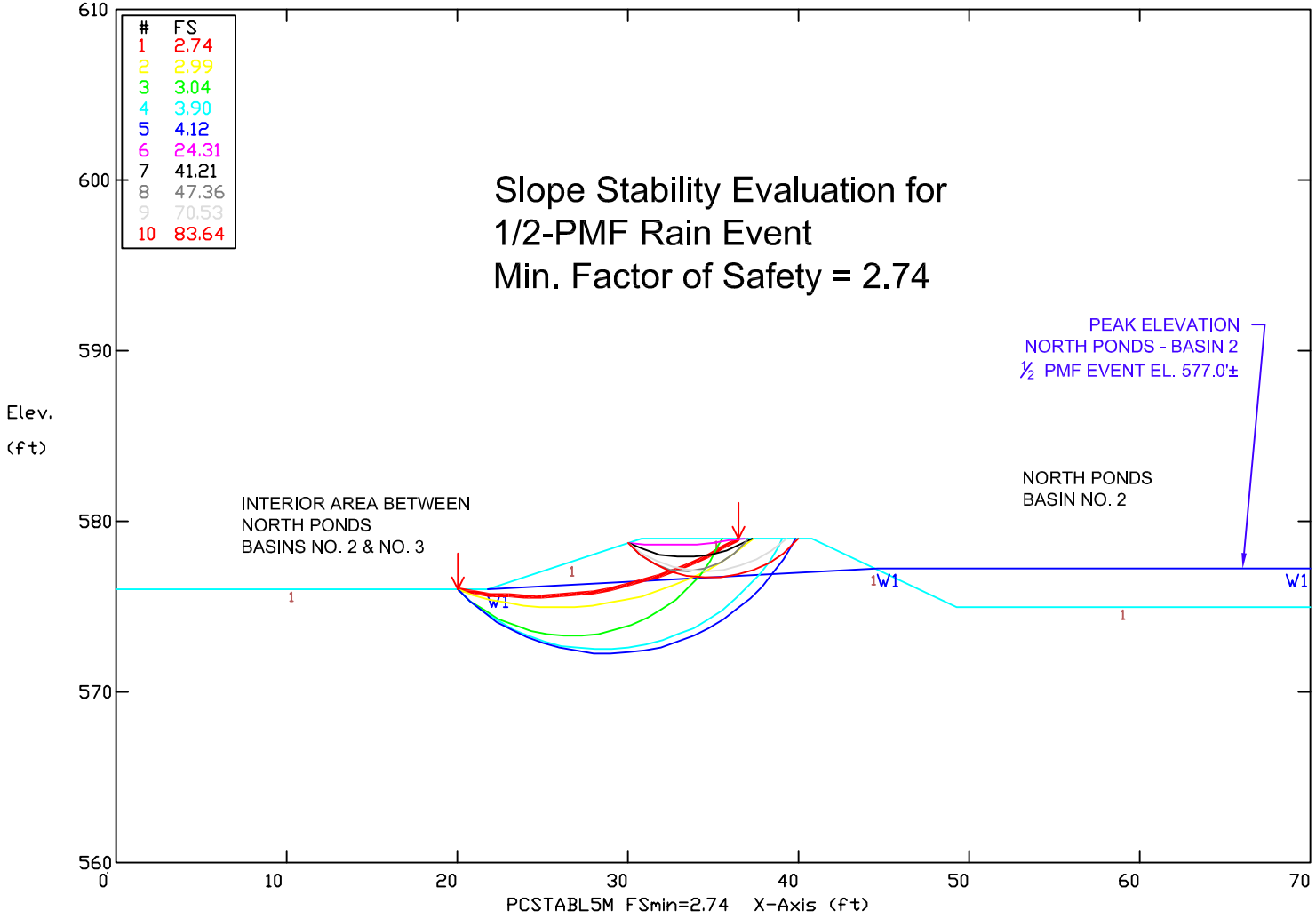
Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130	135	0	35	0	0	0
2	125	130	0	30	0	0	0

NRG IMPOUNDMENT EMBANKMENT EVALUATION POND 3 SEISMIC AT NORMAL POOL LEVEL
Ten Most Critical, C:40FTSEIS.PLT



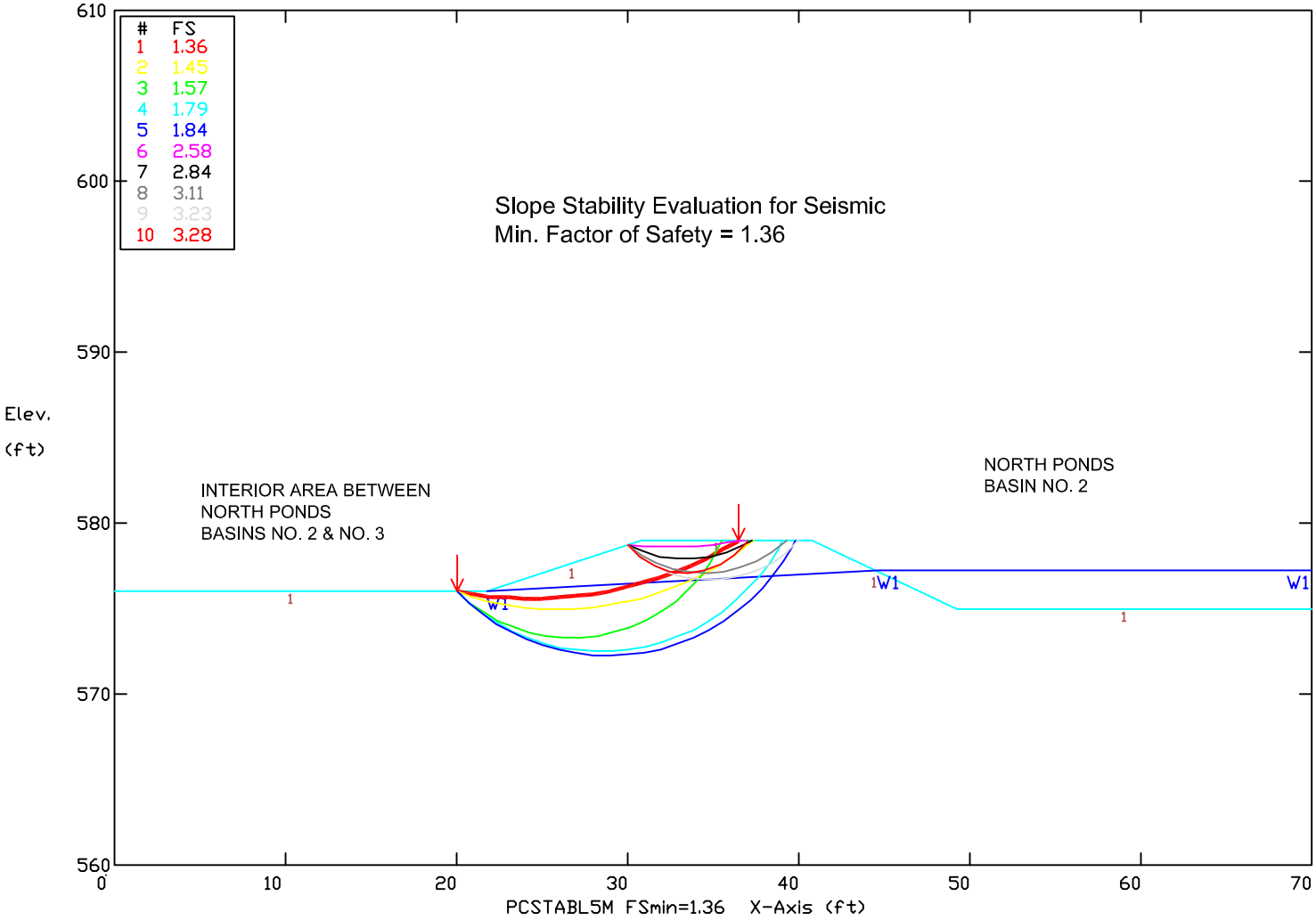
Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	130	135	0	35	0	0	0
2	125	130	0	30	0	0	0

NRG IMPOUNDMENT EMBANKMENT EVALUATION POND 3 INTERNAL BERM
Ten Most Critical. C:NRGINT.PLT



Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125	130	0	30	0	0	0

NRG IMPOUNDMENT EMBANKMENT EVALUATION POND 3 INTERNAL BERM SEISMIC
Ten Most Critical. C:INTSEIS.PLT

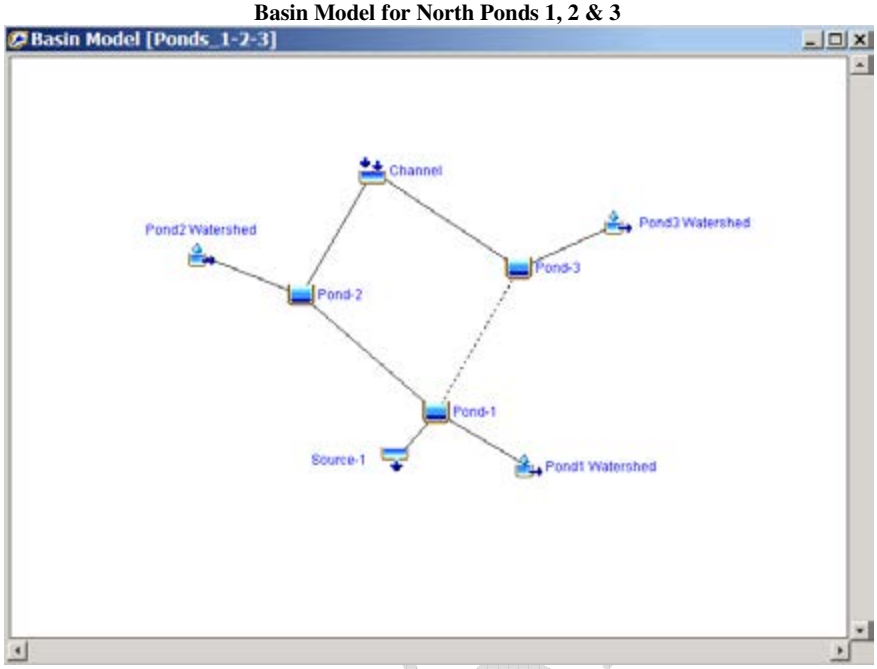


Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	125	130	0	30	0	0	0

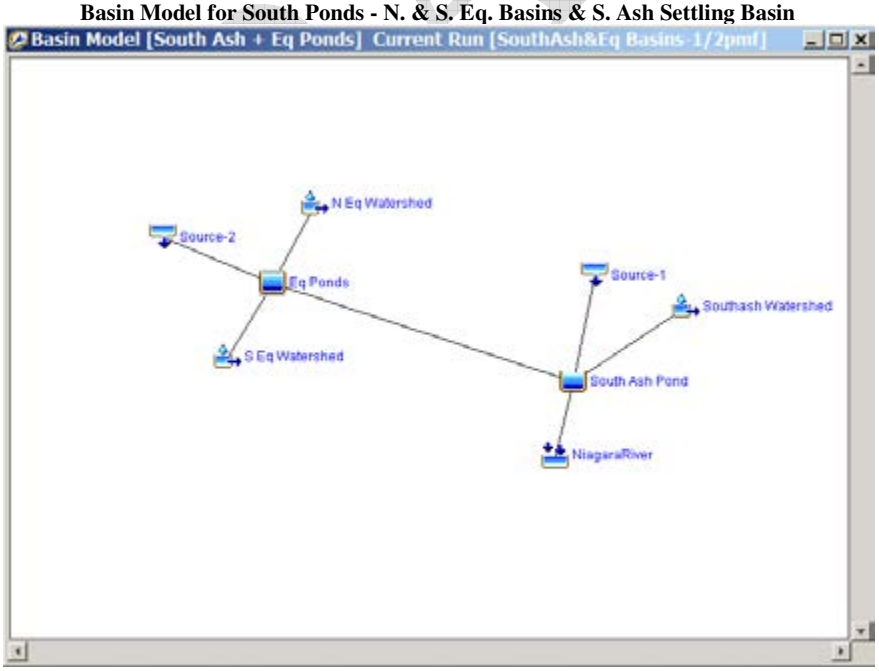
NATURA INTERVAL = 10 MIN

PI	.007	.007	.007	.007	.007	.007	.007	.007	.007	.007
PI	.007	.007	.007	.007	.007	.007	.007	.007	.007	.007
PI	.007	.007	.007	.007	.007	.007	.007	.007	.007	.007
PI	.007	.007	.007	.007	.007	.007	.009	.009	.009	.009
PI	.009	.009	.009	.009	.009	.009	.009	.009	.009	.009
PI	.009	.009	.009	.009	.009	.009	.009	.009	.009	.009
PI	.009	.009	.009	.009	.009	.009	.009	.009	.009	.009
PI	.009	.009	.012	.012	.012	.012	.012	.012	.012	.012
PI	.012	.012	.012	.012	.012	.012	.012	.012	.012	.012
PI	.012	.012	.012	.012	.012	.012	.012	.012	.012	.012
PI	.012	.012	.012	.012	.012	.012	.012	.012	.016	.016
PI	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016
PI	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016
PI	.016	.016	.016	.016	.016	.016	.016	.016	.016	.016
PI	.016	.016	.016	.016	.024	.024	.024	.025	.025	.025
PI	.025	.025	.026	.026	.026	.026	.026	.027	.027	.027
PI	.028	.028	.028	.028	.029	.029	.029	.030	.030	.031
PI	.031	.031	.032	.032	.033	.033	.033	.034	.034	.035
PI	.068	.072	.076	.080	.084	.088	.091	.095	.098	.102
PI	.105	.108	.112	.115	.118	.120	.123	.126	.129	.131
PI	.134	.136	.138	.141	.143	.145	.147	.149	.150	.152
PI	.154	.155	.157	.158	.160	.161	.167	.186	.205	.222
PI	.237	.251	.263	.274	.284	.310	.374	.412	.407	.415
PI	.555	1.132	1.960	2.813	2.837	2.535	1.700	.674	.469	.395
PI	.422	.396	.345	.288	.279	.269	.257	.244	.230	.213
PI	.196	.177	.066	.064	.062	.061	.059	.058	.056	.055
PI	.053	.052	.051	.050	.048	.047	.046	.045	.044	.043
PI	.042	.042	.041	.040	.039	.039	.038	.038	.037	.037
PI	.036	.036	.036	.036	.035	.035	.035	.035	.021	.021
PI	.021	.021	.021	.021	.021	.021	.021	.021	.021	.021
PI	.021	.021	.021	.021	.021	.021	.021	.021	.021	.021
PI	.021	.021	.021	.021	.021	.021	.021	.021	.021	.021
PI	.021	.021	.021	.021	.014	.014	.014	.014	.014	.014
PI	.014	.014	.014	.014	.014	.014	.014	.014	.014	.014
PI	.014	.014	.014	.014	.014	.014	.014	.014	.014	.014
PI	.014	.014	.014	.014	.014	.014	.014	.014	.014	.014
PI	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010
PI	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010
PI	.010	.010	.010	.010	.010	.010	.010	.010	.010	.010
PI	.010	.010	.010	.010	.010	.010	.008	.008	.008	.008
PI	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
PI	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
PI	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
PI	.008	.008								

Basin Model for North Ponds 1, 2 & 3

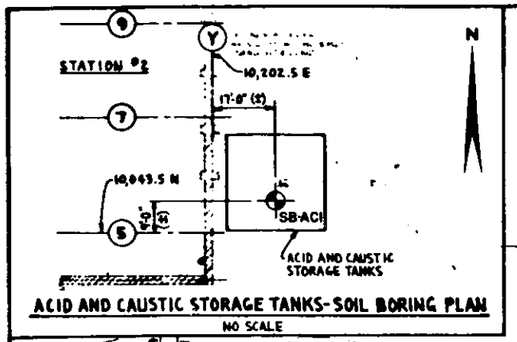


Basin Model for South Ponds - N. & S. Eq. Basins & S. Ash Settling Basin



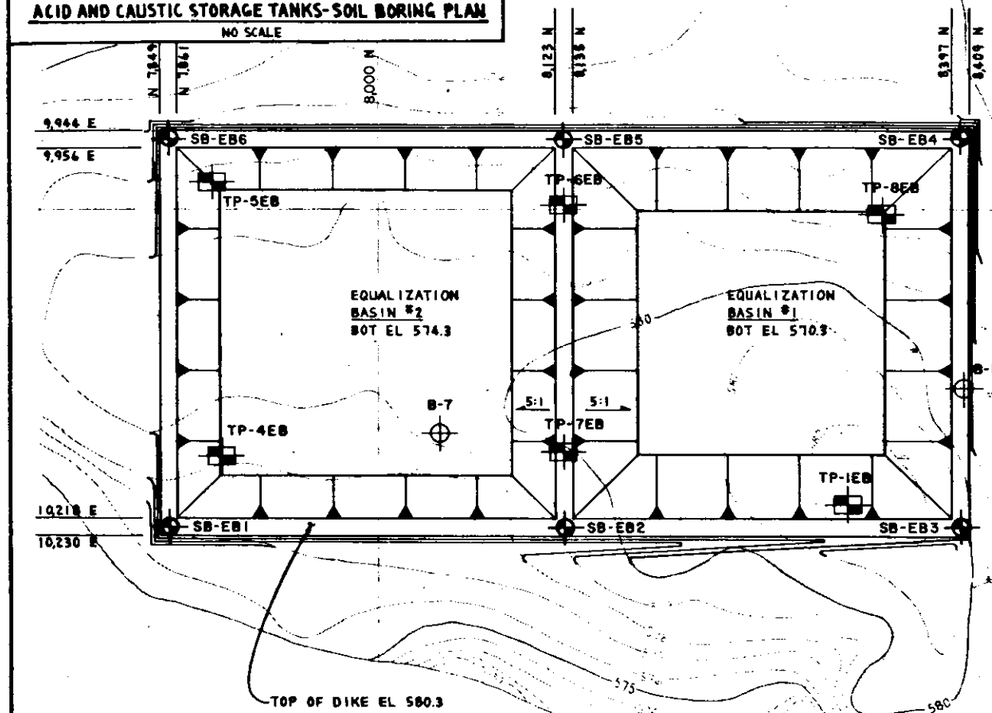
NRG Huntley Power, LLC
3500 River Road
Tonawanda, NY 14150

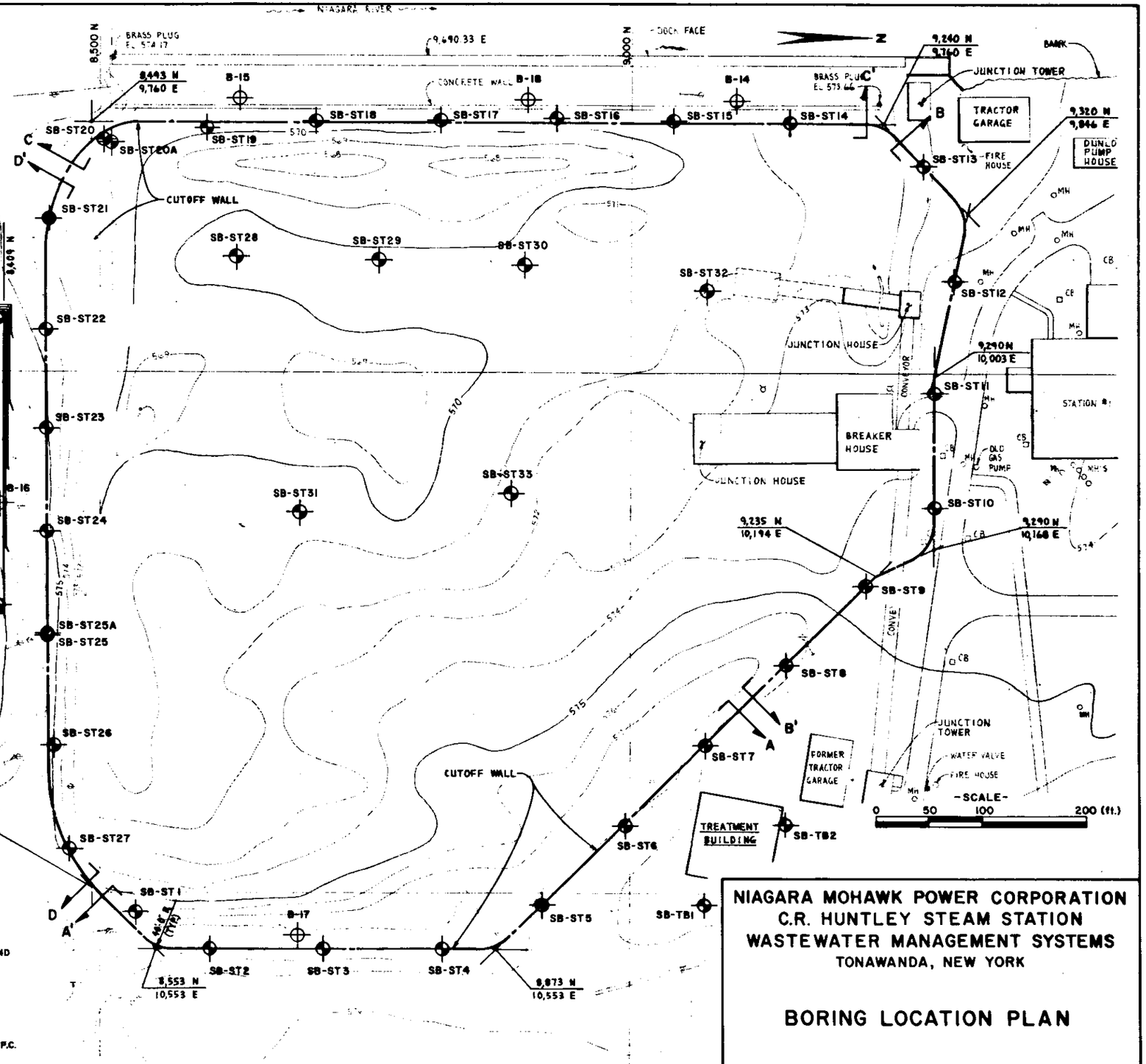
Appendix D
Boring Information
from a Geotechnical Report
for the Huntley North and South EQ Basins



ACID AND CAUSTIC STORAGE TANKS-SOIL BORING PLAN

NO SCALE





LEGEND

SB-ST2	IDENTIFICATION NUMBER	B-7	IDENTIFICATION NUMBER
	TEST BORING DRILLED 1983		TEST BORING DRILLED 1979-1981 (MONITORING WELL)
SB-ST21	IDENTIFICATION NUMBER		PROPOSED LOCATION OF CONTAINMENT WALL
	TEST BORING DRILLED 1983 WITH PIEZOMETER INSTALLED		
TP-2EB	IDENTIFICATION NUMBER		
	TEST PIT EXCAVATED 1983		

NOTES:

1) TEST BORINGS AND TEST PITS WERE LOCATED IN THE FIELD BY WENDEL ENGINEERS P.C. AND PLOTTED ON 50 SCALE PLANS PREPARED BY STANLEY CONSULTANTS, P.C.
2) PREVIOUS BORINGS (MONITORING WELLS) B-7, B-14, B-15, B-16, B-17 & B-18 ARE LOCATED IN THE FIELD BY TAPE MEASUREMENTS FROM 1983 BORINGS SURVEYED BY WENDEL SURVEY AND PLOTTED ON 50 SCALE PLANS PREPARED BY STANLEY CONSULTANTS, P.C.
3) THE LOCATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
4) THIS DRAWING WAS ADAPTED FROM BASE PLAN MAP PREPARED BY STANLEY CONSULTANTS, P.C.

GZA

NIAGARA MOHAWK POWER CORPORATION
C.R. HUNTLEY STEAM STATION
WASTEWATER MANAGEMENT SYSTEMS
TONAWANDA, NEW YORK

BORING LOCATION PLAN

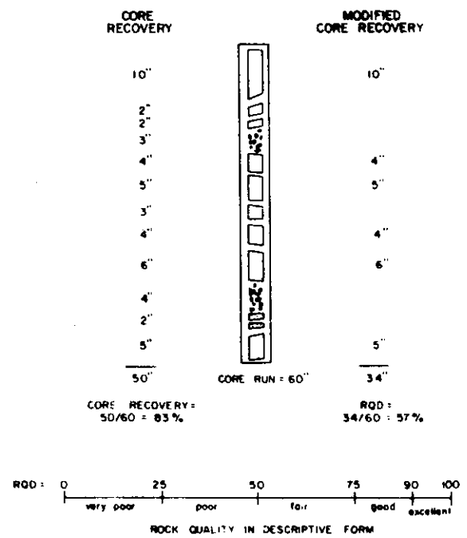
JUNE 1983

FIGURE No. 2

DWG. No. 67-1-C

FILE No. R9810

ROCK QUALITY DESIGNATION (RQD)



REFERENCE
DU DEERE, in Rock Mechanics in Engineering Practice, Stagg & Zienkiewicz, ed., Wiley, 1968

NOTES:

1) Descriptions and classifications are based on visual inspection of samples and boring operations, unless otherwise noted in the text.
2) The stratum lines are based upon interpolation between borings and may not represent actual subsurface conditions.
3) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of the ground water may occur due to other factors than those present at the time measurements were made.
4) For a more detailed description of soil and rock types see the boring logs in Appendix B.
5) For boring locations see figure 2, Boring Location Plan.

KEY TO DENSITY & CONSISTENCY DESCRIPTION OF GRANULAR & COHESIVE SOILS

Number of Blows per ft, N	Relative Density	Number of Blows per ft, N	Consistency
		Below 2	Very soft
0 - 4	Very loose	2 - 4	Soft
4 - 10	Loose	4 - 8	Medium
10 - 30	Medium	8 - 15	Stiff
30 - 50	Dense	15 - 30	Very stiff
Over 50	Very dense	Over 30	Hard

SOIL CLASSIFICATION CHART
(UNIFIED SOIL CLASSIFICATION SYSTEM)

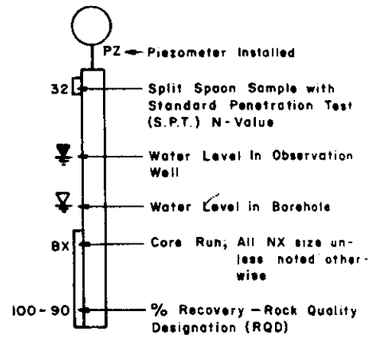
MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE - GRAINED SOILS More than 50% of material larger than NO 200 sieve	GRAVELS More than 50% of coarse fraction larger than NO 4 sieve	Clean Gravels (little or no fines)		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravels with appreciable amounts of fines		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS Less than 50% of coarse fraction larger than NO 4 sieve	Clean Sands (little or no fines)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
		Sands with appreciable amounts of fines		SM	Silty sands, sand-silt mixtures
				SC	Clayey sands, sand-clay mixtures
FINE - GRAINED SOILS More than 50% of material larger than NO 200 sieve	SILTS AND CLAYS Low Plasticity Liquid Limit < 50%			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS High Plasticity Liquid Limit > 50%			MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
	Highly Organic Soils			Pt	Peat, humus, swamp soils with high organic contents
	Miscellaneous Fill			FILL	Miscellaneous fill may belong in any division but is identified as FILL

Note: Dual symbols indicate borderline soils classifications

ROCK CLASSIFICATION CHART

	Co	CAMILLUS SHALE FORMATION

LEGEND FOR BORINGS



NIAGARA MOHAWK POWER CORPORATION
C.R. HUNTLEY STEAM STATION
WASTEWATER MANAGEMENT SYSTEMS
TONAWANDA, NEW YORK

LEGEND FOR GEOLOGIC PROFILE SHEETS

FIGURE No. 5

FILE No. R5610 DWG. No. GT-5-B

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB1

CONTRACTOR GZA Drilling, Inc.
DRILLER Frank Perry
TYPE OF DRILL RIG Acker AD-11
SAMPLING METHOD Standard Penetration Tests
CASING 4" I.D. Flush Joint Casing
SIZE AND TYPE OF BIT -

SURFACE ELEV. 576.87
DATUM U.S.C. & G.S.
LOCATION Equalization Basin Area
DATE STARTED 5/4/83 COMPLETED 5/5/83
ENGINEER S. Putney

DIRECTION OF HOLE: VERTICAL ☒ INCLINED ☐ DEGREES FROM VERTICAL -
OVERBURDEN SAMPLES: DISTURBED 10 UNDISTURBED 2
THICKNESS OF OVERBURDEN 55.0' TOP OF ROCK ELEVATION -
DEPTH DRILLED INTO ROCK - BOTTOM OF HOLE ELEVATION 521.87
TOTAL DEPTH OF HOLE 55.0'

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
0	1	S-1	5		S-1 (0.0'-2.0')		0		Soft red-brown, silty Clay, trace sand, organics slightly plastic, moist, (Fill)
1	3						1		Soft, gray-black, fly ash, fine sandy silt, trace organics, nonplastic, moist (Fill)
	3								
2	2						2		
3							3		
4							4		
5							5		
6	weight OF HAM- MER	S-2	WOH		S-2 (5.0'-7.0')		6		Grading - very soft trace clay, wet.
7							7		
8							8		
9							9		
10					S-3 (10.0'-12.0')		10		
11	1	S-3	1				11		Grading - black-gray
	0								
	1								
12	0						12		
13							13		
14							14		
15							15		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL	C CLOSED	F FRESH	HB HAMMER BREAK
LA LOW ANGLE (≤ 45°)	SO SLIGHTLY OPEN	S SLIGHT	
HA HIGH ANGLE (> 45°)	O OPEN	SM SLIGHT TO MODERATE	
T VERTICAL		M MODERATE	
		MV MODERATE TO SEVERE	
		V SEVERE	

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB1

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
15	1				S-4 (15.0'-17.0')		15		
16	0	S-4	WOH				16		
	0								
17	0				S-5 (17.0'-19.0')		17		
	1								
18	0	S-5	WOH				18		
	0								
19	0						19		
20					S-6 (20.0'-22.0')		20		
	1	S-6	WOH						
21	0						21		
	0								
22	0						22		
23							23		
24							24		
25					S-7 (25.0'-27.0')		25		
	1								
26	0	S-7	WOH				26		Grading - petroleum odor
	0								
27	0						27		
28							28		
29							29		
30	5				S-8 (30.0'-32.0')		30		
	4								
31	3	S-8	6				31		Loose, gray-brown, silty fine-medium SAND, nonplastic, wet (SM)
	3								
32							32		
33							33		
34							34		
35					3-inch undisturbed sample (35.0'-37.0')		35		Medium, brown-red, silty CLAY slightly-moderately plastic, wet (CL)
36		U-1					36		
37							37		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB1

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
37	1				S-9 (37.0'-39.0')		37		
38	2						38		
	2	S-9	5						
39	3						39		
40		U-2			3-inch undisturbed sample (40.0'-42.0')		40		
41							41		
42							42		
43							43		
44					S-10 (44.0'-46.0')		44		
	13								
45	15	S-10	33				45		Dense, gray, fine-medium SAND, trace silt, nonplastic wet, (SW)
	15								
46	18						46		
47							47		
48							48		
49					S-11 (49.0'-51.0')		49		
	18								
50	21						50		Hard, gray, sandy SILT, little medium- fine gravel, trace clay, nonplastic, wet (ML) (Glacial Till)
	24	S-11	51						
51	27						51		
52							52		
53							53		
54							54		
	100/0				S-12 (55.0'-55.0')				
55	100/0'	S-12	100/.0				55		Refusal w/ casing 55.0 ft.
									Bottom of Hole 55.0 ft.
					Groundwater level @ 9.0 ft. upon completion.				The stratification lines represent the approximate boundary between soil and rock types. The actual transition may be gradual.

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES: * Casing refusal w/ 300 lbs. hammer

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL · GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB2

CONTRACTOR GZA Drilling, Inc.
DRILLER Jim Marks
TYPE OF DRILL RIG Trailer Mounted Acker TH
SAMPLING METHOD Standard Penetration Tests
CASING 2½" I.S. Flush Joint Casing
SIZE AND TYPE OF BIT -

SURFACE ELEV. 578.67
DATUM U.S.C. & G.S.
LOCATION Equalization Basin Area
DATE STARTED 5/4/83 COMPLETED 5/4/83
ENGINEER S. Putney

DIRECTION OF HOLE: VERTICAL ☒ INCLINED ☐ DEGREES FROM VERTICAL -
OVERBURDEN SAMPLES: DISTURBED 11 UNDISTURBED -
THICKNESS OF OVERBURDEN 51.5' TOP OF ROCK ELEVATION -
DEPTH DRILLED INTO ROCK - BOTTOM OF HOLE ELEVATION 527.17
TOTAL DEPTH OF HOLE 51.5'

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
0	1						0		
1	3	S-1	6		S-1 (0.0'-1.5')		1		Medium grayish-black fly ash, fine sandy silt, trace organics, trace clay, moist, (Fill)
	3								
2							2		
3							3		
4							4		
5							5		
	3				S-2 (5.0'-6.5')				
6	4	S-2	8				6		Grading - fine-medium fly ash (fine-medium sand size)
	4								
7							7		
8							8		
9							9		
10							10		
	3				S-3 (10.0'-11.5')				
11	4	S-3	11				11		Grading - wet
	7								
12							12		
13							13		
14							14		
15							15		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL	C CLOSED	F FRESH	HB HAMMER BREAK
LA LOW ANGLE (≤ 45°)	SO SLIGHTLY OPEN	S SLIGHT	
HA HIGH ANGLE (> 45°)	O OPEN	SM SLIGHT TO MODERATE	
T VERTICAL		M MODERATE	
		MV MODERATE TO SEVERE	
		V SEVERE	

MISCELLANEOUS NOTES:

GZA

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB2

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
15	2				S-4 (15.0'-16.5')		15		
16	3	S-4	6				16		
	3								
17							17		
18							18		
19							19		
20	2				S-5 (20.0'-21.5')		20		
	2	S-5	5						
21	3						21		
22							22		
23							23		
24							24		
25	1				S-6 (25.0'-26.6')		25		
26	2	S-6	4				26		
	2								
27							27		
28							28		
29							29		
30	15				S-7 (30.0'-31.5')		30		Medium dense, gray, fine-medium SAND, trace silt, nonplastic, wet (SW)
31	14	S-7	28				31		
	14								
32							32		Stiff, reddish-brown, silty CLAY, moderately plastic, wet, (CL)
33							33		
34							34		
35	4				S-8 (35.0'-36.5')		35		
36	4	S-8	8				36		
	4								
37							37		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

GZA

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB2

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
37							37		
38							38		
39							39		
40					S-9 (40.0'-41.5')		40		
	3								
41	3	S-9	6				41		
	3								
42							42		
43							43		
44							44		
45							45		
	2				S-10 (45.0'-46.5')				
46	3	S-10	6				46		
	3								
47							47		
48							48		
49							49		Hard, gray-brown, sandy SILT, little medium-fine gravel, trace clay, nonplastic, wet, (ML) (Glacial Till)
50							50		
	21				S-11 (50.0'-51.5')				
51	65	S-11	185				51		*Refusal w/ casing 51.5 ft.
	120								Bottom of Hole 51.5 ft.
					Groundwater level @ 14.0' upon completion.				The stratification lines represent the approximate boundary between soil and rock types. The actual transition may be gradual.

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES: * Casing refusal w/ 300 lbs. hammer.

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL · GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basin

FILE NO. 5610-2 BORING NO. SB-EB-3

CONTRACTOR GZA Drilling, Inc.
DRILLER Frank Perry
TYPE OF DRILL RIG Acker AD-11
SAMPLING METHOD Standard Penetration Tests
CASING 4" I.D. Flush Joint Casing
SIZE AND TYPE OF BIT -

SURFACE ELEV. 580.85
DATUM U.S.C. & G.S.
LOCATION Equalization Basin Area
DATE STARTED 5/2/83 COMPLETED 5/3/83
ENGINEER S. Putney

DIRECTION OF HOLE: VERTICAL ☒ INCLINED ☐ DEGREES FROM VERTICAL -
OVERBURDEN SAMPLES: DISTURBED 13 UNDISTURBED -
THICKNESS OF OVERBURDEN 52.2' TOP OF ROCK ELEVATION -
DEPTH DRILLED INTO ROCK - BOTTOM OF HOLE ELEVATION 528.65
TOTAL DEPTH OF HOLE 52.2'

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	ROD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
0	1	S-1	5		S-1 (0.0'-2.0')		0		Soft, red-brown, silty clay, slight-moderately, plastic, moist (Fill)
1	2						1		Loose, black, fly ash, trace clay, organics, nonplastic moist, (Fill)
2	2						2		
3	3						3		
4							4		
5							5		
6	1	S-2	1		S-2 (5.0'-7.0')		6		Grading - wet
	0								
	1								
7	0						7		
8	13	S-3	39		S-3 (7.0'-9.0') Note: 7ppm total organic vapors		8		Hard, black, bottom ash, trace clay, nonplastic, moist (Fill)
	18								
	19								
9	20						9		
10							10		
11	4	S-4	6		S-4 (10.0'-12.0')		11		Grading - medium stiff, wet
	2								
	2								
12	4						12		
13							13		
14							14		
15							15		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL	C CLOSED	F FRESH	HB HAMMER BREAK
LA LOW ANGLE (≤ 45°)	SO SLIGHTLY OPEN	S SLIGHT	
HA HIGH ANGLE (> 45°)	O OPEN	SM SLIGHT TO MODERATE	
T VERTICAL		M MODERATE	
		MV MODERATE TO SEVERE	
		V SEVERE	

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basin

FILE NO. 5610.2 BORING NO. SB-EB-3

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	ROD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
15	3				S-5 (15.0'-17.0')		15		Grading - soft
16	1	S-5	3				16		
	1								
17	2						17		
18							18		
19							19		
20					S-6 (20.0'-22.0')		20		
	2								
21	2	S-6	4				21		
	2								
22	2						22		
	2				S-7 (22.0'-24.0')				
23	1	S-7	4				23		Grading - trace shiny filaments, petroleum odor
	2								
24	2						24		
25					S-8 (25.0'-27.0')		25		Grading - wood
	2								
26	1	S-8	3				26		
	1								
27	2						27		
28							28		
29							29		
30					S-9 (30.0'-32.0')		30		
	1								
31	0						31		
	1	S-9	2						
32	1						32		
33							33		
34							34		
35					S-10 (35.0'-37.0')		35		Loose, gray-brown, fine-medium SAND, nonplastic, wet (SW)
	8								
36	13	S-10	10				36		
	6								
37	4						37		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basin

FILE NO. 5610 BORING NO. SB-EB-3

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	ROD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
37							37		
38							38		
39							39		
40							40		
	1				S-11 (40.0'-42.0')				Soft, red-brown, silty CLAY, moderately plastic, wet (CL)
41	1	S-11	4				41		
	2								
42	2						42		
43							43		
44							44		
45							45		
	19								
46	31	S-12	66		S-12 (45.0'-47.0')		46		Hard, gray-brown, sandy SILT, little clay, trace gravel, very slightly plastic, wet (ML) (Glacial Till)
	31								
47	35						47		
48							48		
49							49		
50					S-13 (50.0'-52.0')		50		
	52								
51	50	S-13	157				51		
	69				S-14 (52.0'-52.2')				
52	88						52		*Refusal w/ casing
	100/.2								
									Bottom of Hole 52.2 ft.
					Groundwater level @ 13.9' upon completion				The stratification lines represent the approximate boundary between soil and rock types. The actual transition may be gradual.

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES: *Casing refusal w/ 300 lbs. hammer.

GOLDBERG·ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL · GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB4

CONTRACTOR GZA Drilling, Inc.
DRILLER Frank Perry
TYPE OF DRILL RIG Acker AD-11
SAMPLING METHOD Standard Penetration Tests
CASING 4" I.D. Flush Joint Casing
SIZE AND TYPE OF BIT -

SURFACE ELEV. 574.43
DATUM U.S.C. & G.S.
LOCATION Equalization Basin Area
DATE STARTED 5/3/83 COMPLETED 5/4/83
ENGINEER S. Putney

DIRECTION OF HOLE: VERTICAL ☒ INCLINED ☐ DEGREES FROM VERTICAL -
OVERBURDEN SAMPLES: DISTURBED 10 UNDISTURBED -
THICKNESS OF OVERBURDEN - TOP OF ROCK ELEVATION -
DEPTH DRILLED INTO ROCK - BOTTOM OF HOLE ELEVATION 527.43
TOTAL DEPTH OF HOLE 47.0'

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
0	3						0		
1	12	S-1	38		S-1 (0.0'-2.0')		1		Hard, gray-black, fly ash, coal (Fill)
2	18						2		
	20								
3							3		
4							4		
5					S-2 (5.0'-7.0')		5		
	2								
6	4	S-2	15				6		Stiff, gray-black, fly ash, little sand & silt, trace ogranics, nonplastic, moist, (Fill)
	6								
7	9						7		
8							8		
9							9		
10					S-3 (10.0'-12.0')		10		
	6								
11	3	S-3	8				11		Grading - medium stiff, trace clay
	3								
12	5						12		
13							13		
14							14		
15							15		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL	C CLOSED	F FRESH	HB HAMMER BREAK
LA LOW ANGLE (≤ 45°)	SO SLIGHTLY OPEN	S SLIGHT	
HA HIGH ANGLE (> 45°)	O OPEN	SM SLIGHT TO MODERATE	
T VERTICAL		M MODERATE	
		MV MODERATE TO SEVERE	
		V SEVERE	

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB4

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	ROD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
15	1				S-4 (15.0'-17.0')		15		
16	1	S-4	5				16		
	1								
17	4						17		
18							18		
19							19		
20	1				S-5 (20.0'-22.0')		20		Grading - very soft, gray
21	0						21		
	1	S-5	2						
22	1						22		
23							23		
24							24		
25	5				S-6 25.0'-27.0')		25		
26	4	S-6	8				26		Grading - medium stiff
	3								
27	5						27		
28							28		
29							29		
30					S-7 (30.0'-32.0')		30		
	14								
31	16	S-7	37				31		Dense, gray, fine-medium SAND, trace silt trace fine gravel, nonplastic, wet (SW)
	18								
32	19						32		
33							33		
34							34		
35					S-8 (35.0'-37.0')		35		
	10								
36	16	S-8	40				36		Grading - little fine gravel, trace cobble
	19								
37	21						37		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB4

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	ROD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
37							37		
38							38		
39							39		
40					S-9 (40.0'-42.0')		40		
	14								
41	26	S-9	53				41		Grading - very dense
	23								
42	30						42		
43							43		
44							44		
45					S-10 (45.0'-47.0')		45		
	24								
46	31	S-10	63				46		Hard, gray, sandy SILT, little clay, trace gravel, very slightly plastic, wet (ML) (Glacial Till)
	30								
47	33						47		Bottom of Hole 47.0 ft.
48							48		The stratification lines represent the approximate boundary between soil and rock types. The actual transition may be gradual.
49							49		
50					Groundwater level @ 12.0' upon completion.		50		
51							51		
52							52		
53							53		
54							54		
55							55		
56							56		
57							57		
58							58		
59							59		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

GZA

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB-5

CONTRACTOR GZA Drilling, Inc.
DRILLER Jim Marks
TYPE OF DRILL RIG Trailer Mounted Acker-TH
SAMPLING METHOD Standard Penetration Tests
CASING 2½"I.D. Flush Joint Casing
SIZE AND TYPE OF BIT -

SURFACE ELEV. 577.70
DATUM U.S.C. & G.S.
LOCATION Equalization Basin Area
DATE STARTED 5/2/83 COMPLETED 5/3/83
ENGINEER S. Putney

DIRECTION OF HOLE: VERTICAL ☒ INCLINED ☐ DEGREES FROM VERTICAL -
OVERBURDEN SAMPLES: DISTURBED 12 UNDISTURBED -
THICKNESS OF OVERBURDEN 55.0' TOP OF ROCK ELEVATION -
DEPTH DRILLED INTO ROCK - BOTTOM OF HOLE ELEVATION 522.70
TOTAL DEPTH OF HOLE 55.0'

DEPTH (FT)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	ROD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
0	3						0		
1	5	S-1	14		S-1 (0.0'-1.5')		1		Stiff, brown-red, silty clay, trace organics, very slightly plastic, moist, (Fill)
	9								
2							2		
3							3		
4							4		
5							5		
	8								
6	7	S-2	12		S-2 (5.0'-6.5') Note: 5 ppm total organic vapors.		6		Medium dense, black fly ash, little silty sand, organics, trace coal, nonplastic, wet (Fill)
	5								
7							7		
8							8		
9							9		
10							10		
	1								
11	1	S-3	2		S-3 (10.0'-11.5')		11		Grading - soft
	1								
12							12		
13							13		
14							14		
15							15		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL	C CLOSED	F FRESH	HB HAMMER BREAK
LA LOW ANGLE (≤ 45°)	SO SLIGHTLY OPEN	S SLIGHT	
HA HIGH ANGLE (> 45°)	O OPEN	SM SLIGHT TO MODERATE	
T VERTICAL		M MODERATE	
		MV MODERATE TO SEVERE	
		V SEVERE	

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB-5

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
15	1				S-4 (15.0'-17.0')		15		Grading - very soft
16	0	S-4	WOH				16		
	0								
17	0						17		
18							18		
19							19		
20					S-5 (20.0'-21.5')		20		
	1								
21	1	S-5	2				21		
	1								
22							22		
23							23		
24							24		
25	1				S-6 (25.0'-26.0')		25		Grading - brown, fine sandy silt, trace clay, organics, nonplastic wet, Fill
26	0	S-6	WOH				26		
	0								
27							27		
28							28		
29							29		
30	24				S-7 (30.0'-31.5')		30		Medium dense, gray, fine-coarse SAND, little fine gravel, trace silt, trace wood, nonplastic wet (SW)
	11	S-7	24						
31	13						31		
32							32		
33							33		
34							34		
35	9				S-8 (35.0'-36.5')		35		
	8	S-8	20						... Grading - no gravel, no wood
36	12						36		
37							37		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB-5

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
37							37		
38							38		
39							39		
40					S-9 (40.0'-41.5')		40		
	15								
41	7	S-9	16				41		Grading - little fine-medium gravel
	9								
42							42		
43							43		
44							44		
45					S-10 (45.0'-46.5')		45		Soft, reddish-brown, silty CLAY, moderately plastic, wet (CL)
	1								
46	2	S-10	3				46		
	1								
47							47		
48							48		
49							49		
50					S-11 (50.0'-51.5')		50		Very dense, gray, sandy SILT, trace clay trace fine gravel, nonplastic, wet (ML) (Glacial Till)
	37								
51	58	S-11	122				51		
	64								
52							52		
53							53		
54					S-12 (54.0'-55.0')		54		
	48	S-12	125/ 0.5'						
55	125/.5						55		Refusal w/ casing
					Groundwater level @ 13.8 ft. upon completion				Bottom of Hole @ 55.0'

The stratification lines represent the approximate boundary between soil and rock types. The actual transition may be gradual.

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES: * Casing refusal w/ 300 lbs. hammer.

GZA

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB-6

CONTRACTOR GZA Drilling, Inc.
DRILLER Jim Marks
TYPE OF DRILL RIG Trailer Mounted Acker TH
SAMPLING METHOD Standard Penetration Tests
CASING 2¼" I.D. Flush Joint Casing
SIZE AND TYPE OF BIT -

SURFACE ELEV. 577.50
DATUM U.S.C. & G.S.
LOCATION Equalization Basin Area
DATE STARTED 5/3/83 COMPLETED 5/4/83
ENGINEER S. Putney

DIRECTION OF HOLE: VERTICAL ☒ INCLINED ☐ DEGREES FROM VERTICAL -
OVERBURDEN SAMPLES: DISTURBED 12 UNDISTURBED -
THICKNESS OF OVERBURDEN - TOP OF ROCK ELEVATION -
DEPTH DRILLED INTO ROCK - BOTTOM OF HOLE ELEVATION 532.5
TOTAL DEPTH OF HOLE 45.0

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	ROD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
0	3				S-1 (0.0'-1.5')		0		
1	6 9	S-1	15				1		Medium dense, brown, silty sand little clay, organics, trace slag, moist, (Fill)
2							2		
3							3		
4							4		
5					S-2 (5.0'-6.5')		5		
6	6 11 17	S-2	28				6		Very stiff, reddish-brown, silty clay, little slag & fly ash, moderately plastic, wet, (Fill)
7							7		
8							8		
9							9		
10					S-3 (10.0'-11.5')		10		Dense, gray, fly ash, little fine-medium gravel, trace nonplastic, wet, (Fill) sand
11	25 14 14	S-3	28				11		
12							12		
13							13		
14							14		
15							15		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB-6

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
15	1						15		
16	3				S-4 (16.5'-18.0')		16		Grading - gray, fine sandy silt trace clay, trace organics, fly ash, wet, (Fill)
	5								
17	2						17		
	3	S-4	7						
18	4						18		
19							19		
20					S-5 (20.0'-21.5')		20		
	1								
21	1	S-5	2				21		Grading - soft, trace wood
	1								
22							22		
23							23		
24							24		
25	5				S-6 (25.0'-26.5')		25		
	7	S-6	17						
26	10						26		
	7				S-7 (26.5'-28.0')				
27	8	S-7	17				27		
	9								
28							28		Medium dense, grayish-brown, fine-coarse SAND, trace fine gravel, nonplastic, wet (SW)
29							29		
30					S-8 (30.0'-31.5')		30		
	16								
31	40	S-8	100				31		Grading - very dense fine-medium sand
	60								Very dense, gray-brown fine-medium SAND nonplastic, wet
32							32		
33							33		
34							34		
35					S-9 (35.0'-36.5')		35		
	9								
36	11	S-9	26				36		Grading - medium dense, trace clay, trace shells
	15								
37							37		

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

GOLDBERG-ZOINO ASSOCIATES OF N.Y., P.C.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

-BORING LOG-

PROJECT Niagara Mohawk Power Corporation
Equalization Basins

FILE NO. 5610.2 BORING NO. SB-EB-6

DEPTH (FT.)	BLOWS PER 0.5 FT.	SAMPLE TYPE, NO. & LOCATION	N-VALUE OR % REC.	RQD %	REMARKS	LEGEND	DEPTH (FT.)	CORE BREAKS	SOIL AND ROCK DESCRIPTION
37							37		
38							38		
39							39		
40							40		
	3								Medium stiff, brown-gray, silty CLAY moderately plastic, wet (CL)
41	2	S-10	5		S-10 (40.0'-41.5')		41		
	3								
42							42		
43							43		
44							44		
	50				S-11 (44.0'-45.0')				Very dense, brown, fine-medium SAND, trace silt, nonplastic, wet (SM) Glacial Till
45	120	S-11	120/.5				45		
					Groundwater level @ 13.8' upon completion				Bottom of Hole @ 45.0'
									The stratification lines represent the approximate boundary between soil and rock types. The actual transition may be gradual.

DISCONTINUITY CLASSIFICATION

ORIENTATION	DEGREE OF OPENING	WEATHERING	SPECIAL FEATURES
H HORIZONTAL LA LOW ANGLE (≤ 45°) HA HIGH ANGLE (> 45°) T VERTICAL	C CLOSED SO SLIGHTLY OPEN O OPEN	F FRESH S SLIGHT SM SLIGHT TO MODERATE M MODERATE MV MODERATE TO SEVERE V SEVERE	HB HAMMER BREAK

MISCELLANEOUS NOTES:

ATTACHMENT 1

NORTH POND NO. 1 PHOTOGRAPHS

North Ponds – Pond 1 Evaluation Date: 9/12/2012

Photo 1: Caption- Sluice Outfall into Pond 1

Photo 2: Caption- Pond 1 foreground, Pond 2 in background

North Ponds – Pond 1 Evaluation Date: 9/12/2012

Photo 3: Caption- North embankment Pond 1

Photo 4: Caption- Incised south side of Pond 1

North Ponds – Pond 1 Evaluation Date: 9/12/2012

Photo 5: Caption- Pond 1Pipe Outlet to Pond 2

Photo 6: Caption- Pond 1Pipe Outlet to Pond 3

ATTACHMENT 2

NORTH POND NO. 2 PHOTOGRAPHS

North Ponds – Pond 2 Evaluation Date: 9/12/2012

Photo 1: Caption- Pipe Outfall from Pond 2 into North side drainage ditch

Photo 2: Caption- Pipe Outfall Retaining Wall and Embankment north side Pond 2

North Ponds – Pond 2 Evaluation Date: 9/12/2012

Photo 3: Caption- Pipe Outfall Retaining Wall and Embankment north side Pond 2

Photo 4: Caption- East Embankment Pond 2

North Ponds – Pond 2 Evaluation Date: 9/12/2012

Photo 5: Caption- South Embankment Pond 2

Photo 6: Caption- West Embankment Pond 2

North Ponds – Pond 2 Evaluation Date: 9/12/2012

Photo 7: Caption- West Embankment Pond 2

Photo 8: Caption- South Embankment Pond 2

ATTACHMENT 3

NORTH POND NO. 3 PHOTOGRAPHS

North Ponds – Pond 3 Evaluation Date: 9/12/2012

Photo 1: Caption- Incised Embankment South Side Pond 3

Photo 2: Caption- Pipe Outfall from Pond 1 foreground, West-side embankment left-center

North Ponds – Pond 3 Evaluation Date: 9/12/2012

Photo 3: Caption- Incised Embankment Southeast Corner Pond 3

Photo 4: Caption- Incised East side of Pond 3

North Ponds – Pond 3 Evaluation Date: 9/12/2012

Photo 5: Caption- Incised East side of Pond 3

Photo 6: Caption- Incised East side of Pond 3foreground, North embankment and outlet pipe background

North Ponds – Pond 3 Evaluation Date: 9/12/2012

Photo 7: Caption- North embankment and outlet pipe of Pond 3

Photo 8: Caption- Pond 3outlet pipe draining into north drainage ditch

ATTACHMENT 4

SOUTH ASH SETTLING BASIN PHOTOGRAPHS

South Ponds – South Ash Settling Basin Evaluation Date: 9/12/2012

Photo 1: Caption- Process Water Inflow at North End of South Ash Settling Basin

Photo 2: Caption- East Incised Embankment of South Ash Settling Basin

South Ponds – South Ash Settling Basin Evaluation Date: 9/12/2012

Photo 3: Caption- East Incised Embankment of South Ash Settling Basin

Photo 4: Caption- East Incised Embankment of South Ash Settling Basin

South Ponds – South Ash Settling Basin Evaluation Date: 9/12/2012

Photo 5: Caption- East Incised Embankment of South Ash Settling Basin

Photo 6: Caption- Incised Embankments West Outfall End of South Ash Settling Basin

South Ponds – South Ash Settling Basin Evaluation Date: 9/12/2012

Photo 7: Caption- Outfall Pipe from South Ash Settling Basin to Niagara River

Photo 8: Caption- South Side Incised Embankment South Ash Settling Basin

ATTACHMENT 5

NORTH AND SOUTH EQUALIZATION BASIN PHOTOGRAPHS

South Ponds – North and South Equalization Basins Evaluation Date: 9/12/2012

Photo 1: Caption- East Embankment North Equalization Basin. Note asphalt repair outer slope of embankment; sealant applied on basin interior and later applied on berm top and outside slope (see picture below).

Photo 2: Caption- North Equalization Basin. Newly applied sealant in basin bottom, berm tops and outside slopes.

South Ponds – North and South Equalization Basins Evaluation Date: 9/12/2012

Photo 3: Caption- East Outside Embankment of South Equalization Basin. Note asphalt repair outer slope of embankment; application of sealant on basin interior in progress at time of photo and later applied on berm top and outside slope (see picture below).

Photo 4: Caption- South Equalization Basin, newly applied asphalt sealant in basin bottom, berm tops and outside slopes.