NATURAL RESOURCE TECHNOLOGY

Ameren

Pond D Closure Alternatives Report

Hutsonville Power Station
Crawford County Illinois

April 27, 2009

Project No: 1954

NATURAL RESOURCE TECHNOLOGY

POND D CLOSURE ALTERNTIVES REPORT

HUTSONVILLE POWER STATION
CRAWFORD COUNTY ILLINOIS

Project No: 1954

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1 INTRODUCTION

1.1 Background

Ameren Energy Generating (AEG) operates the Hutsonville Power Station in Crawford County Illinois (Figure 1-1). The power station is located on the west bank of the Wabash River, one mile north of the City of Hutsonville (SW ¼, Section 17, Township 8N, Range 11W). The coal fired power plant has been in operation since the 1940's. There are currently two units operating at the plant, completed in 1953 (unit 3) and 1954 (unit 4), with a combined generating capacity of 164 MW. Fly ash from the operating units is collected by an electrostatic precipitator and sluiced to a 12-acre lined ash impoundment (Pond A, Figure 1-2), which was constructed in 1984. Bottom ash is sluiced to a separate pond and eventually recycled. Sluice water from Pond A is routed through a 4.2-acre lined interim pond (Pond B, constructed in 2000) before discharge to the Wabash River via NPDES-permitted outfall #002 (IL0000175). Sluice water from the bottom ash pond is routed through a 1.7-acre drainage collection pond (Pond C, constructed in 2000) and Pond B before discharge to the Wabash River via the same outfall.

The site also has a 22-acre unlined ash impoundment (Pond D), which was constructed in 1968. This impoundment was the primary ash management unit prior to construction of Pond A, and was used as a secondary settling pond until it was removed from service in 2000. On occasion, precipitation and flood backwater can accumulate in the impoundment and cause ponded conditions in low areas.

Groundwater quality has been monitored at this facility since 1984. Concentrations of boron and sulfate at several monitoring wells exceed the Illinois Class I groundwater quality standards (Title 35, Part 620, Illinois Administrative Code, or 35 IAC 620). Boron and sulfate are indicator parameters for coal ash leachate.

In 1999, Ameren retained Science & Technology Management, Inc. (STMI) and Natural Resource Technology Inc. (NRT) to perform a hydrogeologic assessment. The hydrogeologic assessment identified a correlation between shallow groundwater quality (elevated boron and sulfate concentrations in groundwater) and potential leachate sources, namely the former ash laydown area (which was excavated prior to construction of Ponds B and C) and Pond D. Boron and sulfate are migrating east towards the Wabash River; however, there are no groundwater supply wells in the shallow sediments between Pond D and the Wabash River.

Groundwater quality data from monitoring wells in the deep alluvial aquifer, as well as periodic samples from the plant production wells show that boron and sulfate concentrations in this deeper aquifer are lower than Illinois Class I groundwater quality standards.

1.2 Closure Objectives and Approach

While Pond D has been dewatered, Ameren desires to close the impoundment so as to prevent off-site groundwater impacts and construct a final cover system to minimize infiltration. The goal of these actions is to close the impoundment in a manner protective of human health and the environment. Site-specific considerations for establishing appropriate closure objectives include a risk assessment confirming that groundwater discharge to the Wabash River from Pond D is not harming human health or the environment (AECOM, 2009).

A variety of groundwater management and final cover alternatives for closure of Pond D have been identified and screened based on factors such as technical feasibility and cost. Tables 3-1, 3-2, and 3-3 summarize the closure alternatives evaluated and screening process, which is described in Section 3.

2 SITE CONDITIONS

Hydrogeology and groundwater quality were characterized in the 1999 hydrogeologic assessment. Additional field investigation was performed in 2001 and 2004 to upgrade the monitoring well system surrounding Pond D, characterize the deep alluvial aquifer, and to collect detailed information specific to the alternatives assessment (Appendix A). Data from these sources were used to develop the description of current site conditions presented here.

Figure 1-2 shows the locations of soil borings and monitoring wells used in site investigations and monitoring. Tables 2-1 through 2-4 present information pertaining to soil borings and groundwater monitoring wells from which samples were collected.

2.1 Distribution of Coal Ash Fill

Ash at the Hutsonville Power Station has been managed in Ponds A and D. In addition, ash was placed in a laydown area between the southern portions of Ponds A and D. In 2000, all ash in the laydown area was excavated, and the interim pond (Pond B) and drainage collection pond (Pond C) were constructed in that location.

Four direct-push probe borings (GP20 through GP23) advanced through Pond D during the 1999 hydrogeologic assessment indicated ash thickness ranging from about 12 feet at the north end of the impoundment to 31 feet in the central portion of the impoundment (Figure 2-1, Section C-C'). Ash in the central and southern portions of Pond D extended as much as 16 feet below the normal water table elevation.

2.2 Hydrogeology and Groundwater Quality

2.2.1 Hydrogeology

The impoundments are underlain by two water-bearing units separated by materials that have low hydraulic conductivity (shale bedrock or silts and clays). The upland portion of the power plant property and the western portion of Pond D, are underlain by a thin (less than 20 feet thick) layer of sand-rich soil, which is underlain by Pennsylvanian-age sandstone and then shale (Figure 2-1, Cross-Section A-A'). The

lowland portion of the site and eastern portion of Pond D are underlain by 90 feet of alluvium in the Wabash River bedrock valley. The upper 20 feet of alluvium is fine-grained, primarily composed of silt and clay with thin sand lenses, while the lower 70 feet is coarse-grained, consisting of sand and gravel. Every boring drilled into the alluvium encountered the fine-grained deposits, and on-site borings that extended to the underlying sand and gravel (SB101, SB102, MW7D, MW14, MW115, and MW121) encountered 19 to 25 feet of these deposits (Figure 2-1, Cross-Section B-B'). Pennsylvanian-age shale underlies the alluvium.

The shallow upland sand and sandstone, and sand lenses in the fine-grained alluvium, are referred to as the upper migration zone, and constitute the uppermost aquifer at this site. There are 13 monitoring wells screened in this aquifer (Table 2-5); six of these wells are monitored for Pond D, and four of these are downgradient of Pond D. The coarse-grained alluvium is referred to as the deep alluvial aquifer. This aquifer is not present beneath most of the site, including the power plant, Ponds A, B, and C, and the northern and western portions of Pond D. There are five monitoring wells screened in the deep alluvial aquifer, all of which are monitored for Pond D (Table 2-5). The shale underlying the upland sandstone and the silts and clays of the fine grained alluvium separate the upper migration zone from the deep alluvial aquifer.

Groundwater flow was mapped for four consecutive quarters during which complete sample sets were available. Unfortunately, depth to water readings for all of the upper migration zone and one of the deep alluvial aquifer maps were not collected on the same day during this period. While this discrepancy did not appear to change map depictions of the overall direction of groundwater flow, it affected relative readings between wells. Therefore, a second set of drawings was produced using data collected after the plant initiated same-date measurements beginning in 2006. All maps (Figures 2-2 through 2-17) show that groundwater flow in the upper migration zone and the deep alluvial aquifer is eastward toward the Wabash River.

2.2.2 Groundwater Quality

The 1999 Hydrogeologic Assessment identified boron, sulfate, manganese, and TDS as parameters of concern (POCs) because their concentrations in groundwater near Pond D exceeded Illinois Class I groundwater quality standards. Boron and sulfate are indicator parameters of coal ash leachate, and are the primary POCs. Manganese is ubiquitous in soils, may have higher concentrations in soil than in coal ash, and is highly sensitive to redox conditions; therefore, it is not a reliable indicator of coal ash leachate. High TDS may be observed at sites where coal ash leachate migration occurs, because high TDS

concentrations reflect elevated concentrations of soluble ash constituents such as calcium, potassium, sodium, and sulfate; however, other natural and anthropogenic sources can cause high TDS concentrations, therefore it is not a reliable indicator of coal ash leachate impacts.

Pond D monitoring wells MW6, MW7, MW8, and MW11R have boron and sulfate concentrations higher than Class I standards; these wells are screened in the upper migration zone. Groundwater monitoring results are presented in Figures 2-18a and b, and Table 2-6a and b. Groundwater within the deep alluvial aquifer complies with Class 1 groundwater quality standards and reflects only nominal impacts from Pond D in only one of the five wells. The lack of significant groundwater impacts in the deep alluvial aquifer after more than 40 years of Pond D operation provides further evidence that the silts and shales separating the upper migration zone from the deep alluvial aquifer are an effective confining layer.

2.3 Potential Groundwater Receptors

There are no groundwater supply wells, other than the two plant wells, between Pond D and the Wabash River, which is the ultimate receptor of groundwater impacted by leachate from Pond D (Appendix C). The plant wells and four irrigation wells that are south of Pond D are completed in the deep alluvial aquifer.

As documented previously, groundwater in the upper migration zone downgradient of Pond D has elevated boron and sulfate concentrations and therefore represents an exposure pathway; however, this formation is not utilized for water supply in the vicinity of Pond D.

The deep alluvial aquifer is utilized as a drinking water supply by the city of Hutsonville, approximately 1 mile to the south. However, groundwater flow in this aquifer is toward the Wabash River (Figures 2-10 through 2-16). As a result, there are no potable water supply wells, other than the two plant wells, situated between Pond D and the discharge point for groundwater (the Wabash River). The plant wells have low boron and sulfate concentrations and do not show evidence of impacts from Pond D.

3 IDENTIFICATION AND SCREENING OF CLOSURE ALTERNATIVES

3.1 Overview

Several closure alternatives were identified for Pond D and evaluated to determine whether or not they would effectively and efficiently meet the closure objectives, specifically:

- Prevent off-site migration of impacted groundwater;
- Minimize infiltration of rain and snowmelt to the coal ash within Pond D; and
- Protect human health and the environment.

Alternatives that potentially meet the closure objectives are presented below and summarized in Table 3-1. These alternatives are divided into two distinct categories: Groundwater Management and Final Cover Alternatives.

Additionally, since surface water management is a necessary component of any final cover design, surface water management alternatives were developed and evaluated for incorporation into the final cover alternatives.

3.2 Screening Criteria

Screening criteria for assessing groundwater management, final cover, and surface water management alternatives consist of the following:

- Construction / Implementation Feasibility: Construction feasibility refers to the ability to build the system given site-specific conditions. Implementation feasibility refers to the ability of this alternative to meet technical factors, such as appropriateness or suitability, and availability of the technology given site-specific constraints, geographic location; and administrative factors, such as local and state permitting requirements and regulatory reviews for approval.
- Effectiveness: Effectiveness refers to the ability of the alternative to achieve the three closure objectives.

- Cost: Costs for the purpose of initial screening refer to relative cost ranges for each of the alternatives, and include utilization of available published cost data from similar projects, vendor data, and engineering judgment. As such, **costs are for general comparative purposes, and are not used singly as a screening tool unless substantial cost differentials would immediately preclude the technology from further consideration**.

Construction / implementation feasibility and effectiveness were significant criteria for screening. If an alternative failed these criteria, then it was not considered further. Therefore, the criteria of cost was secondary unless substantial concerns were identified that would clearly eliminate the alternative (e.g., same feasibility and effectiveness with significantly higher costs).

Comments on the screening criteria for each closure alternative are provided with the description of each alternative below and summarized on Table 3-1. Rough cost summaries for each of the alternatives are provided in Appendix B. Table 3-2 provides a summary of the areal extent and volumes of ash in Pond D used for quantity estimation in the rough cost summaries. Table 3-3 provides a material balance analysis for each of the final cover alternatives that explains how each source of fill available on site will be utilized within the final cover alternative.

3.3 Groundwater Management Alternatives

3.3.1 Overview

As noted in AECOM, 2009, groundwater migration from Pond D to the Wabash River does not pose a threat to human health and the environment. Further, impacted groundwater is localized and limited to the pond area itself and a narrow band of shallow groundwater immediately south of the property. Accordingly, the goal of the groundwater management alternatives is to prevent southward off-site migration of impacted groundwater in the upper migration zone.

The following groundwater management alternatives were evaluated:

- Site monitoring with no groundwater collection;
- Groundwater collection trench; and
- Containment using a low-permeability vertical barrier.

In addition, the following source control measures are grouped with the groundwater management alternatives because they have a similar objective of preventing off-site migration:

- Ash stabilization;
- Ash removal and disposal, recycling at an off-site facility, or beneficial reuse; and
- Ash impoundment reconstruction.

As noted in the discussion that follows, the source control measures were eliminated during the screening process because they are technologically infeasible and/or economically unviable.

3.3.2 Site Monitoring with No Groundwater Collection

This alternative represents a no-action alternative. Establishing a groundwater monitoring program will be required as a component of each Groundwater Management Alternative discussed below; therefore, costs for site monitoring have not been separately evaluated.

Groundwater modeling performed separately from this evaluation (NRT, 2009) suggests that groundwater quality at the south property boundary may achieve compliance with Class I groundwater quality within a period of about 17 years after closure of Pond D. This alternative does not achieve the objective of *preventing* off-site migration of impacted groundwater. Therefore the no-action component of this alternative was not carried forward, although, as presented above, the groundwater monitoring component is a necessary part of any groundwater management alternative.

3.3.3 Groundwater Collection Trench

This alternative consists of a collection trench south of Pond D. The collection trench would contain a perforated horizontal pipe surrounded by gravel bedding. A geotextile would be placed along the trench walls to filter out surrounding soils. The horizontal pipe would have a relatively shallow pitch to sumps placed along the alignment of the trench at a spacing determined by site-specific hydrogeologic conditions. Pumps would be placed in the sumps to extract groundwater from the trench. Extracted groundwater would be directly discharged to the interim pond (Pond B) for management and eventual discharge to the Wabash River via the existing NPDES permit.

This alternative was carried forward because it is capable of achieving the closure objective of preventing off-site, southward migration of impacted groundwater in the upper migration zone.

3.3.4 Containment Using a Low-Permeability Vertical Barrier

This Groundwater Management Alternative would prevent off-site migration of impacted groundwater by installing a low-permeability vertical barrier through the upper migration zone. Construction of a vertical barrier would require keying into a low-permeability geologic formation, such as shale bedrock or clay. Two basic barrier configurations were considered:

- Partially Encapsulating Barrier: this type of barrier would be installed along the east and south (downgradient) sides of Pond D. The barrier would be completed with an interior hydraulic gradient control system utilizing groundwater collection trenches upgradient of the barrier or extraction wells within the impoundment. The hydraulic gradient control system would prevent hydraulic mounding by maintaining an inward gradient.

- Fully Encapsulating Wall: This type of barrier would surround the entire perimeter of Pond D to fully encapsulate the saturated ash zone and deflect upgradient groundwater flow around Pond D. Internal hydraulic controls would be required to manage groundwater fluctuations that could potentially compromise containment integrity. However, since this type of barrier would deflect upgradient groundwater flow, a significantly lower volume of groundwater compared to the partially encapsulating barrier would need to be extracted to maintain an inward gradient.

Several vertical barrier technologies are available, including sheet piling with sealed interlocks, cement-bentonite or soil-cement slurry, and jet grouting. Each of these technologies has the capability to create a barrier with hydraulic conductivity approaching 1×10^{-7} centimeters per second (cm/s) with proper design and construction quality control / assurance. However, without a competent low-permeability formation in which to key the barrier, proper containment cannot be achieved. Accordingly, this alternative was not considered.

3.3.5 Ash Stabilization

Ash stabilization is a technology designed to micro-encapsulate the ash in a cement-like matrix (monolith) to minimize the rate of groundwater infiltration and leaching of ash constituents to groundwater. Ash fill is stabilized and solidified using one of several reagents delivered either via soil mixing or jet grouting technology. Once the ash is stabilized, groundwater flows around, rather than through the ash, greatly reducing leachate volume and potentially eliminating the need for active groundwater management. A laboratory bench-scale test would be needed to fully quantify this alternative's feasibility and effectiveness, including whether such stabilization will effectively eliminate leaching from the coal ash as groundwater flows around the outer perimeter of the monolith.

Soil mixing utilizes large-diameter augers (5 to 12 feet in diameter) that mechanically mix soils with a stabilizing reagent carried by drilling fluid. Jet grouting utilizes a small drill rig to advance a drill bit into the soils, through which grout is pumped under high pressure. As the drill string is rotated and slowly raised, a cylindrical grout column is created. The grout injection produces grout columns ranging from approximately 2 to 5 feet in diameter. A key disadvantage of this technology is maintaining the continuity and integrity of the grout column. Discontinuities or irregularities in subsurface conditions can lead to irregularity in grout column diameter. Typically, conservative overlapping is performed to achieve uniform coverage.

This alternative was not considered due to technical uncertainties and relatively high cost compared to other groundwater management alternatives that have similar or better effectiveness and less technical uncertainty.

3.3.6 Ash Removal and Disposal

Removal of ash from Pond D eliminates the source of groundwater impacts at the site. Excavation of a significant volume of ash and extensive site dewatering throughout the course of the project would be required. For purposes of evaluating this alternative, partial removal (i.e., removal of saturated ash only) was compared to removal of all ash from Pond D. Key design and technical considerations for excavation include:

- Excavated ash would be disposed off site if not returned to its original location.
- For the partial removal alternative, a capillary break would be created following the removal of saturated ash by placing a relatively free-draining material, such as self-compacting gravel, at and above the groundwater interface. This material prevents saturation of the ash left above the groundwater interface due to capillary rise from the underlying water table, and provides a buffer to a future increase in groundwater elevation. Above the capillary break, excavated ash would be placed as backfill to grade. Above the ash backfill, an engineered cover would be constructed to minimize surface water infiltration through the unsaturated ash.
- Extensive engineering controls that could include water misting would be required for managing fugitive dust emissions.

This alternative's effectiveness would be controlled largely by the ability to remove saturated ash from below the water table. The technical and economic feasibility of this is questionable. In addition, there does not appear to be a regulatory requirement to remove ash from an IEPA-permitted impoundment facility such as Pond D. Consequently, this alternative was not considered due to its technical

uncertainties and relatively high cost compared to other groundwater management alternatives that have similar or better effectiveness and less technical uncertainty.

3.3.7 Pond D Reconstruction

Reconstruction of Pond D is identified as a Groundwater Management Alternative since the reconstructed facility would release significantly less leachate than Pond D. Reconstruction of Pond D would require extensive excavation and relocation or off-site disposal of all ash currently contained in Pond D. Pond D would then be reconstructed as a new unit designed to:

- Separate ash from the water table through the addition of clean fill to raise the base of Pond D above the water table; and
- Reduce or eliminate ash leachate migration by constructing a low-permeability liner.

Upon completion of reconstruction activities, ash removed from Pond D could either be replaced or the unit could be operated as a new ash impoundment. Alternatively, the reconstruction project could be designed to provide additional disposal capacity. If the ash removed from Pond D was replaced and no additional capacity was provided, reconstruction would not be complete until a final cover (as discussed in Section 3.4) was installed.

This alternative has similar feasibility uncertainties as the ash removal option described above with regard to the excavation of saturated ash. In addition, regulatory uncertainties associated with this alternative rendered it infeasible. Consequently, the costs for this alternative were not evaluated and it was not considered further.

3.4 Final Cover Alternatives

Four different final cover alternatives were selected for initial evaluation:

- Geomembrane (e.g., PVC);
- Compacted clay;
- Earthen (clean soil fill); and
- Pozzolanic.

The first two alternatives consist of (from the bottom up) a low-permeability layer, either a geomembrane or 3 feet of compacted clay, followed by a 3-foot thick soil layer designed to drain infiltrated surface

water from above the low-permeability layer, protect the low-permeability layer from weathering and maintenance activities on the surface of the final cover, and support vegetation.

The third alternative, a layered earthen final cover, reflects a simplified approach to conventional landfill cover design practices. Instead of relying on low-permeability clay or a geomembrane as a barrier, the design of a layered earthen cover incorporates the use of high-permeability sand and/or gravel layers to create a capillary break. The capillary break causes retention of water in the rooting zone, which increases transpiration to the atmosphere relative to covers without capillary breaks, and minimizes downward drainage. If the rooting zone becomes saturated, the high-permeability sand and/or gravel layer(s) promote rapid lateral drainage and continue to limit infiltration. However, migration of water to this drainage layer would only occur after the retention capacity of the rooting zone is reached.

Given the humid climate in this area, the layered earthen cover will not be as effective as a compacted clay or geomembrane cover in minimizing infiltration; however, a net reduction in annual infiltration can be achieved. Construction of a layered earthen cover is a lower cost approach than geomembrane or compacted clay because it relies on locally available materials and no geomembrane nor low-permeability clay is used, thus eliminating the cost of these materials themselves as well as the construction quality assurance / control efforts associated with them.

The fourth final cover alternative reflects an innovative approach to cover design. Fly ash from an on-site source (Pond A), would be collected and blended with a stabilizing reagent (e.g., quick lime, Portland cement, class C fly ash) to create a cement-like monolithic cover to minimize the rate of infiltration and leaching of ash constituents to groundwater. A 3-foot thick, low-permeability layer would be constructed from the pozzolanic fly ash mixture followed by a 3-foot thick earthen protective layer. However, mix design testing for this alternative was unable to identify a mix that achieves a permeability lower than $1x10^{-6}$ cm/s with adequate strength.

Of the final cover alternatives evaluated, only the geomembrane cover was carried forward. The layered earthen and pozzolanic alternatives were screened out because the geomembrane alternative is more effective at minimizing infiltration. The compacted clay alternative was screened out because it has a higher estimated cost for similar effectiveness as the geomembrane alternative.

3.5 Surface Water Management Alternatives

Three surface water management alternatives were selected for initial evaluation:

- Route surface water east towards the Wabash River;
- Route surface water west towards Pond C; and
- A combination of these two approaches.

Diverting all surface water to the Wabash River would require the most fill, while combining surface water drainage to either the Wabash River or Pond C would require the least fill. Detailed design of surface water management features will consider the stability of the dikes surrounding Pond D. A box culvert has already been constructed to route surface water from Pond D to Pond C. For purposes of estimating fill volumes to construct the surface water management alternatives, a minimum 5% slope has been assumed to provide adequate drainage and prevent standing water from accumulating in depressions on the final cover surface.

Of the Surface Water Management Alternatives evaluated, only the combination alternative was carried forward since the others are anticipated to be significantly more expensive and provide only similar effectiveness.

4 SELECTED CLOSURE ALTERNATIVES

4.1 Overview

The results of closure alternative screening are presented with the descriptions for each alternative in Section 3 and summarized in the last column of Table 3-1. To summarize briefly, the selected alternatives consist of the following:

Groundwater Management Alternative

- Groundwater collection trench

Final Cover Alternative

- Geomembrane

Surface Water Management Alternative

- Route surface water east and west towards the Wabash River and Pond C

Figure 4-1 depicts the site plan for the selected closure alternatives.

4.2 Total Estimated Preliminary Costs for Selected Alternatives

The total estimated costs for the selected closure alternatives are as follows:

- Total Capital Cost: $4,700,000
- Total Annual Operation & Maintenance Costs: $52,000
- Projected 5-year Cost in 2005 Dollars: $4,960,000
- Projected 30-year Cost in 2005 Dollars: $6,260,000

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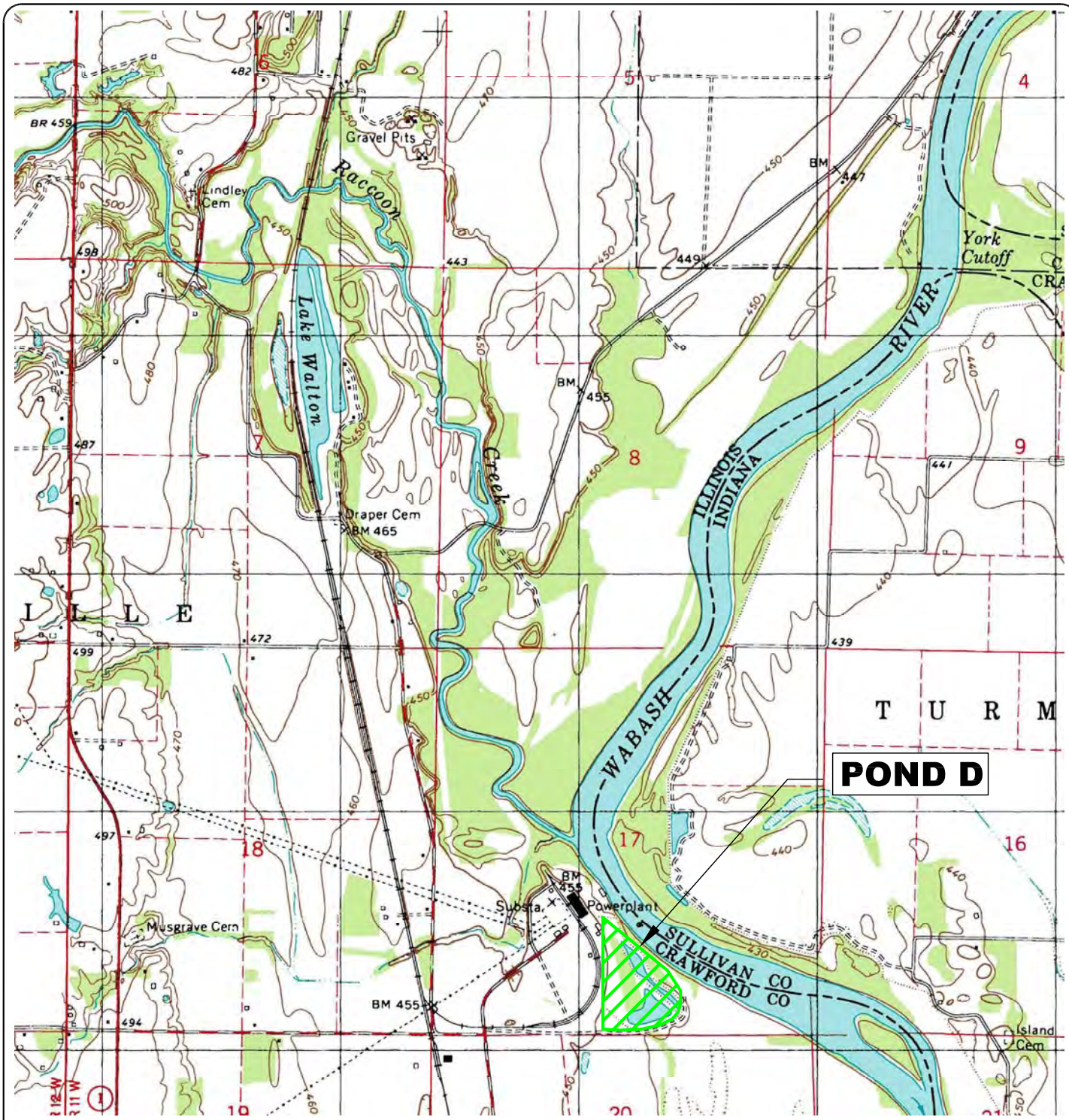
FIGURES



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SCALE IN FEET

CONTOUR INTERVAL 10 FEET

SITE LOCATION MAP

POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

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DRAWN BY: KNW 04/07/09 APP'D BY: EJT DATE: 04/24/09

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1954

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1954–A05

FIGURE NO.
1–1

SITE PLAN

POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

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DATE: 04/03/09	DATE: 04/08/09	DATE: 04/24/09

DRAWING NO: 1954-23-B01
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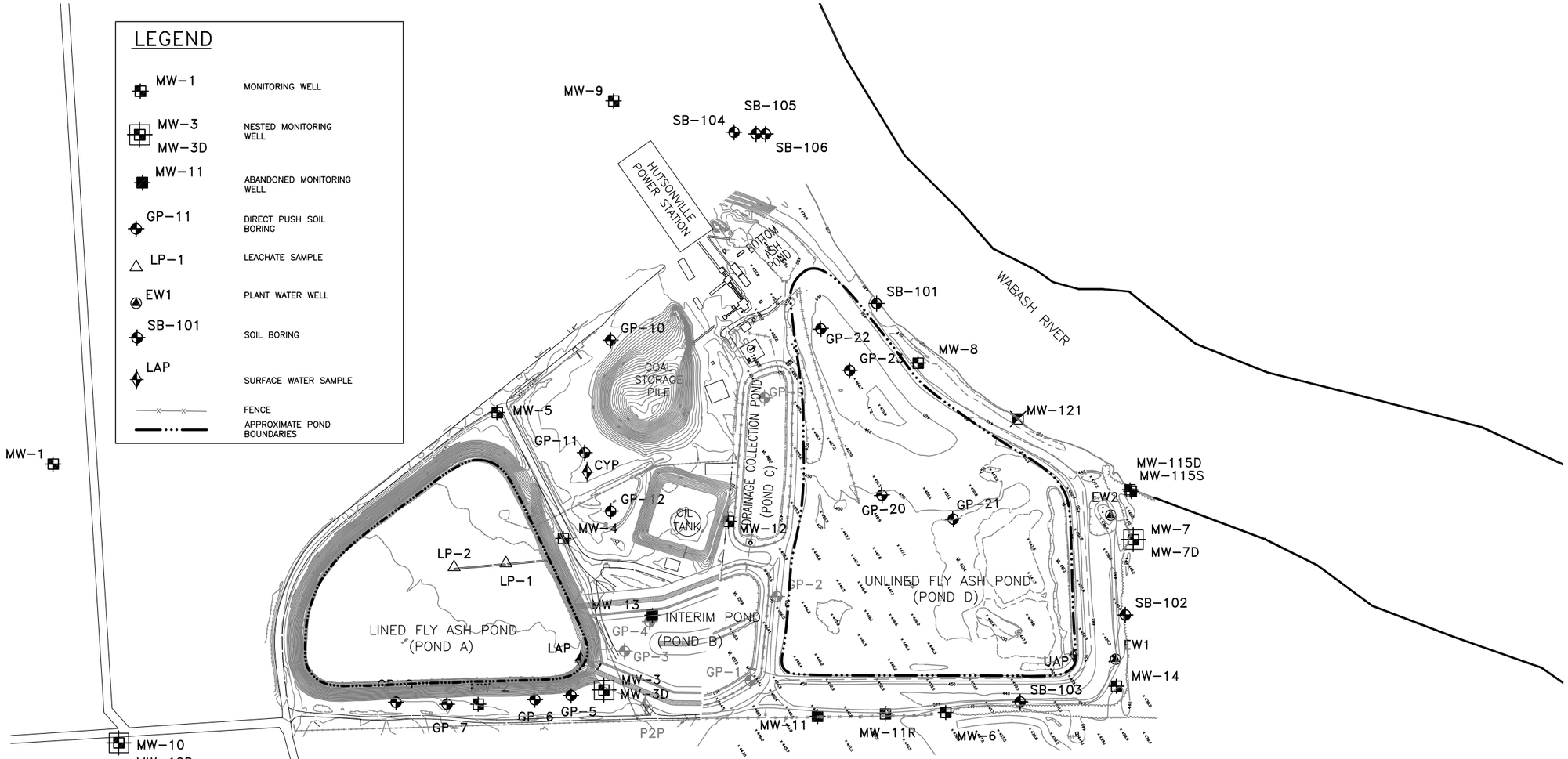


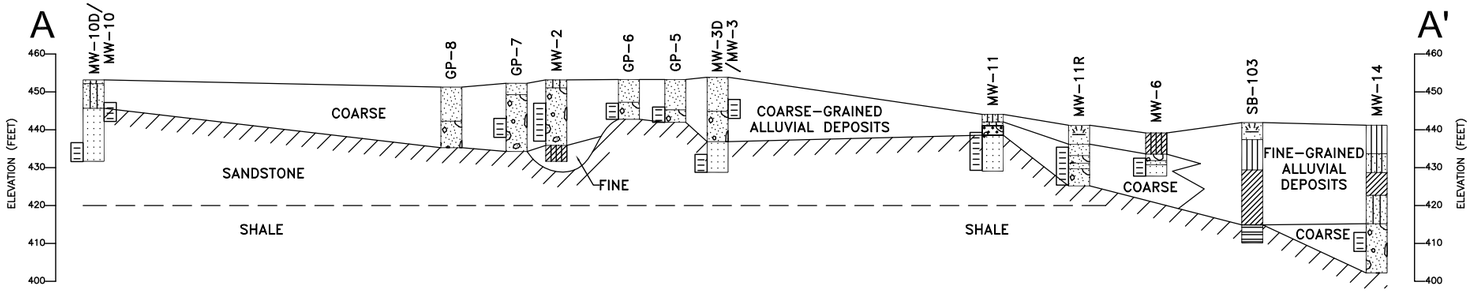
SOURCE NOTES:
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
TW-115D AND TW-115S WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

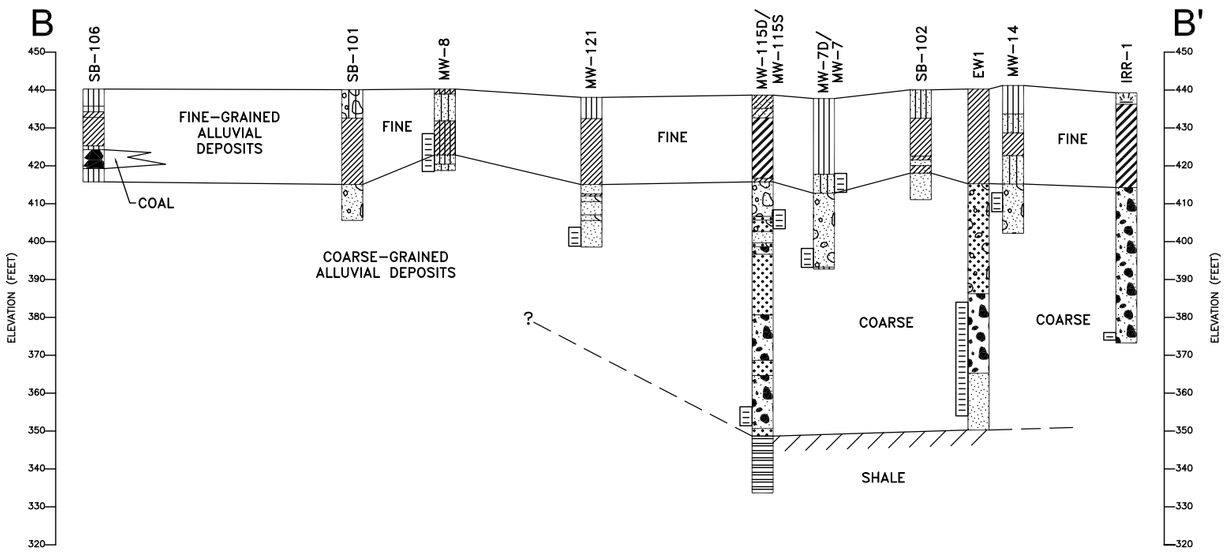
NOTES:
1. DISCONTINUITIES BETWEEN SURVEYS ARE INDICATED BY BREAKS IN CONTOUR LINES.
2. SOIL BORINGS GP-1 THROUGH GP-4, GP-9 AND SURFACE WATER SAMPLE P2P ARE SCREENED SINCE THEY ARE ASSOCIATED WITH FORMER ASH LAYDOWN AREA NOW REPLACED WITH THE INTERIM POND AND THE DRAINAGE COLLECTION POND. SEE NRT REPORT "HYDROGEOLOGIC ASSESSMENT" FOR FURTHER INFORMATION.

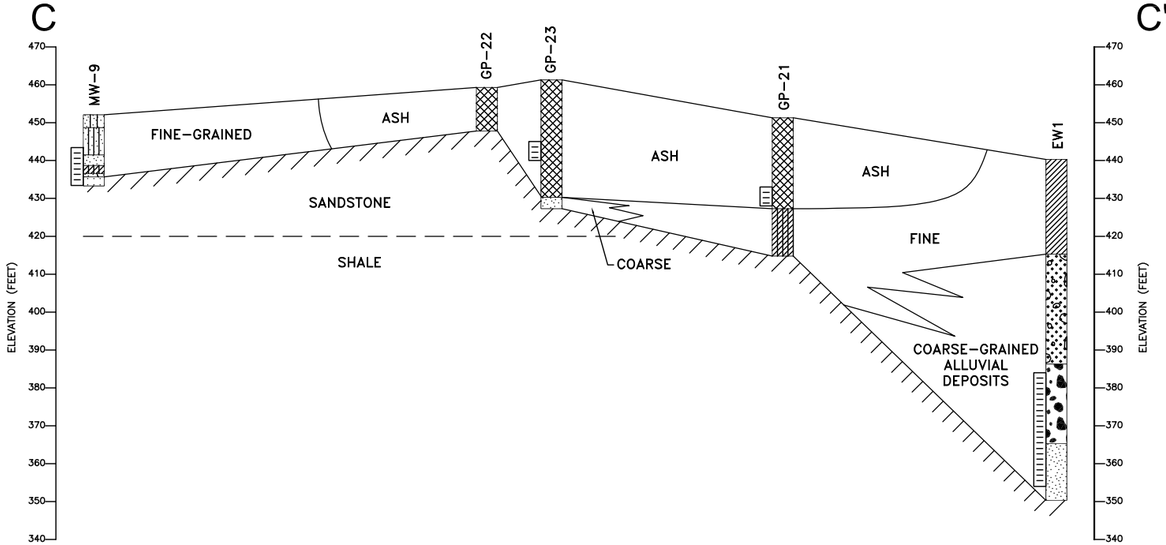
NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
1-2





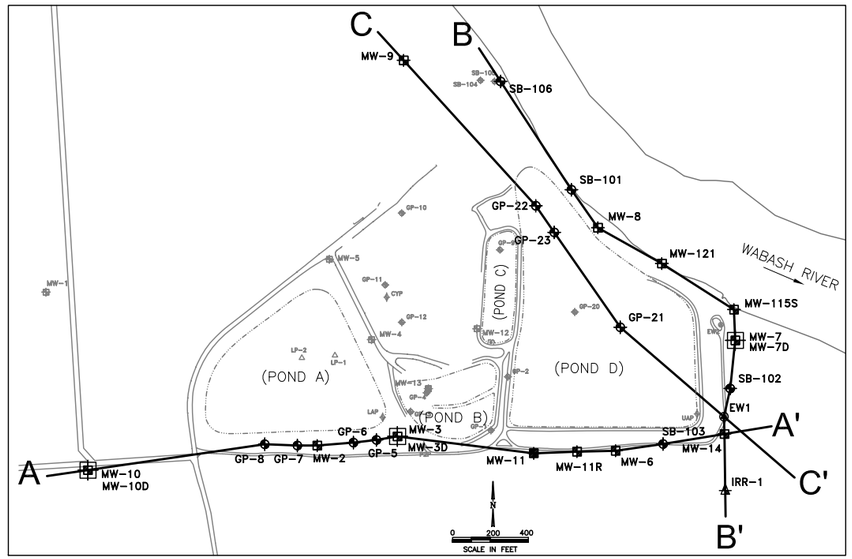


LEGEND

- TOPSOIL
- SILT
- SILTY LEAN CLAY
- SANDY SILT
- SILTY SAND
- LEAN CLAY
- FAT CLAY
- GRAVELLY SILT
- SANDSTONE
- SHALE
- COAL
- WELL GRADED SAND
- WELL GRADED GRAVEL WITH SAND
- WELL GRADED SAND WITH GRAVEL
- POORLY GRADED SAND
- POORLY GRADED SAND WITH GRAVEL
- SANDY LEAN CLAY
- ASH
- WELL GRADED GRAVEL
- SCREENED INTERVAL

NOTES:
1. IRR-1 IS THE WAMPLER IRRIGATION WELL (ISGS WELL #12-033-36667-00).
2. EW1 IS BASED ON ISGS WELL, PERMIT #47367.
3. SURFACE ELEVATION FOR SB-106 WAS ESTIMATED FROM NEIGHBORING BORING ELEVATIONS.
4. C-C' SHALE/SANDSTONE CONTACT EXTRAPOLATED FROM A-A'.

VERTICAL SCALE IN FEET: 20
HORIZONTAL SCALE IN FEET: 200
VERTICAL EXAGGERATION =10



C-C'	BGH	03/05/08	BRH
B-B'	BGH	03/05/08	BRH
A-A'	BGH	03/05/08	BRH
ID	CHK'D BY:	DATE:	APP'D BY:

DRAWN BY:	KNW	DATE:	04/03/09
CHECKED BY:	KJB	DATE:	04/08/09
APPROVED BY:	EJT	DATE:	04/24/09
DRAWING NO: 1954-23-B02			
REFERENCE: .			

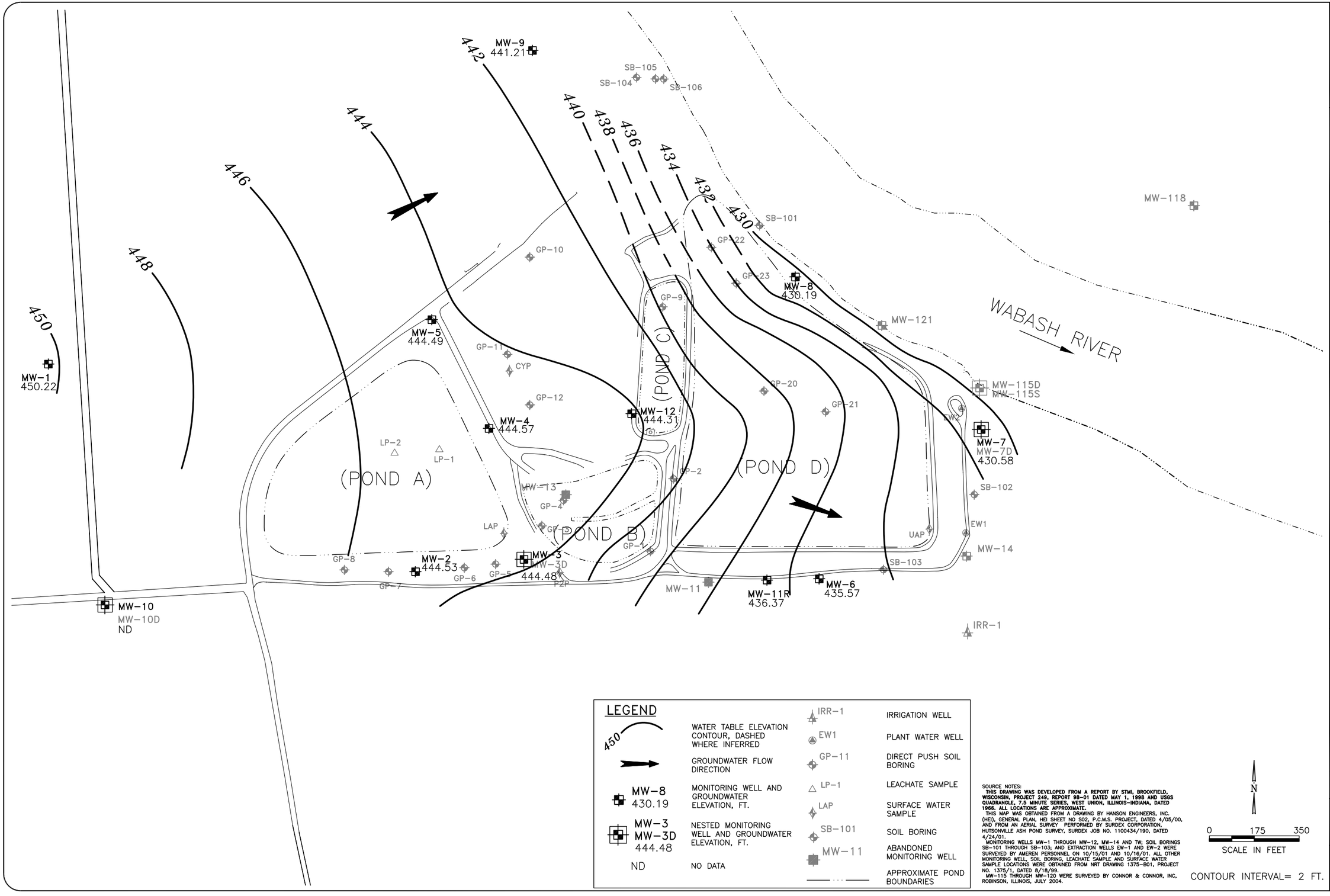
GEOLOGIC CROSS SECTIONS

POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1954/2.3

FIGURE NO. 2-1



LEGEND

450	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-8 430.19	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-3 MW-3D 444.48	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1968. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350

SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

THIRD QUARTER, 2003 UPPER MIGRATION ZONE FLOW CONTOURS

POND D CLOSURE ALTERNATIVES REPORT

AMEREN - HUTSONVILLE POWER STATION

HUTSONVILLE, ILLINOIS

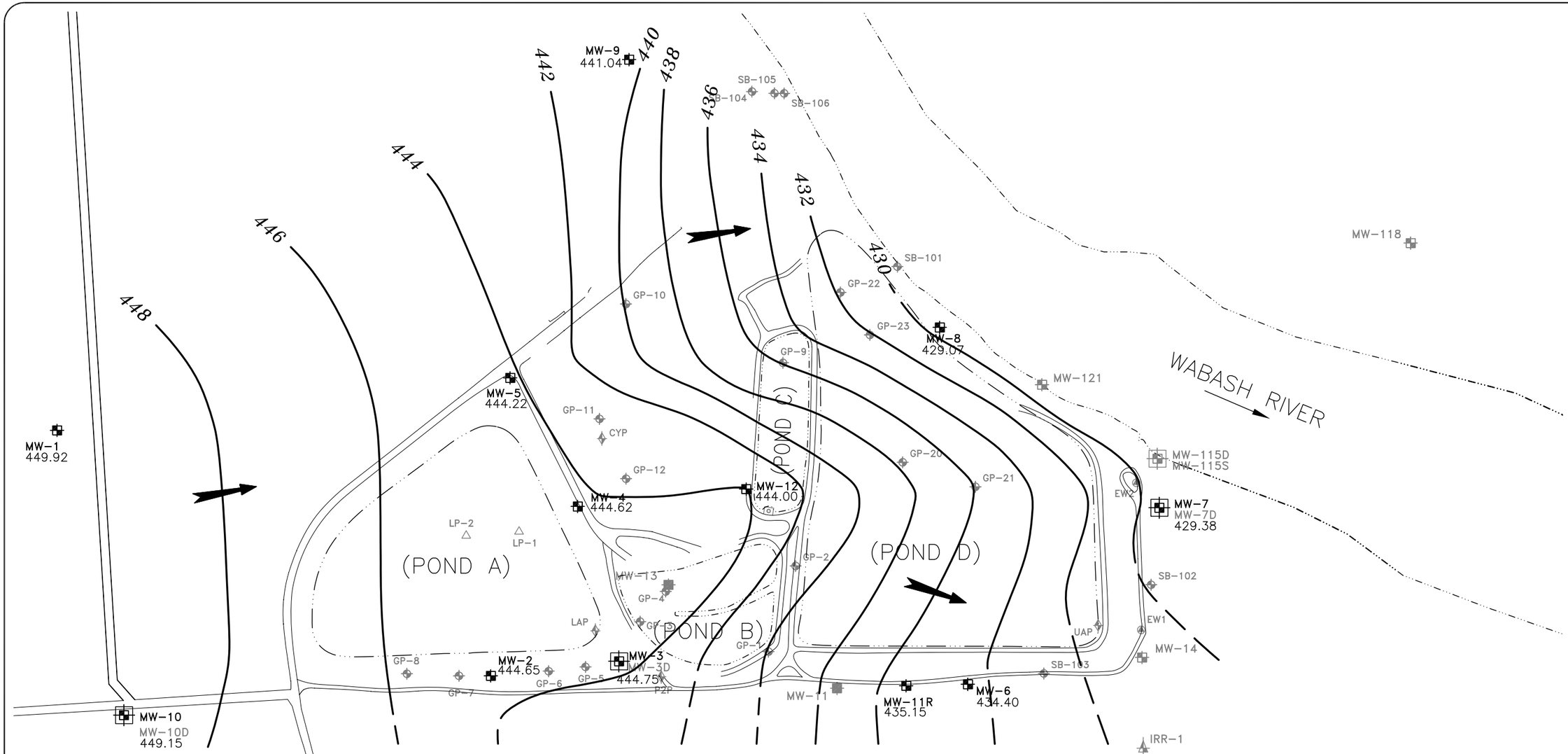
DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09

DRAWING NO: 1954-23-B03
REFERENCE: .

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-2



LEGEND

448	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-8 429.07	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-3 MW-3D 444.75	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09
DRAWING NO: 1954-23-B04		
REFERENCE:.		

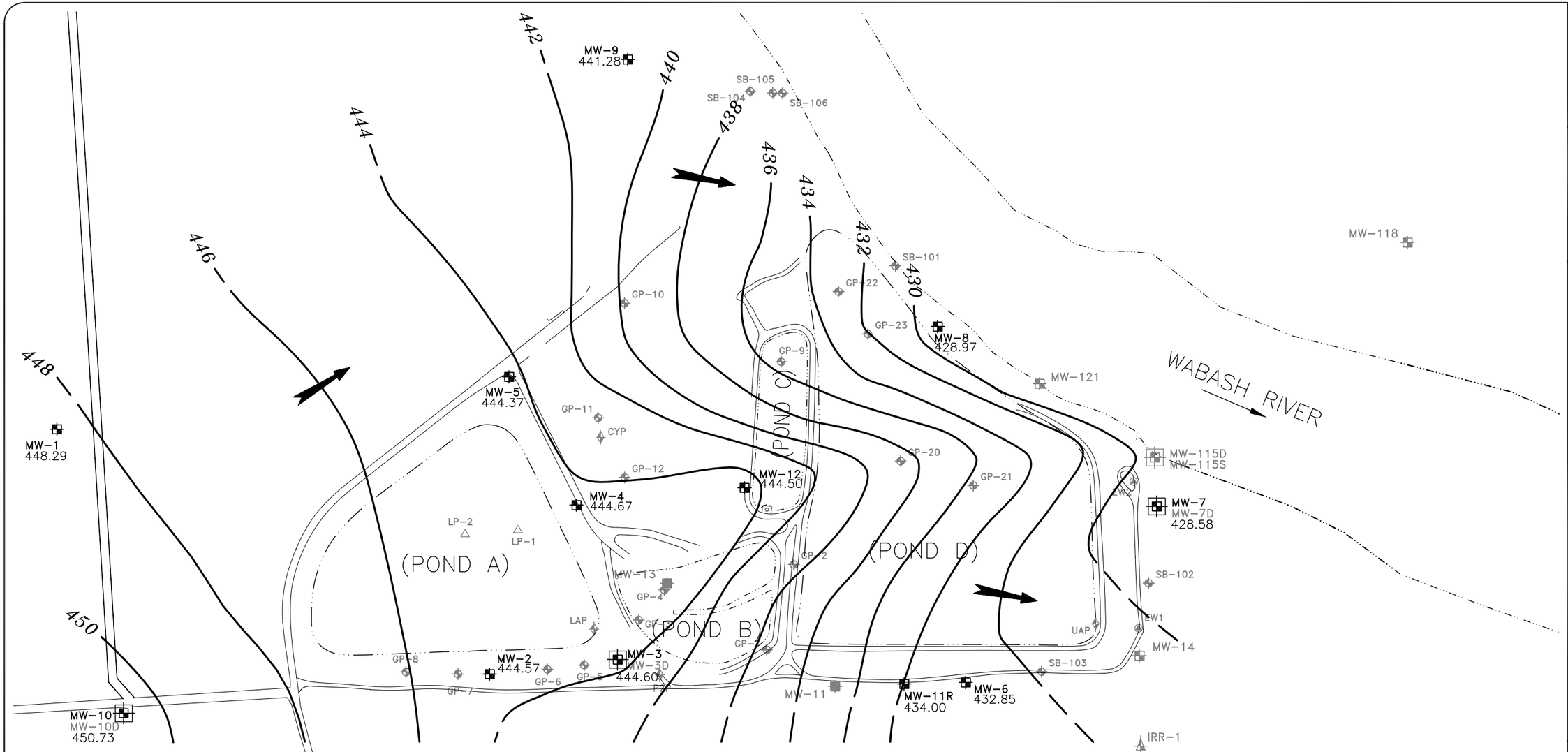
FOURTH QUARTER, 2003 UPPER MIGRATION ZONE FLOW CONTOURS

POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-3



LEGEND

448	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-8 428.97	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-3 MW-3D 444.60	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

FIRST QUARTER, 2004 UPPER MIGRATION ZONE FLOW CONTOURS
POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09

DRAWING NO: 1954-23-B05
REFERENCE: .

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-4

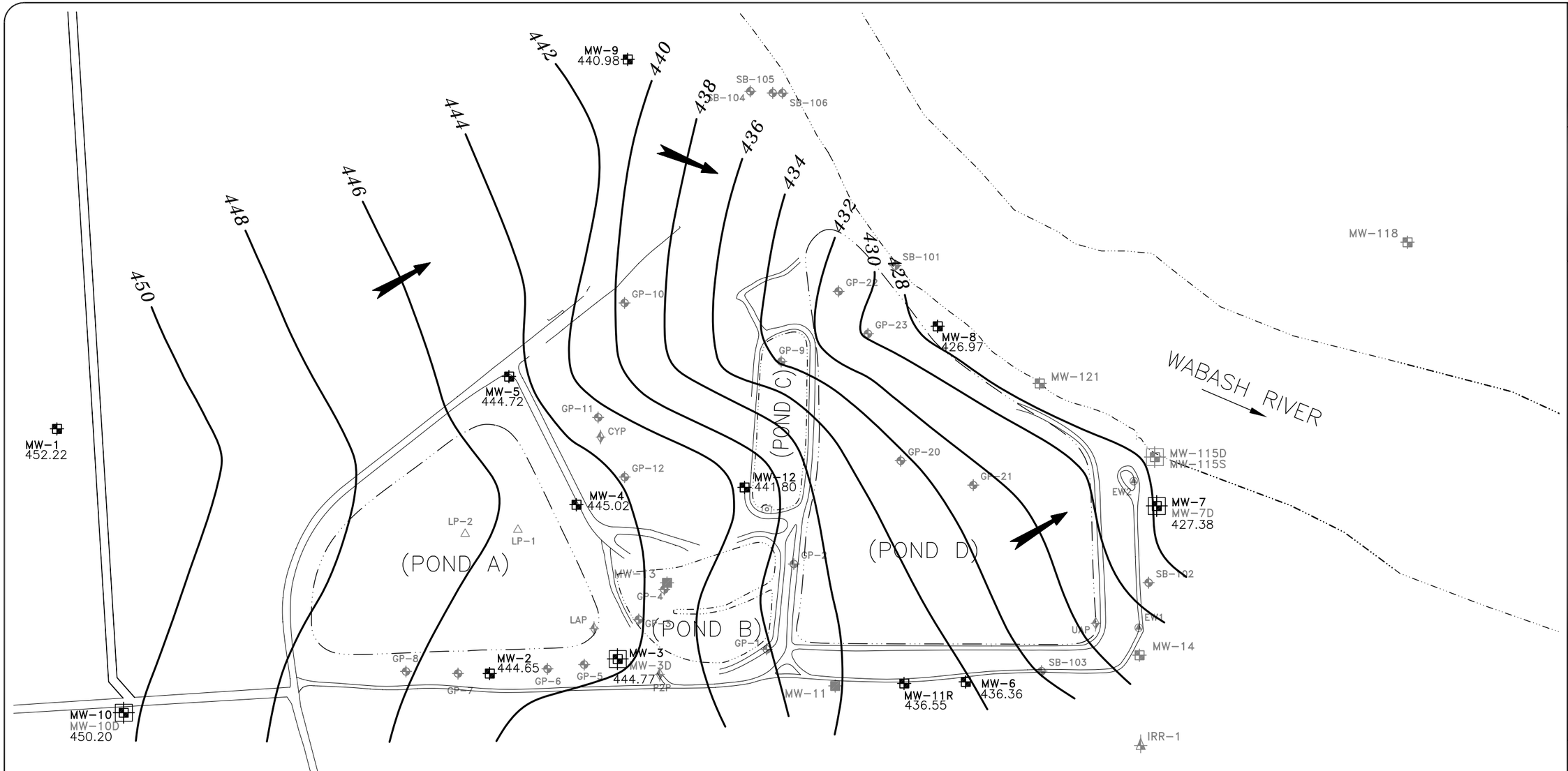
SECOND QUARTER, 2004 UPPER MIGRATION ZONE FLOW CONTOURS
POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

DRAWN BY: KNW	DATE:	04/03/09
CHECKED BY: KJB	DATE:	04/08/09
APPROVED BY: EJT	DATE:	04/24/09
DRAWING NO: 1954-23-B06		
REFERENCE: .		

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1954/2.3

FIGURE NO. 2-5



LEGEND

448	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-8 426.97	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-3 MW-3D 444.77	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT SB-01 DATED MAY 1, 1908 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

MW-9
441.55

SB-105
SB-104
SB-106

440
442
444
446
448
450
438
436
434
432
428
430

MW-118

SB-101
GP-22
GP-23
MW-8
428.77

GP-10
GP-9
MW-121

WABASH RIVER

MW-5
445.79

GP-1
CYP
GP-12

MW-1
451.38

MW-12
ND

GP-20
GP-21

MW-115D
MW-115S

EW2

MW-7
MW-7D
427.88

LP-2
LP-1

(POND A)

(POND C)

(POND D)

GP-2

MW-4
446.32

MW-13
GP-4
GP-3

SB-102

EW1

LAP

UAP

MW-14

GP-8
MW-2
445.69
GP-7
GP-6
GP-5
MW-3
MW-3D
445.96
PZP

(POND B)

GP-11

SB-103

MW-11

MW-11R
436.85

MW-6
435.80

MW-10
MW-10D
ND

IRR-1

LEGEND

448	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-8 428.77	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-3 MW-3D 445.96	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
—— ·· ——	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

DRAWN BY: KNW DATE: 04/03/09
CHECKED BY: KJB DATE: 04/08/09
APPROVED BY: EJT DATE: 04/24/09
DRAWING NO: 1954-23-B07
REFERENCE: .

FEBRUARY 12, 2007 UPPER MIGRATION ZONE FLOW CONTOURS
POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

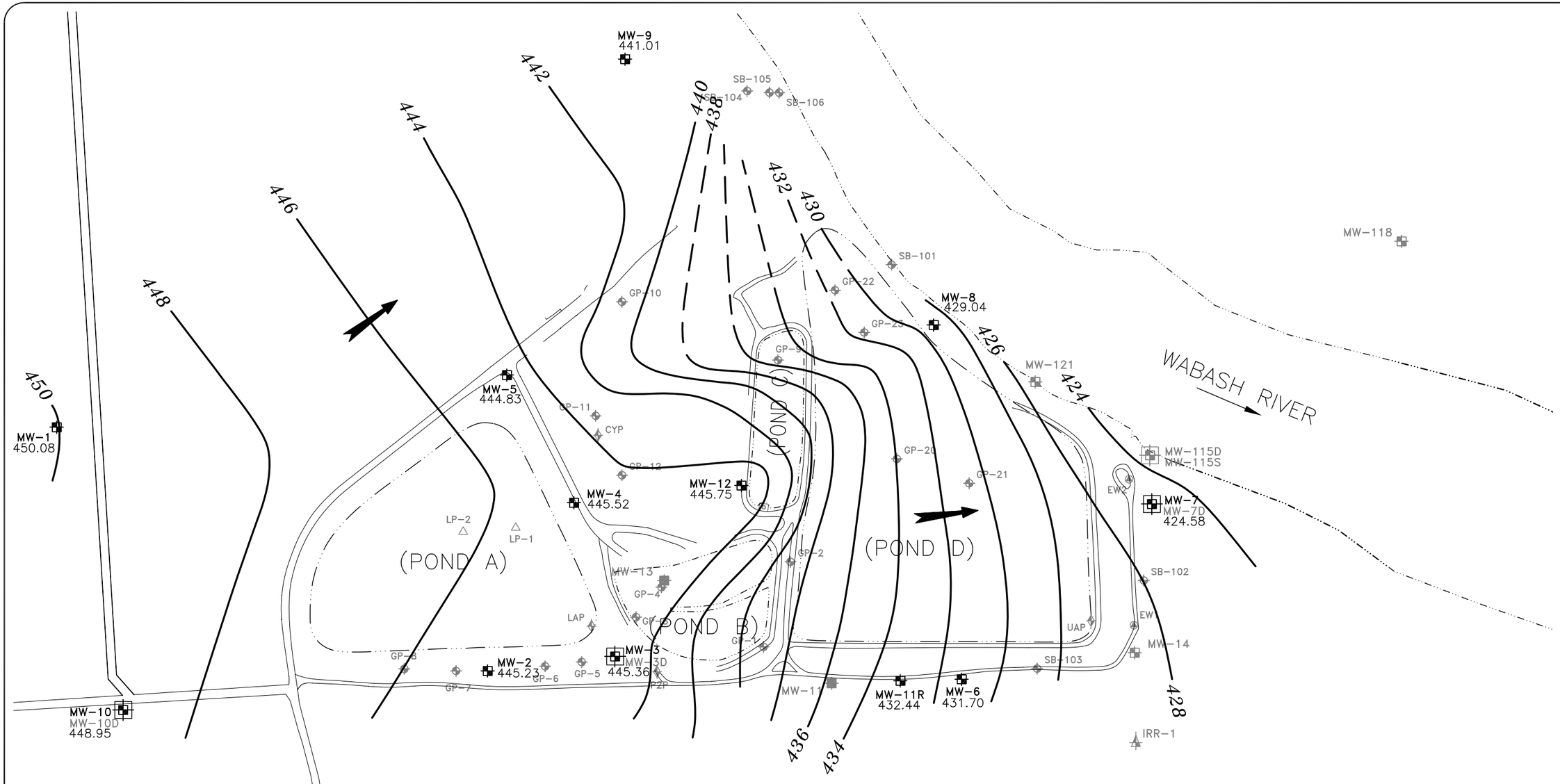
NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-6

MAY 13, 2007 UPPER MIGRATION ZONE FLOW CONTOURS
POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

DRAWN BY: KNW	DATE:	04/03/09
CHECKED BY: KJB	DATE:	04/08/09
APPROVED BY: EJT	DATE:	04/24/09
DRAWING NO: 1954-23-B08		
REFERENCE: .		



LEGEND

448	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-8 429.04	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-3 MW-3D 445.36	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO 502, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350

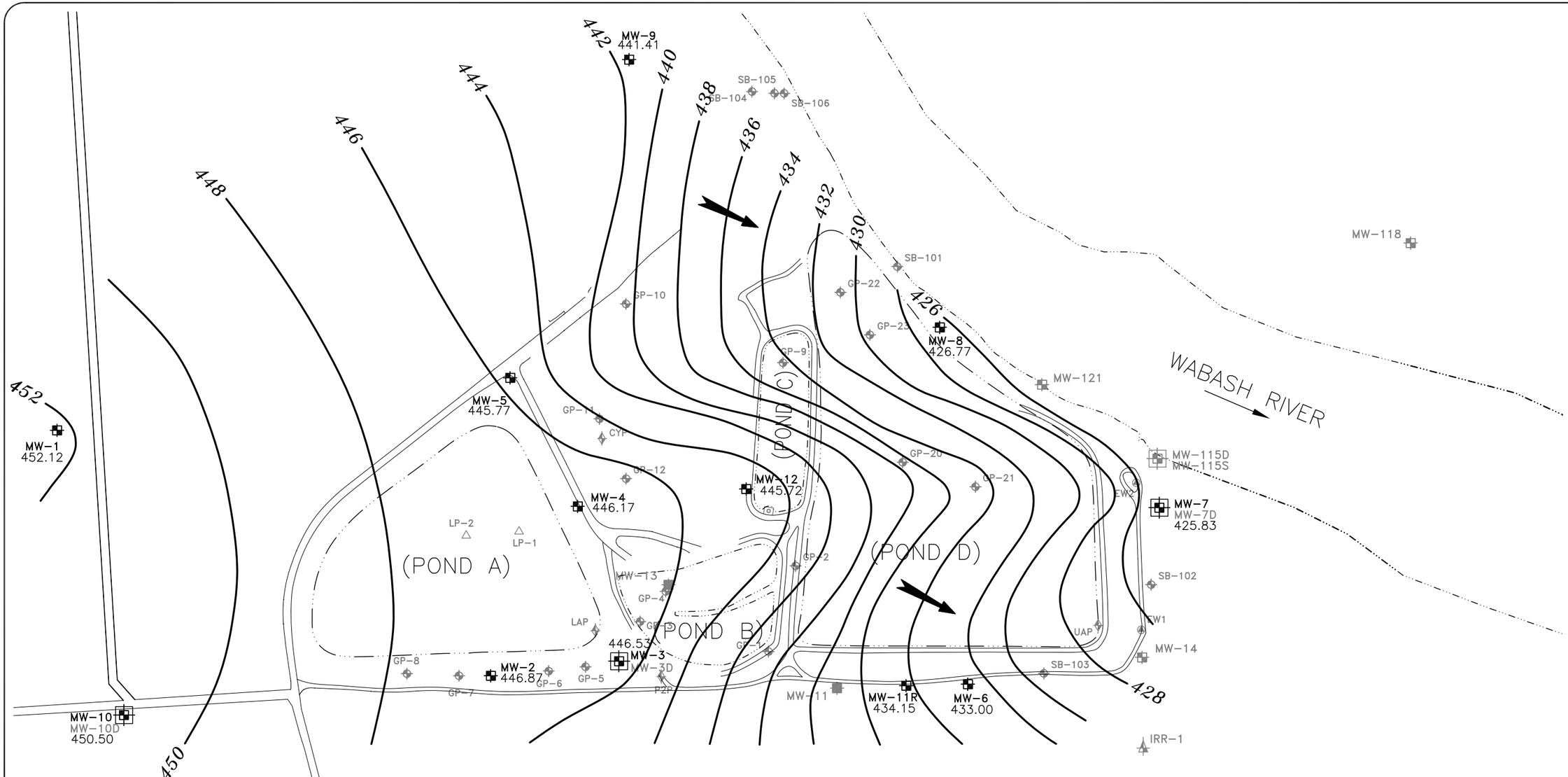
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-7



LEGEND

448	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-8 426.77	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-3 MW-3D 446.53	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

JULY 2, 2007 UPPER MIGRATION ZONE FLOW CONTOURS
POND D CLOSURE ALTERNATIVES REPORT
AMEREN SERVICES HUTSONVILLE POWER STATION
HUTSONVILLE, ILLINOIS

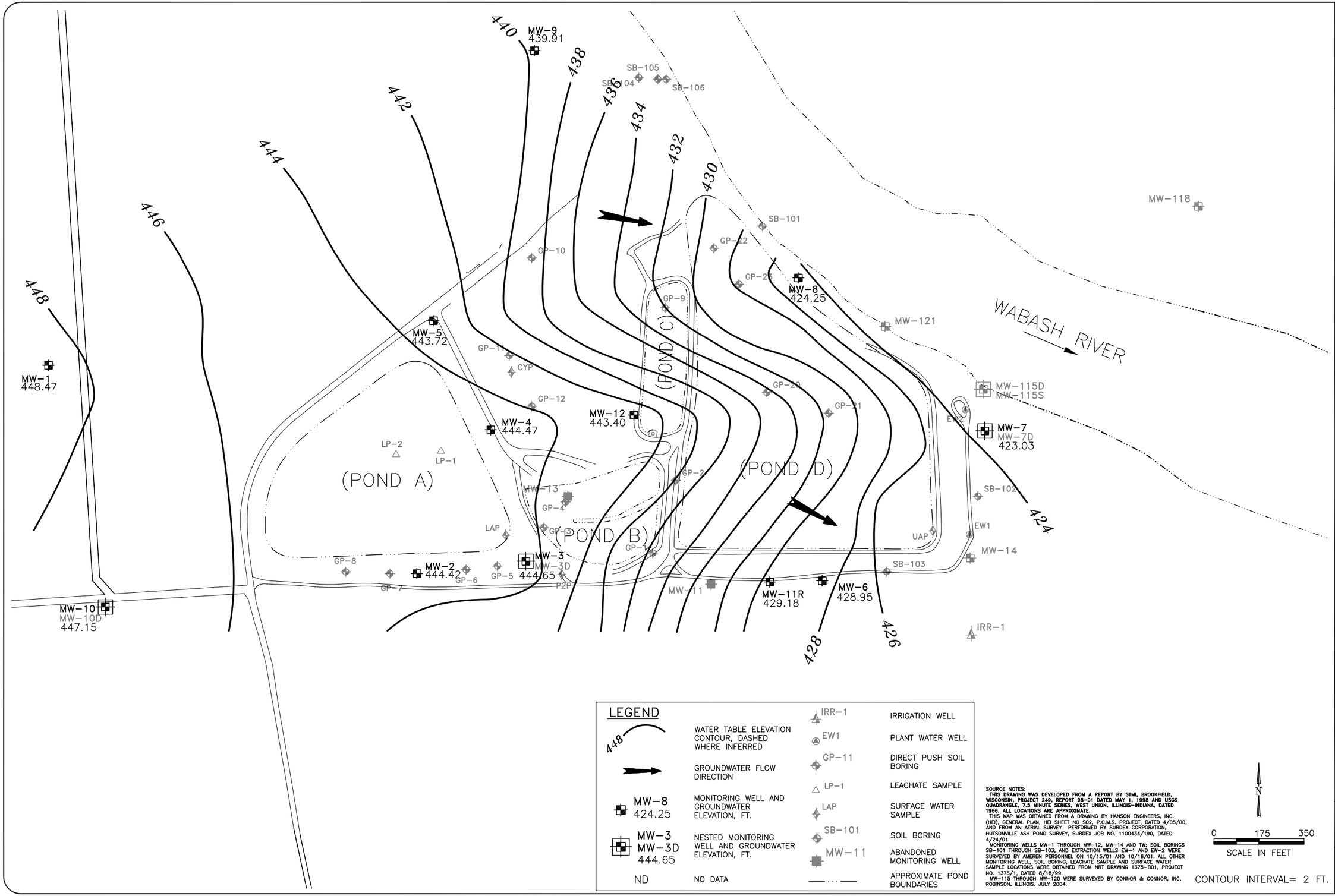
DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09

DRAWING NO: 1954-23-B09
REFERENCE: .

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-8



LEGEND

448	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-8 424.25	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-3 MW-3D 444.65	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1988. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09
DRAWING NO: 1954-23-B10		
REFERENCE:.		

OCTOBER 2, 2007 UPPER MIGRATION ZONE FLOW CONTOURS

POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

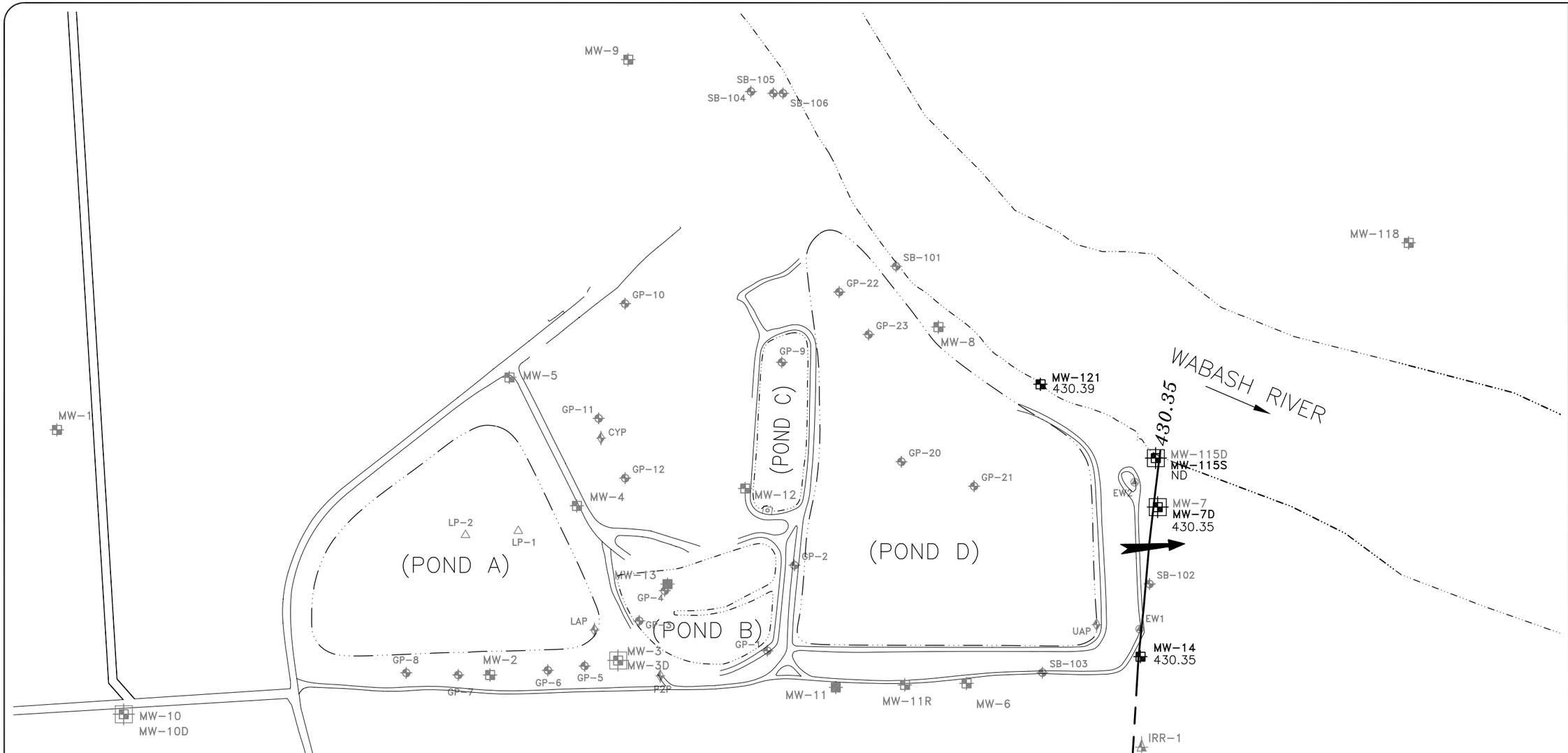
NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-9

THIRD QUARTER, 2003
DEEP ALLUVIAL AQUIFER FLOW
POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

DRAWN BY: KNW	DATE:	04/03/09
CHECKED BY: KJB	DATE:	04/08/09
APPROVED BY: BRH	DATE:	04/24/09
DRAWING NO: 1954-23-B11		
REFERENCE:.		



LEGEND

430.35	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-14 430.35	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-7 MW-7D 430.35	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

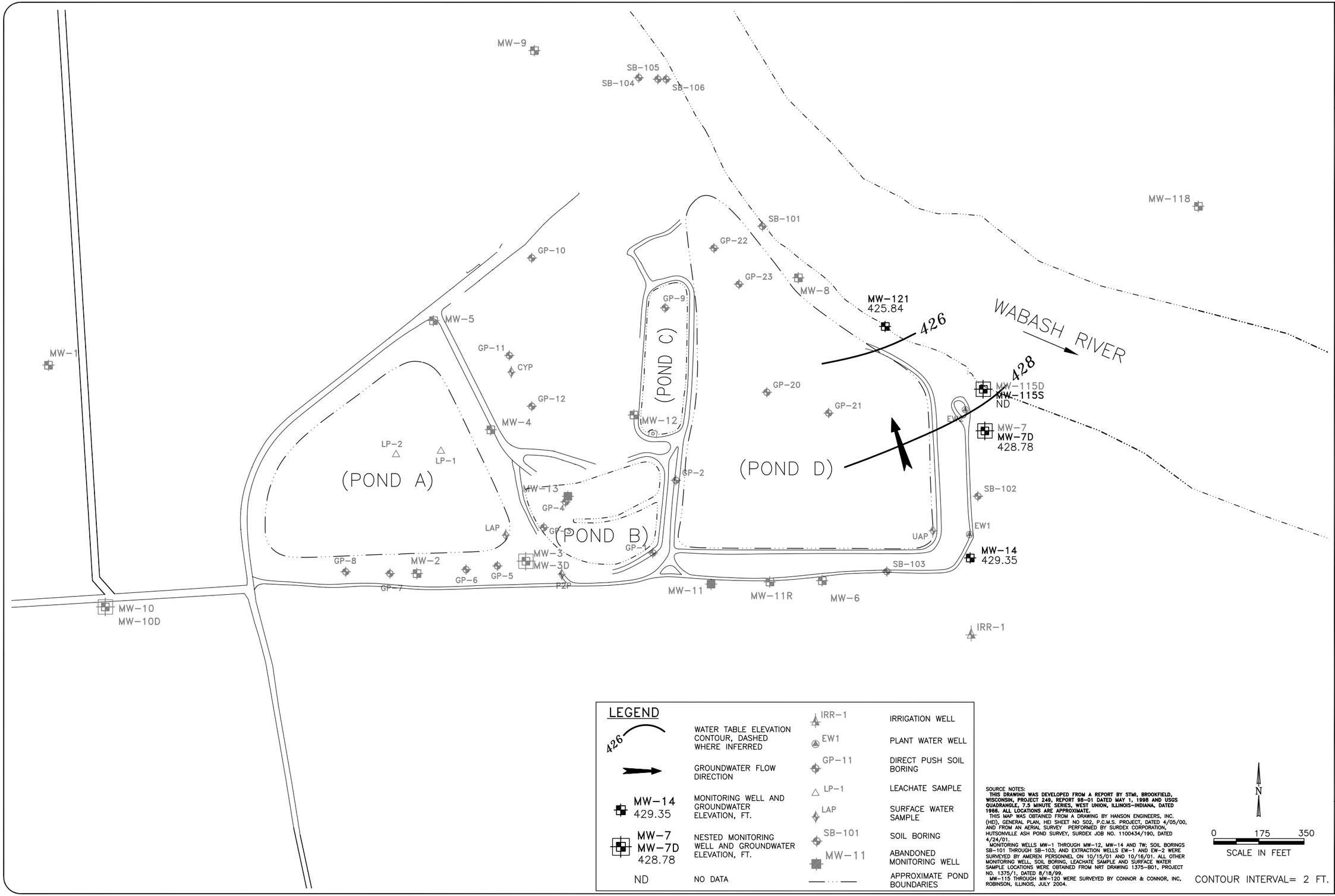
0 175 350
SCALE IN FEET

NO CONTOUR INTERVAL

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-10



LEGEND

426	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-14 429.35	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-7 MW-7D 428.78	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 110434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

FOURTH QUARTER, 2003
DEEP ALLUVIAL AQUIFER FLOW
POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

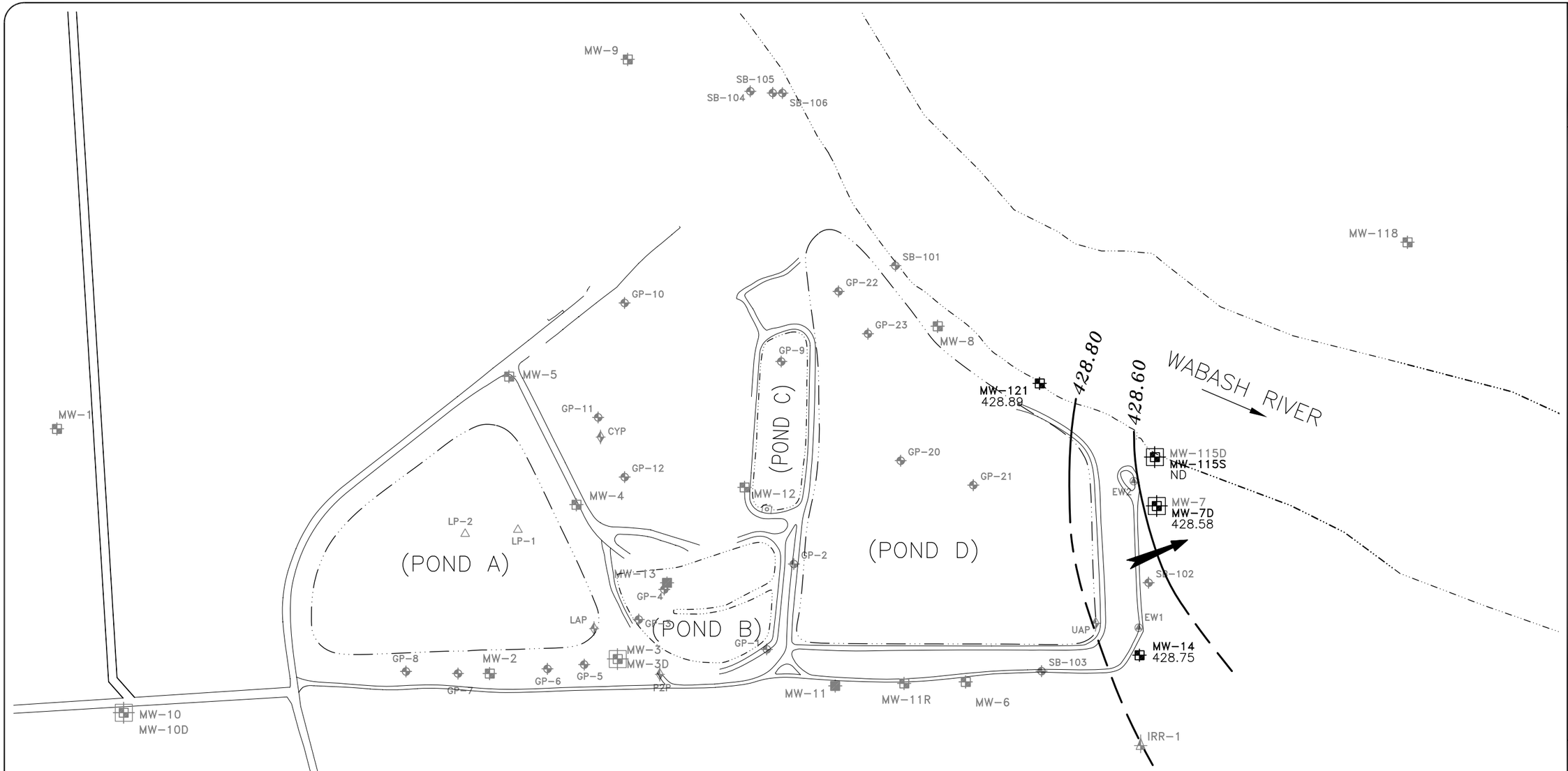
DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09

DRAWING NO: 1954-23-B12
REFERENCE:.

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-11



LEGEND

428.80	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-14 428.75	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-7 MW-7D 428.58	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1968. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 0.2 FT.

DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09
DRAWING NO: 1954-23-B13		
REFERENCE:.		

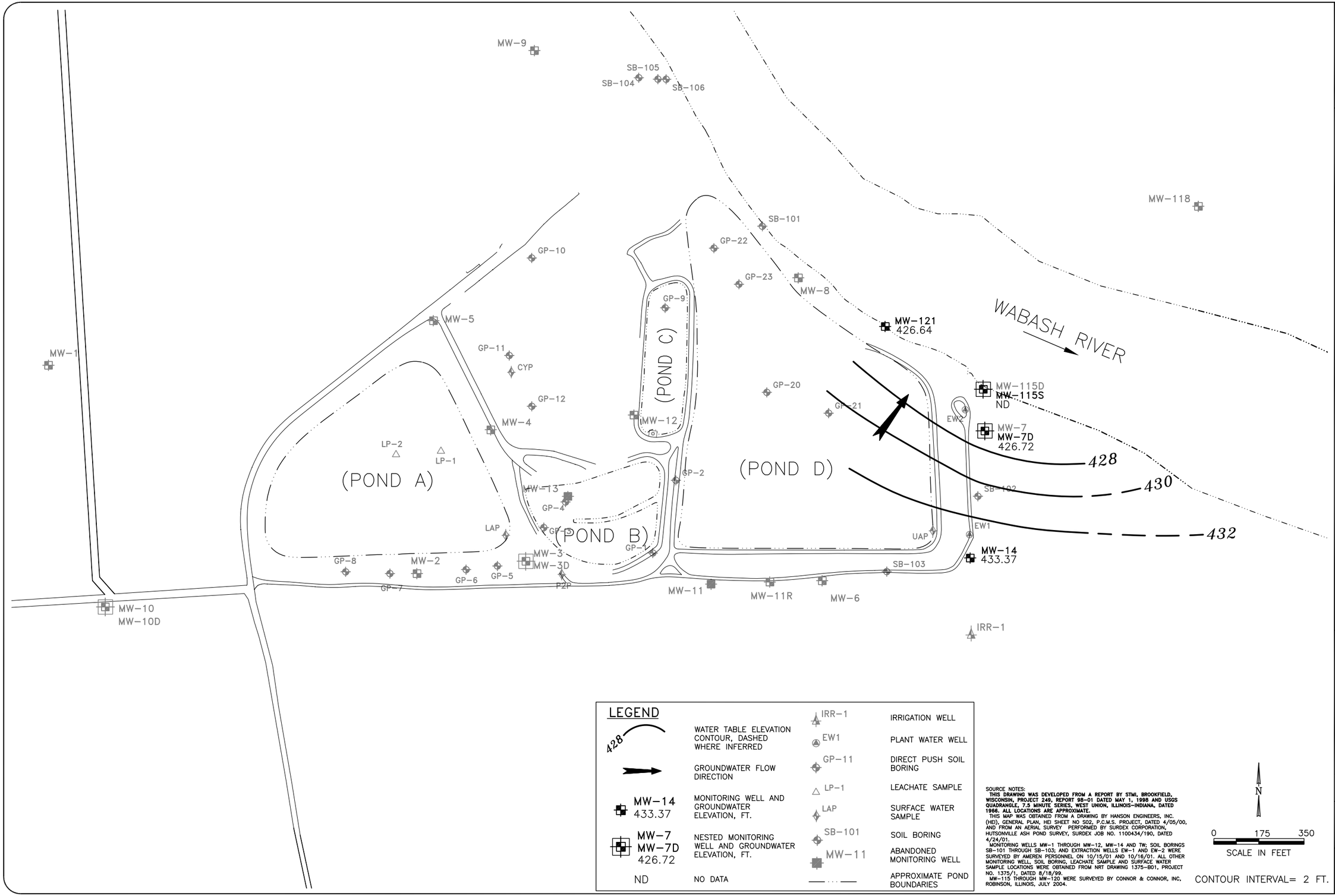
FIRST QUARTER, 2004 DEEP ALLUVIAL AQUIFER FLOW

POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-12



LEGEND

428	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-14 433.37	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-7 MW-7D 426.72	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09
DRAWING NO: 1954-23-B14		
REFERENCE:.		

SECOND QUARTER, 2004 DEEP ALLUVIAL AQUIFER FLOW

POND D CLOSURE ALTERNATIVES REPORT

AMEREN SERVICES

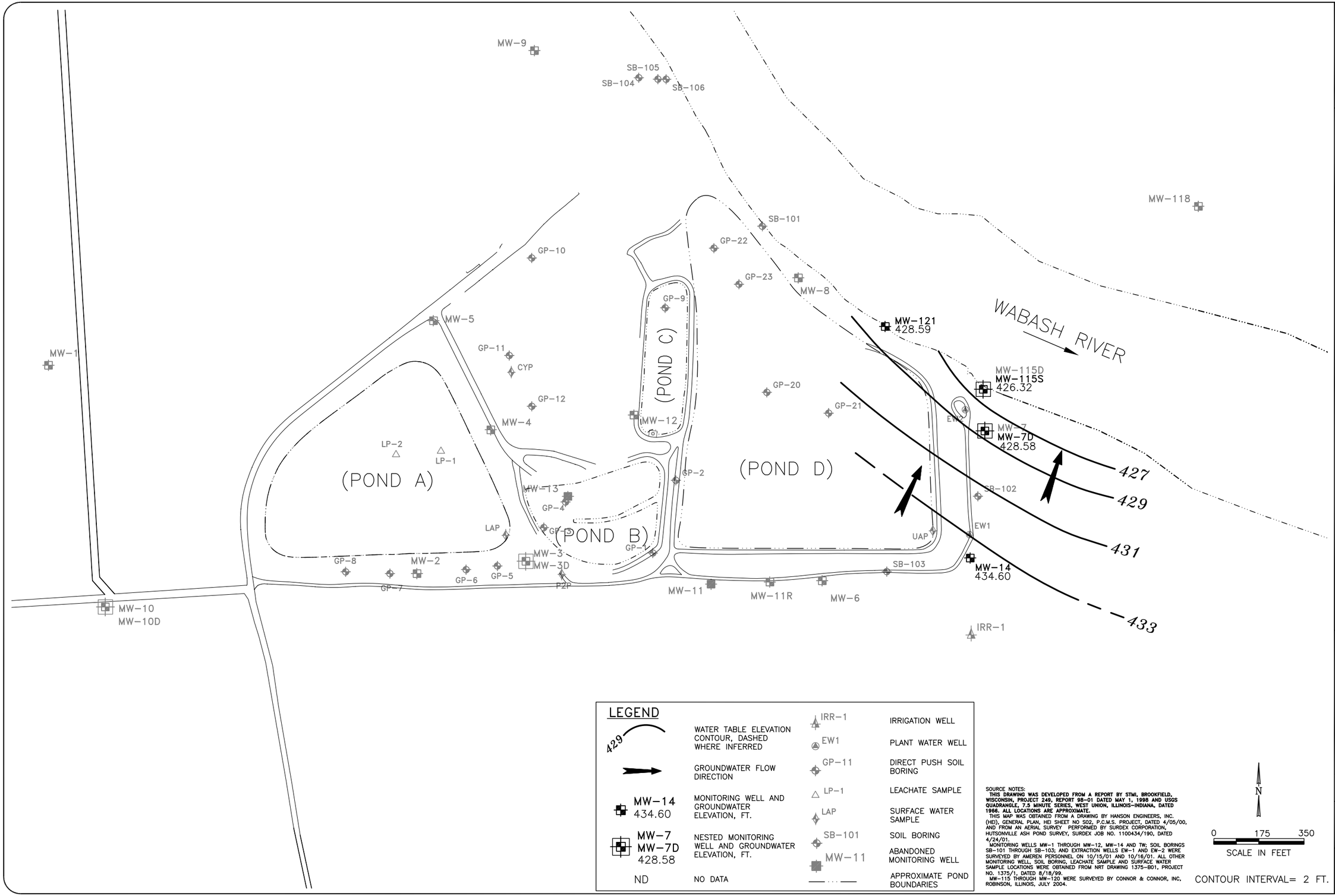
HUTSONVILLE POWER STATION

HUTSONVILLE, ILLINOIS

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1954/2.3

FIGURE NO. 2-13



LEGEND

429	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-14 434.60	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-7 MW-7D 428.58	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.O.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

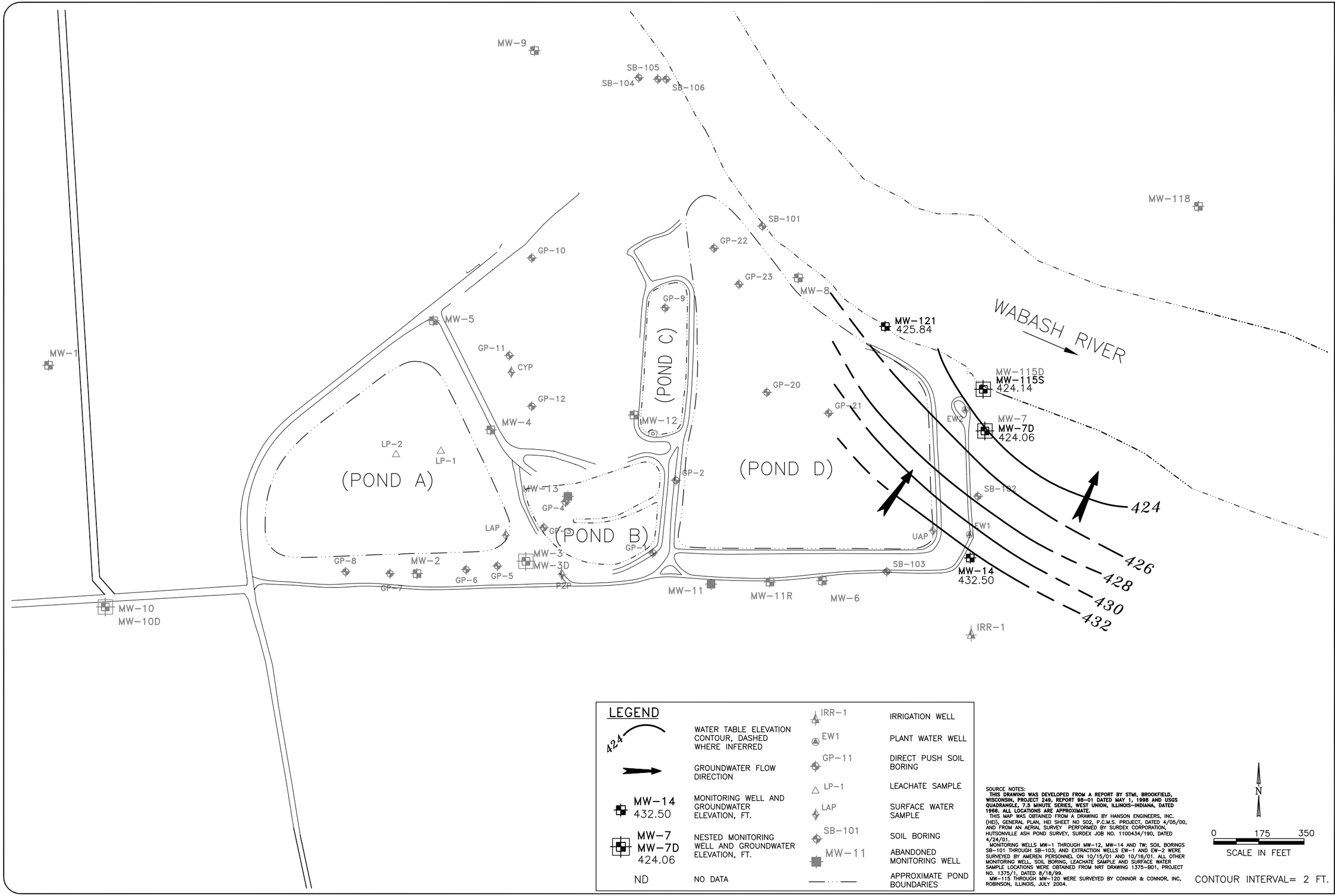
DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09
DRAWING NO: 1954-23-B15		
REFERENCE:.		

FEBRUARY 12, 2007
DEEP ALLUVIAL AQUIFER FLOW
POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-14



LEGEND

424	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-14 432.50	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-7 MW-7D 424.06	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 2 FT.

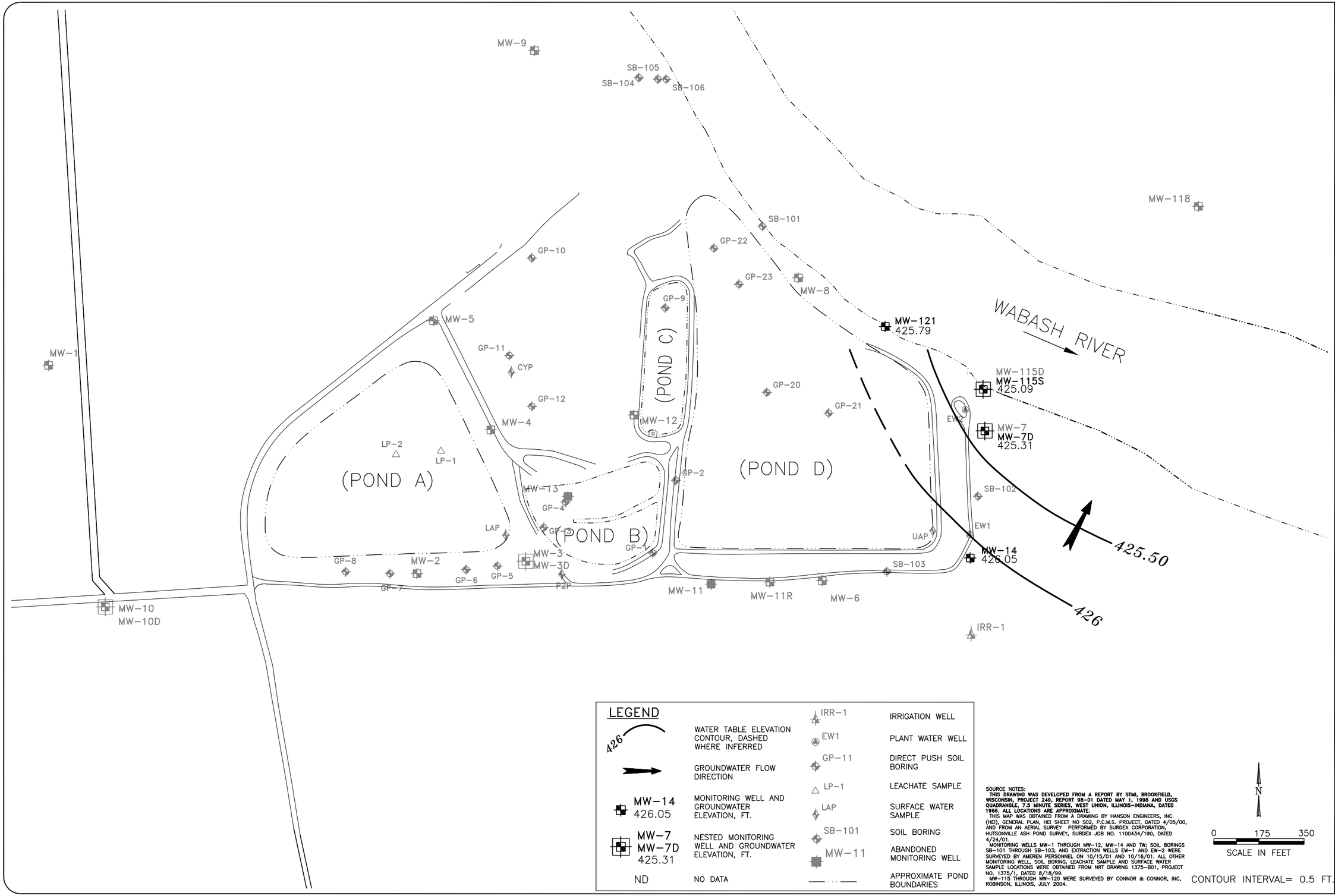
DRAWN BY: KNW	DATE: 04/03/09	
CHECKED BY: KJB	DATE: 04/08/09	
APPROVED BY: EJT	DATE: 04/24/09	
DRAWING NO: 1954-23-B16		
REFERENCE:.		

MAY 13, 2007
DEEP ALLUVIAL AQUIFER FLOW
POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES
HUTSONVILLE, ILLINOIS

NATURAL RESOURCE TECHNOLOGY

PROJECT NO. 1954/2.3

FIGURE NO. 2-15



LEGEND

426	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-14 426.05	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-7 MW-7D 425.31	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT SB-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 0.5 FT.

JULY 2, 2007
DEEP ALLUVIAL AQUIFER FLOW
POND D CLOSURE ALTERNATIVES REPORT
AMEREN SERVICES
HUTSONVILLE POWER STATION
HUTSONVILLE, ILLINOIS

DRAWN BY:	KNW	DATE: 04/03/09
CHECKED BY:	KJB	DATE: 04/08/09
APPROVED BY:	EJT	DATE: 04/24/09

DRAWING NO: 1954-23-B17
REFERENCE:.

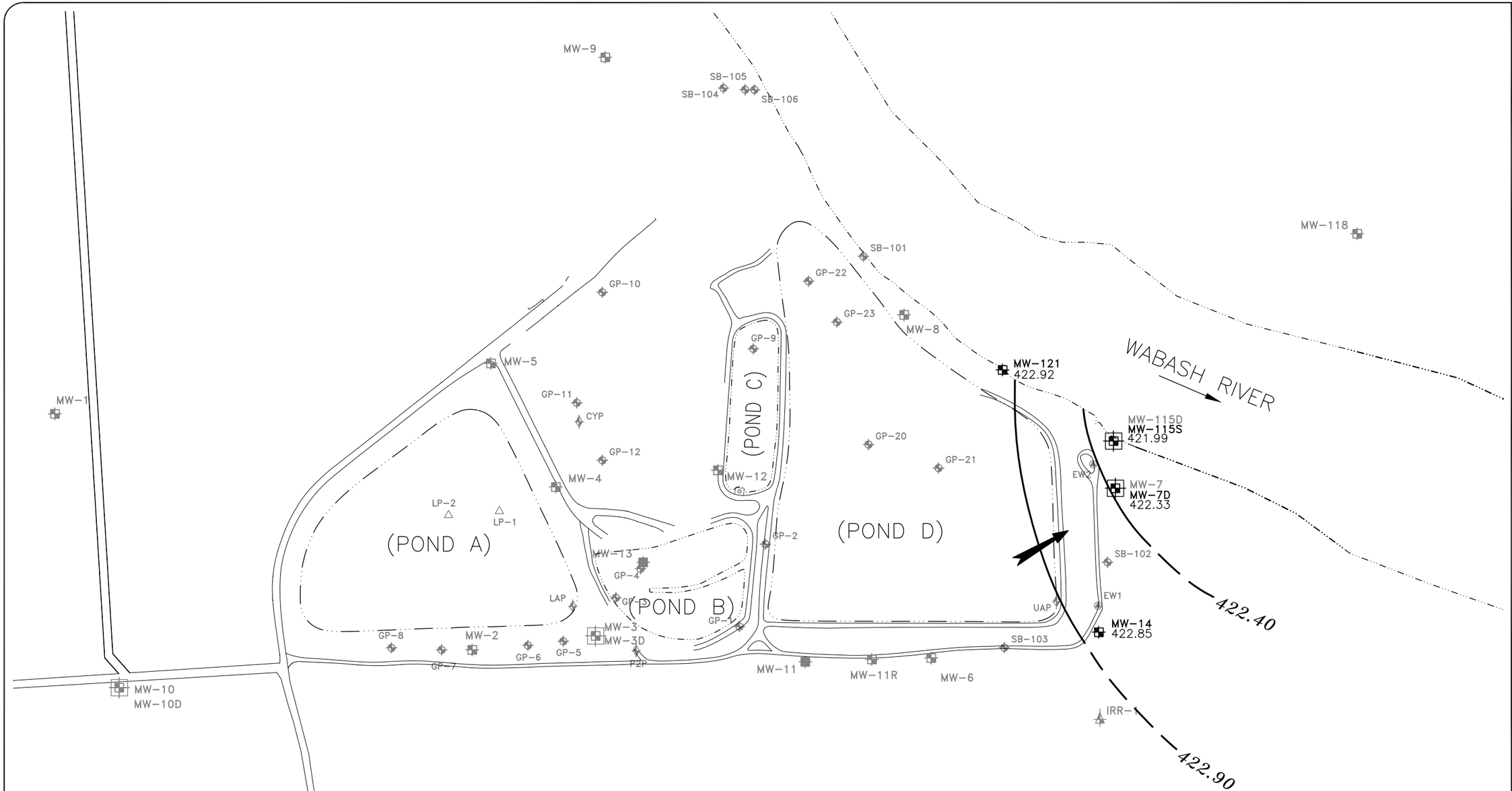
NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-16

OCTOBER 2, 2007
DEEP ALLUVIAL AQUIFER FLOW
POND D CLOSURE ALTERNATIVES REPORT
AMEREN SERVICES
HUTSONVILLE POWER STATION
HUTSONVILLE, ILLINOIS

DRAWN BY: KNW	DATE: 04/03/09	
CHECKED BY: KBJ	DATE: 04/08/09	
APPROVED BY: EJT	DATE: 04/24/09	
DRAWING NO: 1954-23-B18		
REFERENCE:.		



LEGEND

422.40	WATER TABLE ELEVATION CONTOUR, DASHED WHERE INFERRED
	GROUNDWATER FLOW DIRECTION
MW-14 422.85	MONITORING WELL AND GROUNDWATER ELEVATION, FT.
MW-7 MW-7D 422.33	NESTED MONITORING WELL AND GROUNDWATER ELEVATION, FT.
ND	NO DATA
IRR-1	IRRIGATION WELL
EW1	PLANT WATER WELL
GP-11	DIRECT PUSH SOIL BORING
LP-1	LEACHATE SAMPLE
LAP	SURFACE WATER SAMPLE
SB-101	SOIL BORING
MW-11	ABANDONED MONITORING WELL
	APPROXIMATE POND BOUNDARIES

SOURCE NOTES:
THIS DRAWING WAS DEVELOPED FROM A REPORT BY STMI, BROOKFIELD, WISCONSIN, PROJECT 249, REPORT 98-01 DATED MAY 1, 1998 AND USGS QUADRANGLE, 7.5 MINUTE SERIES, WEST UNION, ILLINOIS-INDIANA, DATED 1966. ALL LOCATIONS ARE APPROXIMATE.
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN, HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
MW-115 THROUGH MW-120 WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

N

0 175 350
SCALE IN FEET

CONTOUR INTERVAL= 0.5 FT.

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
1954/2.3

FIGURE NO.
2-17

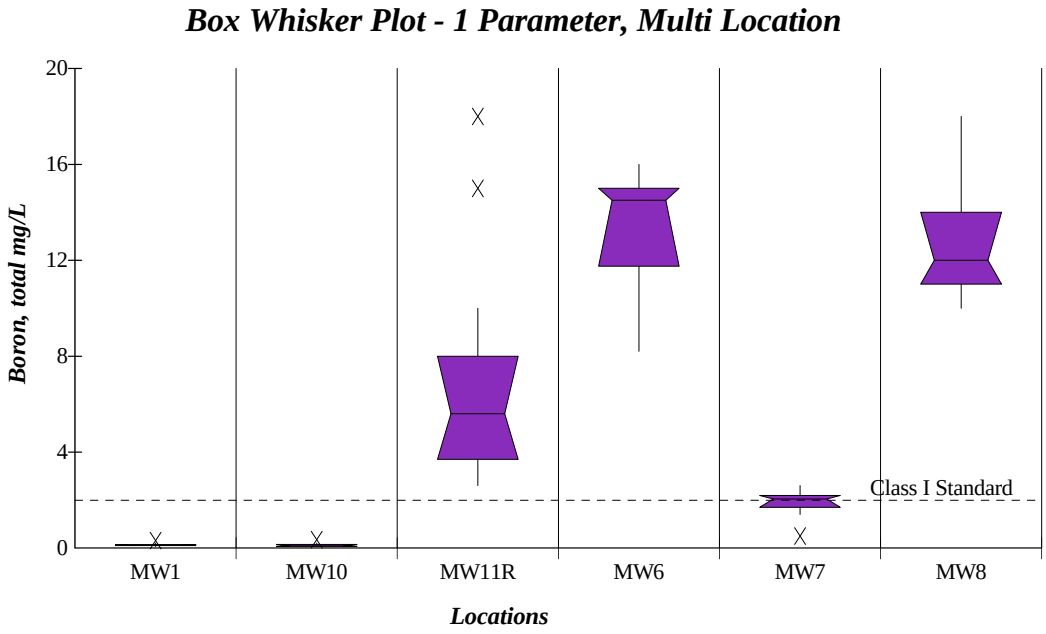


Figure 2-18a. Box-whisker plot showing boron concentrations in the upper migration zone from 2002 through 2008. MW1 and MW10 are upgradient wells.

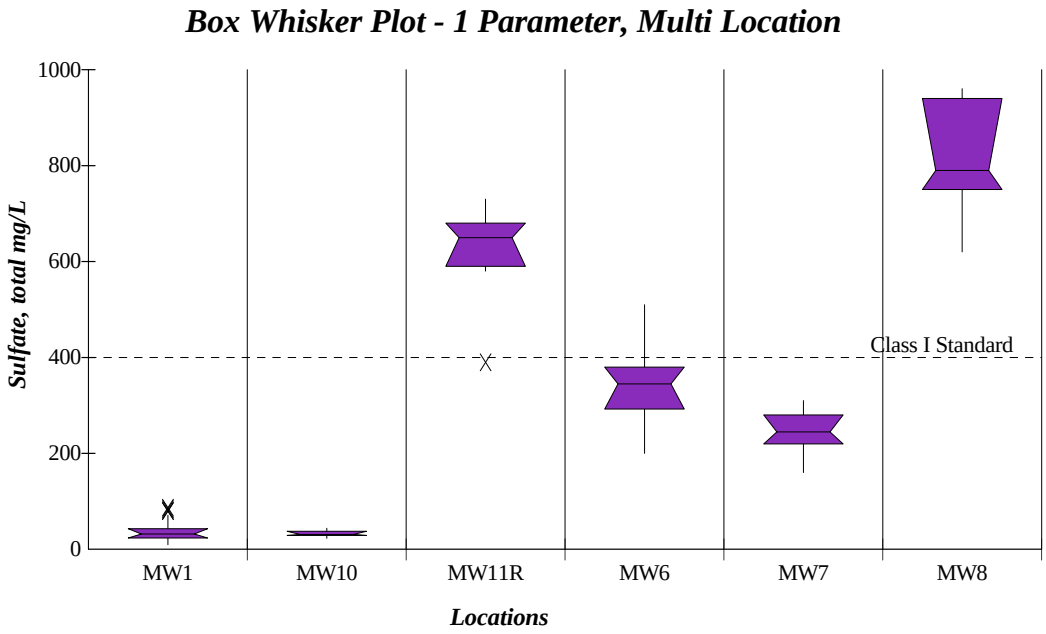


Figure 2-18b. Box-whisker plot showing sulfate concentrations in the upper migration zone from 2002 through 2008. MW1 and MW10 are upgradient wells.

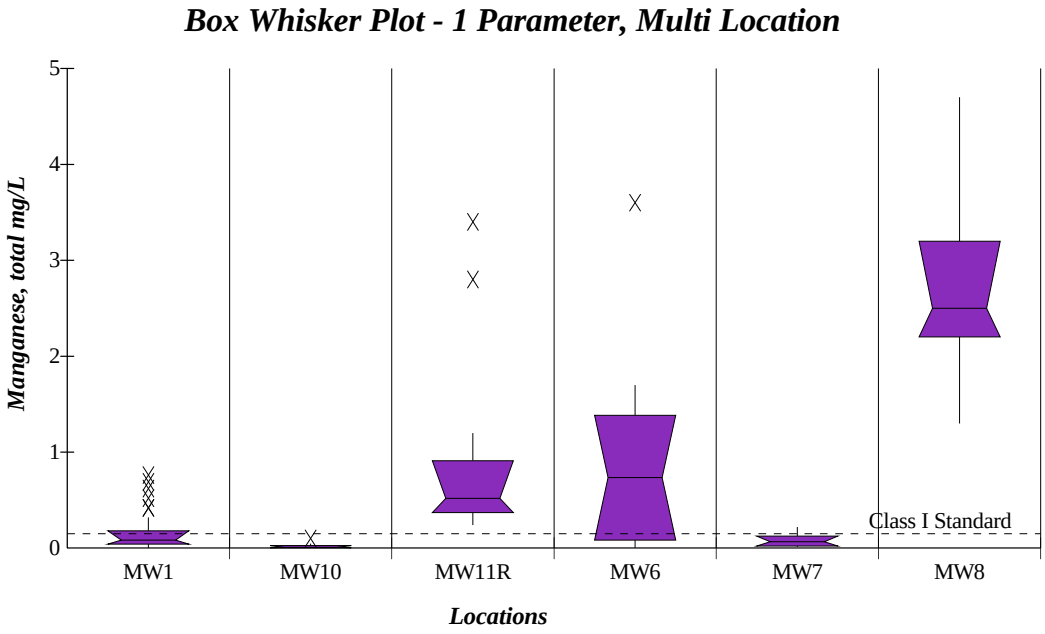


Figure 2-18c. Box-whisker plot showing manganese concentrations in the upper migration zone from 2002 through 2008. MW1 and MW10 are upgradient wells.

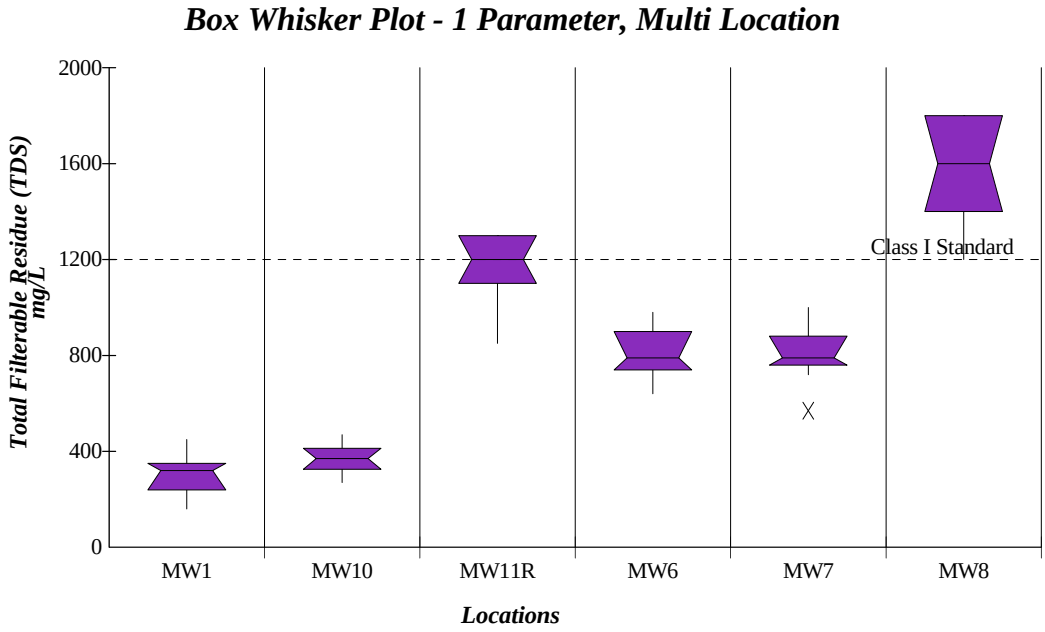


Figure 2-18d. Box-whisker plot showing TDS concentrations in the upper migration zone from 2002 through 2008. MW1 and MW10 are upgradient wells.

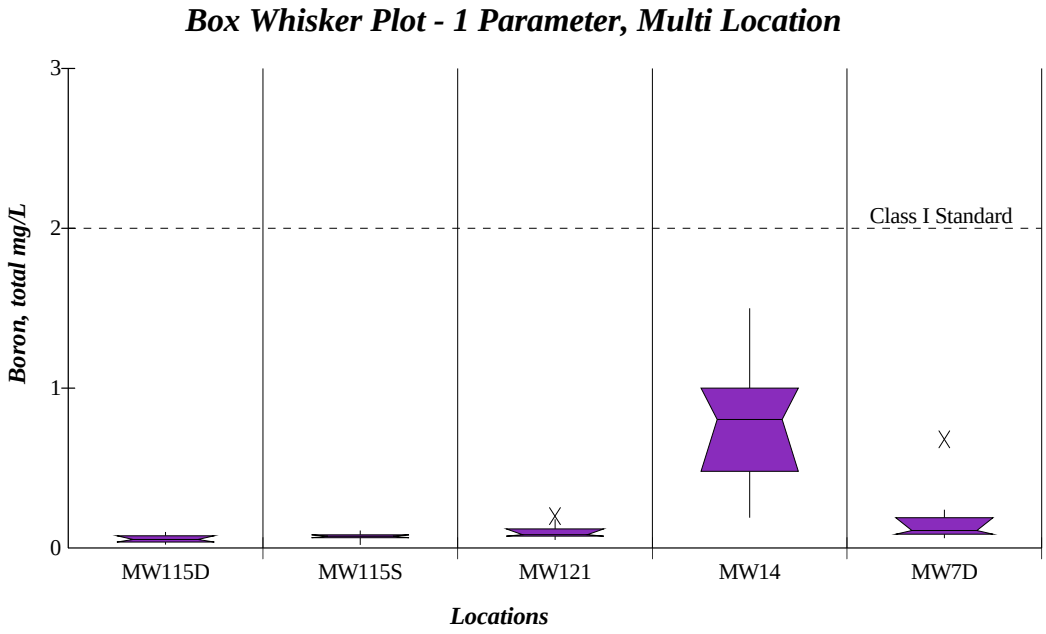


Figure 2-19a. Box-whisker plot showing boron concentrations in the deep alluvial aquifer from 2002 through 2008.

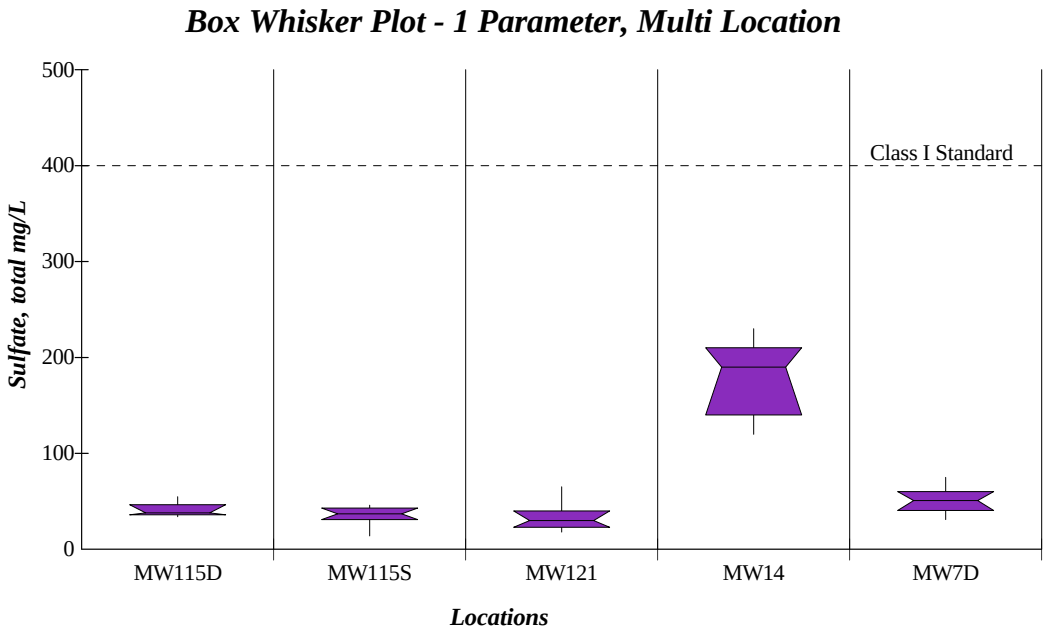


Figure 2-19b. Box-whisker plot showing sulfate concentrations in the deep alluvial aquifer from 2002 through 2008.

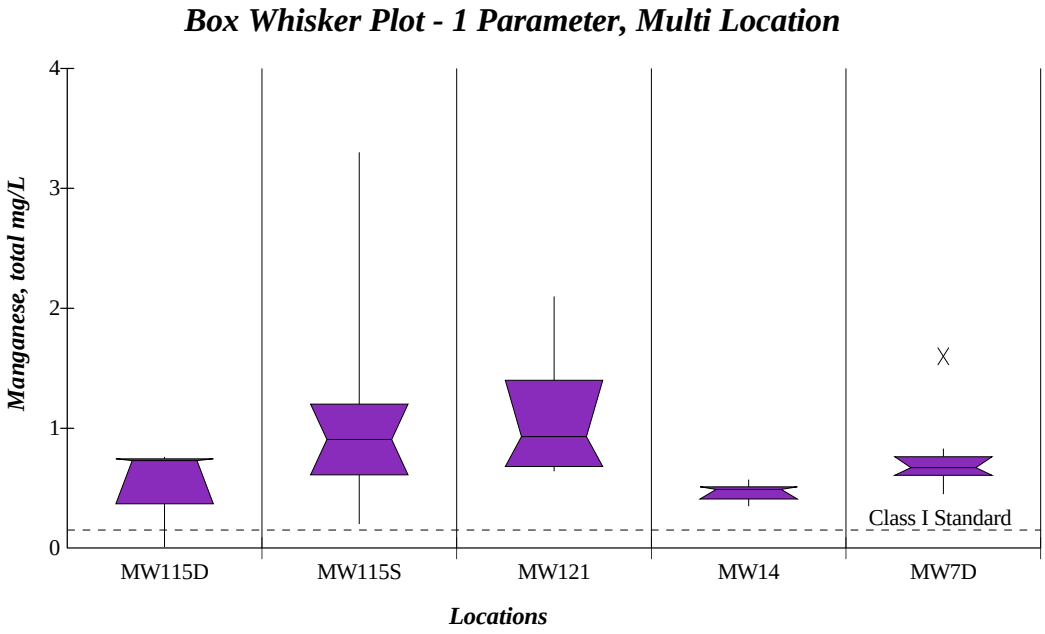


Figure 2-19c. Box-whisker plot showing manganese concentrations in the deep alluvial aquifer from 2002 through 2008.

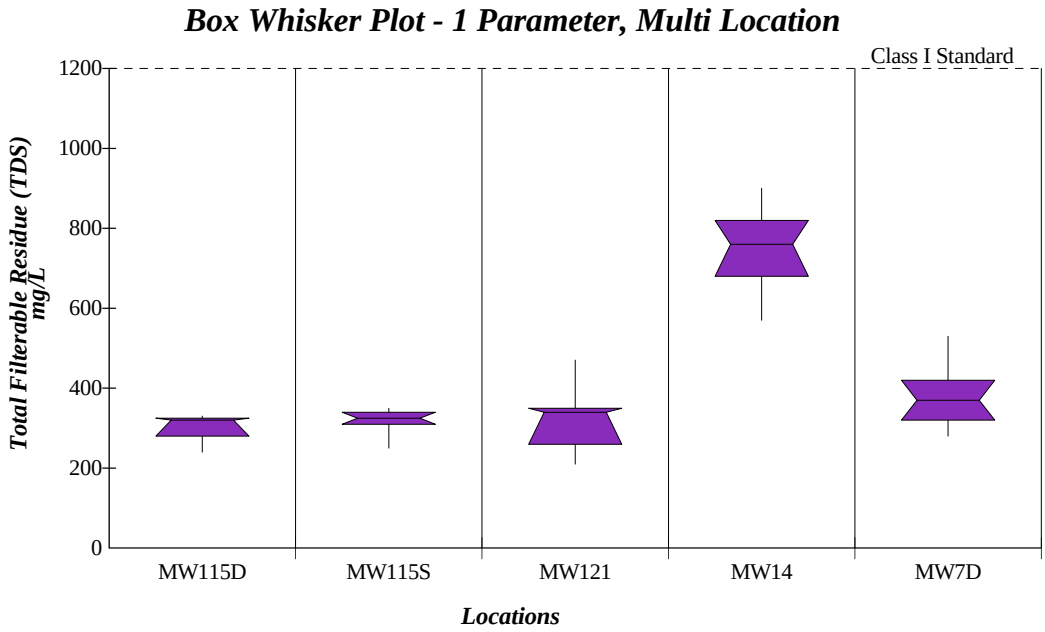


Figure 2-19d. Box-whisker plot showing TDS concentrations in the deep alluvial aquifer from 2002 through 2008.

SELECTED CLOSURE ALTERNATIVES

POND D CLOSURE ALTERNATIVES REPORT
HUTSONVILLE POWER STATION
AMEREN SERVICES, HUTSONVILLE, ILLINOIS

FIGURE NO. 4-1

DRAWING NO: 1954-23-B22
REFERENCE: -

PROJECT NO.	DARWAN BY:	CHECKED BY:	APPROVED BY:
1954/2.3	KNW 04/03/09	KJB 04/08/09	EJT 04/24/09

NATURAL RESOURCE TECHNOLOGY

LEGEND

- PROPOSED FINAL COVER EXTENT
- PROPOSED GROUNDWATER COLLECTION SUMP
- PROPOSED ALIGNMENT OF COLLECTION TRENCH
- PROPOSED UNDERGROUND TRANSFER PIPE
- MIN 5% SLOPE — PROPOSED COVER SLOPE
- TW — TEMPORARY MONITORING WELL
- M-1 — MONITORING WELL
- M-3 / M-3D — NESTED MONITORING WELL
- MW-11 — ABANDONED MONITORING WELL
- GP-11 — DIRECT PUSH SOIL BORING
- LP-1 — LEACHATE SAMPLE
- EW1 — PLANT WATER WELL
- SB-101 — SOIL BORING
- LAP — SURFACE WATER SAMPLE
- FENCE

PLAN 38° TRUE NORTH

0 50 100 200
SCALE IN FEET

SOURCE NOTES:
THIS MAP WAS OBTAINED FROM A DRAWING BY HANSON ENGINEERS, INC. (HEI), GENERAL PLAN; HEI SHEET NO S02, P.C.M.S. PROJECT, DATED 4/05/00, AND FROM AN AERIAL SURVEY PERFORMED BY SURDEX CORPORATION, HUTSONVILLE ASH POND SURVEY, SURDEX JOB NO. 1100434/190, DATED 4/24/01.
MONITORING WELLS MW-1 THROUGH MW-12, MW-14 AND TW; SOIL BORINGS SB-101 THROUGH SB-103; AND EXTRACTION WELLS EW-1 AND EW-2 WERE SURVEYED BY AMEREN PERSONNEL ON 10/15/01 AND 10/16/01. ALL OTHER MONITORING WELL, SOIL BORING, LEACHATE SAMPLE AND SURFACE WATER SAMPLE LOCATIONS WERE OBTAINED FROM NRT DRAWING 1375-B01, PROJECT NO. 1375/1, DATED 8/18/99.
TW-115D AND TW-115S WERE SURVEYED BY CONNOR & CONNOR, INC, ROBINSON, ILLINOIS, JULY 2004.

NOTES:
1. DISCONTINUITIES BETWEEN SURVEYS ARE INDICATED BY BREAKS IN CONTOUR LINES.
2. SOIL BORINGS GP-1 THROUGH GP-4, GP-9 AND SURFACE WATER SAMPLE P2P ARE SCREENED SINCE THEY ARE ASSOCIATED WITH FORMER ASH LAYDOWN AREA NOW REPLACED WITH THE INTERIM POND AND THE DRAINAGE COLLECTION POND. SEE NRT REPORT "HYDROGEOLOGIC ASSESSMENT" FOR FURTHER INFORMATION.

SB-106
HUTSONVILLE POWER STATION
BOTTOM ASH POND
WABASH RIVER
SB-101
GP-10
COAL STORAGE PILE
EXISTING BOX CULVERT FOR DIVERSION OF SURFACE WATER TO POND C
GP-9
DRAINAGE COLLECTION POND (POND C)
MW-8
MW-5
GP-11
CYP
GP-12
OIL TANK
MW-12
MW-4
LP-2
LP-1
GROUNDWATER COLLECTION CONTROL BUILDING
GROUNDWATER COLLECTION DISCHARGE PIPE
GP-2
MW-13
GP-4
GP-3
LAP
LINED FLY ASH POND (POND A)
INTERIM POND (POND B)
UNLINED FLY ASH POND (POND D)
MIN 5% SLOPE
TW
TW-115D
TW-115S
EW2
MW-7
MW-7D
SB-103
EW1
MW-14
GP-8
GP-7
MW-2
GP-6
GP-5
MW-3
MW-3D
P2P
MW-11
MW-11R
MW-6

TABLES

Table 2-1 - Soil Boring and Discrete Groundwater Sampling Data

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3

Hutsonville Power Station — BY: AAS/KJB CHKD BY: RJC/CAR/EJT

Ameren Services — DATE: O-11/01; U-4/09

Location	Northing (ft)	Easting (ft)	Ground Elevation (ft, MSL[2])	Target Sample Depth (ft, BGS[2])	Depth to Water (ft, BGS)	Bedrock Surface Depth & Elevation (ft, BGS)	(ft, MSL)
SB-101	4325	5483	440	no water sample	unknown	>34.5	<405.5
SB-102	2982	5497	440	(17.5-19.5)(26-29)	unknown	>29.0	<410.8
SB-103	2969	5038	442	no water sample	unknown	29.0	412.6
SB-104	--[9]	--[9]	--[9]	no water sample	unknown	11.0	--[9]
SB-105	--[9]	--[9]	--[9]	no water sample	unknown	9.0	--[9]
SB-106	--[9]	--[9]	--[9]	no water sample	unknown	>24.5	--[9]
GP-1	3586	4366	460	17 [3]	14	17.3	442.5
GP-2	3753	4610	457	19	9	20.0	437.3
GP-3	3924	4093	459	16	11	16.0	443.3
GP-4	3951	4221	459	16	10	17.0	442.4
GP-5	3918	3859	453	11	6	11.3	441.9
GP-6	3981	3754	453	10	6	10.5	442.5
GP-7	4151	3512	452	10	4	18.0	434.0
GP-8	4263	3380	451	no water sample	4	16.0	435.3
GP-9	4307	4990	453	12	7	21.0	432.4
GP-10	4779	4701	454	12	6	14.3	439.5
GP-11	4534	4399	453	10	5	13.0	439.5
GP-12	4325	4346	451	9	4	9.5	441.3
GP-13	2693	3354	447	9	4	10.0	437.0
GP-14	1105	5752	440	32	10	>40	<400
GP-15	2790	3213	450	12	4	18.0	431.8
GP-16	2887	3065	454	12	4	28.0	425.7
GP-17	2583	3541	446	8	4	12.0	433.6
GP-18	2488	3677	446	12	4	23.8	422.2
GP-19	(6)	(6)	~440	no water sample	10	>32	<410
GP-20	3805	5099	451	21	3	21.0	429.7
GP-21	3594	5239	451	22	3	36.5	414.2
GP-22	4373	5285	459	11 [3]	>11.5	11.5	447.2
GP-23	4203	5273	461	22	7	34.0	426.7
LP-1 [4]	4405	3961	466	7.3	1	--	--
LP-2 [4]	4502	3815	466	8	1	--	--
MW-11R	3217	4655	441	5.5-15.5	14	16.0	424.9
MW-14	2812	5326	441	(22-24)(36-39) 28-33	19	>39	<401.93
MW-121	3717	5605	438	(25-27)(34-39)	16	>39.5	<398.314

Notes:

1. Four-foot stainless steel screen (for GPs) or polyvinyl chloride (PVC) screen (for LPs).
2. MSL = mean sea level; BGS = below ground surface.
3. Insufficient water sample recovery for laboratory analysis.
4. Temporary 1-inch outside diameter, PVC well point installed in lined ash impoundment.
5. Chips at 3 feet in GP-8 and at 0.5 feet in GP-9.
6. Surveyors could not locate GP-19. It was about 700 feet south of GP-14.
7. Depth to water in wells MW-11R, MW-14 and TW were taken from top of casing.
8. Target sample depths in parentheses for B-103, MW-14 and TW were taken using a hydropunch for deep depths and bailers inside of augers for shallower depths.
9. Location and elevation data not available; these soil boring locations were flooded during the most recent survey on October 15 and 16, 2001.

Table 2-2 - Monitoring Well Locations, Elevations, Depth to Bedrock, and Screened Formation

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3

Hutsonville Power Station — BY: AAS/ PAR/KJB CHKD BY: RJC/CAR/EJT

Ameren Services — DATE: O-11/01, U-5/05, U-4/09

Well	Date Drilled	Northing (ft)[4]	Easting (ft)[4]	Surface Elevation (ft, MSL[2])	TOC[1] Elevation (ft, MSL)	Total Well Depth (ft, BGS)	Depth to Bedrock (ft, BGS)	Bedrock Elevation (ft, MSL)	Bedrock Penetration (ft)	Screened Formation[3]
MW-1	2/14/1984	5606	2964	455.8	459.22	8.9	6.3	449.5	2.7	sand, ss
MW-2	2/10/1984	4087	3594	452.9	455.85	18.1	>21	--	0	s&g
MW-3	2/9/1984	3865	3957	453.6	455.15	10.8	10.3	443.3	0.5	s&g
MW-3D	10/6/1998	3860	3952	453.6	455.28	25.1	10.5	443.1	15.0	ss
MW-4	2/13/1984	4351	4164	453.9	457.02	12.3	10.7	443.2	2.5	s&g, ss
MW-5	2/13/1984	4822	4249	452.2	455.02	17.9	17.7	434.5	1.4	s&g, ss
MW-6	2/9/1984	3095	4818	438.9	443.70	11.5	8.5	430.4	3.0	s&g, ss
MW-7	2/8/1984	3166	5675	438.1	442.78	25.1	>25	--	0	si s&g
MW-7D	10/5/1998	3176	5676	437.5	438.68	44.3	>44	--	0	si s&g
MW-8	2/7/1984	4081	5469	440.0	443.97	22.5	>21.5	--	0	si sand
MW-9	2/14/1984	5408	5205	451.8	454.78	18.4	16.3	435.5	2.4	si s&g, ss
MW-10	10/7/1998	4730	2560	452.8	454.40	10.7	7.5	445.3	3.5	si s&g, ss
MW-10D	10/7/1998	4729	2565	452.7	454.66	21.3	7.5	445.2	14.0	ss
MW-11R	10/3/2001	3217	4655	440.9	443.55	15.5	16.0	424.9	0	s&g
MW-14	10/3/2001	2812	5326	440.9	443.35	33.0	>39	--	0	s&g
MW-115D	5/1/2004	898053	1176882	438.4	440.80	87.0	90	348.4	15	gravel
MW-115S	5/1/2004	898047	1176886	438.4	440.89	35.0	90	348.4	0	s&g
MW-121	10/2/2001	3717	5605	437.8	440.59	39.0	>39.5	--	0	s&g

Notes:

1. TOC = top of casing
2. BGS = below ground surface; MSL = mean sea level.
3. s&g = sand and gravel, si = silty, ss = sandstone, cl=clayey.
4. Location coordinates for wells installed through 2001 based on plant coordinate system. Coordinates for wells installed in 2004
5. Does not include temporary and abandoned wells.

are state plane.

--: not determined

Table 2-3 - Monitoring Well Completion Details

Pond D Closure Alternatives Report

Hutsonville Power Station

Ameren Services

NRT PROJECT NO.: 1954/2.3

BY: AAS/ PAR/ KJB CHKD BY: RJC/ CAR/ EJT

DATE: O-11/01, U-5/05, U-4/09

Well	Screen Top Depth (ft, BGS[1])	Screen Top Elevation (ft[1])	Screen Bottom Elevation (ft)	Screen Length (ft)	Casing/ Screen Type	Filter Pack Elevation[2] (ft)	Fine Sand Thickness[3] (ft)	Bentonite Chip Thickness[3] (ft)	Annular Seal Thickness[4] (ft)	Concrete Collar Thickness[5] (ft)	PVC Casing Stickup (ft, AGS[1])	Gallons Water Purged[3,6]	Depth to Water[7] (ft, TOC[1])	Water Level Elevation[7] (ft)
MW-1	4.0	455.3	450.32	5.0	2" I.D. PVC	447.4-453.5			1.5	1.5	3.4		7.43	451.79
MW-2	5.0	450.8	437.75	13.0	2" I.D. PVC	431.8-449.3	--	--	2	2	3.0	--	8.67	447.18
MW-3	4.4	449.4	444.35	5.0	2" I.D. PVC	442.7-448.1	--	--	2	2	1.5	--	7.64	447.51
MW-3D	18.4	435.2	430.18	5.0	2" I.D. PVC	428.2-436.7	1	1	14	3	1.7	20	7.91	447.37
MW-4	5.0	452.2	444.72	7.5	2" I.D. PVC	441.0-450.4	--	--	2	2	3.1	--	9.72	447.30
MW-5	5.0	450.1	437.12	13.0	2" I.D. PVC	433.1-448.3	--	--	2	2	2.8	--	8.46	446.56
MW-6	5.0	438.6	432.20	6.4	2" I.D. PVC	427.5-434.9	--	--	2	2	4.8	--	10.83	432.87
MW-7	15.0	427.7	417.68	10.0	2" I.D. PVC	412.9-423.9	--	--	2	2	4.7	--	10.71	432.07
MW-7D	38.2	399.4	394.38	5.0	2" I.D. PVC	392.5-402.5	3	--	32	3	1.1	27	10.81	427.87
MW-8	16.5	426.5	421.47	5.0	2" I.D. PVC	417.9-423.9	--	--	2	2	4.0	--	16.05	427.92
MW-9	8.5	446.4	436.38	10.0	2" I.D. PVC	433.2-444.0	--	--	2	2	3.0	--	7.59	447.19
MW-10	4.1	448.7	443.70	5.0	2" I.D. PVC	441.9-448.9	--	1	4	--	1.6	20	3.10	451.30
MW-10D	14.3	438.4	433.36	5.0	2" I.D. PVC	431.4-438.9	1	1	14	--	2.0	12	3.68	450.98
MW-11R	2.8	438.1	428.05	10.0	2" I.D. PVC	424.9-436.4	1	--	4	--	2.7	120	13.55	430.00
MW-14	25.5	415.4	410.35	5.0	2" I.D. PVC	401.9-414.9	2	--	24	--	2.4	150	18.23	425.12
MW-115D	82	356.4	351.40	5.0	2" I.D. PVC	350.4-357.4	1	3.0	28	--	2.4	135	15.48	425.32
MW-115S	30	408.4	403.40	5.0	2" I.D. PVC	402.4-409.4	1	--	80	--	2.5	40	15.55	425.34
MW-121	31.2	406.6	401.59	5.0	2" I.D. PVC	397.8-405.8	2	--	30	--	2.8	120	16.30	424.29

Notes:

1. TOC = top of well casing; BGS = below ground surface; AGS = above ground surface.
2. All elevations have been adjusted to match information collected during October 2001 survey of the monitoring wells.
3. Data on fine sand thickness, bentonite chip thickness, and gallons of water purged were only available for wells installed since 1998.
4. Annular seal thickness includes bentonite-cement grout and bentonite pellets/chips.
5. Concrete collar was not installed at shallow 1998 wells and all wells installed in 2001 in order to maximize annular seal. Concrete collars were also not installed around 2004 wells due to their anticipated abandonment within approximately 18 months.
6. Volume removed during well development.
7. Depth to groundwater measured on 11/12/98 except as follows: 10/3/01 for wells MW-11R, MW-14 and TW; 9/14/04 for the TW-100 series wells.
8. Does not include temporary and abandoned wells.

--: Not present or unknown.

Table 2-4 - Monitoring Well Slug Test Results

Pond D Closure Alternatives Report
Hutsonville Power Station
Ameren Services

NRT PROJECT NO.: 1954/2.3
BY: AAS/ PAR/ KJB CHKD BY: RJC/ CAR/ EJT
DATE: O-11/01, U-5/05, U-4/09

Well	Hydraulic Conductivity (ft/min)	Hydraulic Conductivity (cm/s)	Geologic Unit
MW-1[1]	8.0E-05	4.1E-05	Sand & Sandstone
MW-3[1]	5.2E-02	2.7E-02	Silty Sand & Gravel
MW-3D[1]	1.1E-03	5.4E-04	Sandstone
MW-5[1]	1.6E-02	8.0E-03	Silty Sand & Gravel
MW-6[1]	6.3E-02	3.2E-02	Clayey Gravel, Silty Sand, Sandstone
MW-7[1]	5.1E-04	2.6E-04	Sandy Silt, Sand & Gravel
MW-7D[1]	9.5E-02	4.8E-02	Silty Sand & Gravel
MW-9[1]	1.6E-03	8.3E-04	Silt, Silty Sand, Sandstone
MW-10[1]	1.2E-03	6.2E-04	Silty Sand, Sandstone
MW-10D[1]	7.9E-04	4.0E-04	Sandstone
MW-12[1]	1.2E-01	6.2E-02	Sand
MW-13[1,2]	3.5E-02	1.8E-02	Clayey Sand & Gravel
MW-121[1]	4.7E-02	2.4E-02	Sand
MW-115D[1]	2.3E-02	1.2E-02	Gravel with Sand
MW-115S[3]	1.8E-01	9.3E-02	Gravel to Sand
TW-116[1]	9.0E-04	4.6E-04	Clayey Sand & Gravel
TW-117[1]	1.3E-02	6.7E-03	Sand
TW-118[3]	3.2E-01	1.6E-01	Sand
TW-119[1]	4.4E-03	2.2E-03	Sand

Notes:

1. Bouwer and Rice (1976) analysis method.
2. Slug test data for monitoring well MW-13 provided for reference. MW-13 has been abandoned.
3. Butler (1998) analysis method.

Table 2-5 - Monitoring Well Programs, Monitored Aquifers, and Positions Relative to Pond D

Pond D Closure Alternatives Report
Hutsonville Power Station
Ameren Services

NRT PROJECT NO.: 1954/2.3
BY: BRH CHKD BY: EJT
DATE: O-4/09

Well	Monitoring Program	Aquifer	Position Relative to Pond D
MW-1	**Ponds A and D**	**Upper Migration Zone**	**Upgradient**
MW-2	Pond A	Upper Migration Zone	Upgradient
MW-3	Pond A	Upper Migration Zone	Upgradient
MW-3D	none	Upper Migration Zone	Upgradient
MW-4	Pond A	Upper Migration Zone	Upgradient
MW-5	Pond A	Upper Migration Zone	Upgradient
MW-6	**Pond D**	**Upper Migration Zone**	**Downgradient**
MW-7	**Pond D**	**Upper Migration Zone**	**Downgradient**
MW-7D	**Pond D**	**Deep Alluvial Aquifer**	**Downgradient**
MW-8	**Pond D**	**Upper Migration Zone**	**Downgradient**
MW-9	none	Upper Migration Zone	Sidegradient
MW-10	**Pond D**	**Upper Migration Zone**	**Upgradient**
MW-10D	none	Upper Migration Zone	Upgradient
MW-11R	**Pond D**	**Upper Migration Zone**	**Downgradient**
MW-14	**Pond D**	**Deep Alluvial Aquifer**	**Downgradient**
MW-115D	**Pond D**	**Deep Alluvial Aquifer**	**Downgradient**
MW-115S	**Pond D**	**Deep Alluvial Aquifer**	**Downgradient**
MW-121	**Pond D**	**Deep Alluvial Aquifer**	**Downgradient**

Hutsonville Ash Impoundment
Table 2-6a. Groundwater Monitoring Results: Pond D Upper Migration Zone, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
Limit			State Std 2.000		0.150	6.500 - 9.000	400.000	1,200.000
MW1	01/14/2002		0.170	58.000	[0.180]	7.300	57.000	290.000
	02/25/2002		0.150	44.000	0.069	7.770	43.000	270.000
	03/25/2002		0.150	35.000	0.098		40.000	190.000
	04/23/2002		0.150	33.000	0.130	7.430	37.000	220.000
	05/23/2002		0.170	42.000	[0.420]	7.380	25.000	240.000
	06/27/2002		0.098	74.000	[0.690]	7.450	24.000	290.000
	07/30/2002		0.110	96.000	0.091	7.410	30.000	390.000
	08/31/2002		0.160	96.000	0.014	7.510	63.000	450.000
	09/17/2002	02092695-1	0.150	99.000	0.042	7.530	68.000	440.000
	10/17/2002		0.310	160.000	0.019		80.000	450.000
	11/21/2002		0.140	90.000	0.150	7.120		
	11/25/2002					7.200	49.000	360.000
	12/11/2002	02122282-1	0.180	96.000	[0.270]	7.090	39.000	370.000
	01/08/2003	03011887-1	0.140	67.000	0.003	7.190	84.000	300.000
	02/05/2003	03021653-1	0.140	76.000	0.053	7.210	87.000	340.000
	03/17/2003	03032351-1	0.120	41.000	0.003	7.460	48.000	180.000
	04/07/2003	03041847-1	0.140	37.000	0.001	7.850	38.000	210.000
	05/05/2003	03051599-1	0.140	40.000	0.014	7.470	37.000	200.000
	06/02/2003	03061314-1	0.110	56.000	0.072	7.600	25.000	270.000
	07/07/2003	03071766-1	0.092	85.000	[0.240]	7.318	20.000	330.000
	08/04/2003	03081508-1	0.110	85.000	0.047	7.500	19.000	320.000
	10/06/2003	03101729-1	0.093	80.000	0.070	7.200	17.000	320.000
	11/03/2003	03111368-1	0.093	78.000	0.120	7.000	16.000	340.000
	12/01/2003	03121269-1	0.160	75.000	0.013	7.100	50.000	370.000
	01/05/2004	04011364-1	0.100	60.000	0.041	7.090	40.000	260.000
	02/09/2004	04021831-1	0.150	42.000	0.025	7.500	40.000	190.000
	03/02/2004	04031476-1	0.110	46.000	0.032	7.400	32.000	240.000
	04/04/2004	04041354-1	0.120	40.000	0.044	7.500	35.000	210.000
	05/04/2004	04051491-1	0.100	55.000	[0.280]	7.300	15.000	260.000
	06/01/2004	04061297-1	0.067	77.000	[0.220]	7.300	15.000	290.000

Hutsonville Ash Impoundment
Table 2-6a. Groundwater Monitoring Results: Pond D Upper Migration Zone, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

MW1	07/12/2004	04072337-1	0.082	85.000	[0.210]	7.200	18.000	350.000
	08/02/2004	04081328-1	0.099	86.000	[0.170]	7.200	15.000	330.000
	09/13/2004	04092601-1	0.098	80.000	0.100	7.600	20.000	370.000
	10/04/2004	04101561-1	0.140	85.000	0.047	7.300	18.000	340.000
	11/08/2004	04112264-1	0.110	85.000	0.130	7.200	35.000	360.000
	12/06/2004	04121931-1	0.140	84.000	[0.260]	7.200	51.000	300.000
	01/03/2005	05011545-1	0.170	48.000	[0.180]	7.300	42.000	260.000
	02/23/2005	05023558-1	0.200	38.000	[0.180]	7.220	34.000	200.000
	03/14/2005	05032818-1	0.130	40.000	[0.300]	7.260	26.000	180.000
	04/19/2005	05043119-1	0.140	54.000	[0.200]	7.260	32.000	230.000
	05/04/2005		0.140	56.000	[0.760]	7.080	17.000	210.000
	06/19/2005		0.120	90.000	[0.520]	7.260	26.000	290.000
	07/18/2005		0.130	97.000	[0.210]	6.900	23.000	280.000
	08/08/2005		0.093	86.000	0.046	6.990	25.000	340.000
	09/12/2005		0.140	95.000	[0.230]	6.900	39.000	420.000
	10/04/2005		0.110	120.000	0.130	7.010	48.000	300.000
	11/01/2005		0.140	86.000	0.140	6.740	53.000	380.000
	12/05/2005		0.110	84.000	0.016	6.670	32.000	340.000
	01/09/2006		0.100	91.000	0.048	6.570	27.000	340.000
	02/07/2006		0.110	61.000	0.005	6.700	71.000	300.000
	03/06/2006		0.110	66.000	0.008	6.900	80.000	300.000
	04/11/2006		0.160	44.000	0.007	7.500	39.000	190.000
	05/23/2006		0.120	69.000	0.049	7.500	31.000	300.000
	06/12/2006		0.100	88.000	[0.320]	7.150	26.000	350.000
	07/10/2006		0.120	85.000	0.055	7.200	29.000	350.000
	08/07/2006		0.120	88.000	0.052	7.000	31.000	380.000
	09/11/2006		0.100	94.000	0.003	7.000	38.000	380.000
	10/04/2006		0.110	84.000	0.082	6.900	26.000	330.000
	11/06/2006		0.110	91.000	[0.200]	[6.400]	49.000	410.000
	12/05/2006		0.130	65.000	0.120	7.000	44.000	280.000
	01/08/2007					7.000		
	02/12/2007					7.000		
	03/21/2007					6.900		
		07033395-1	0.140	43.000	0.100		29.000	200.000
	04/09/2007		0.140	41.000	[0.170]		26.000	200.000
	05/06/2007		0.130	42.000	[0.420]		21.000	220.000
	06/11/2007		0.098	89.000	[0.620]	6.800	9.900	350.000
	07/09/2007		0.100	77.000	[0.280]	7.000	18.000	290.000

Hutsonville Ash Impoundment
Table 2-6a. Groundwater Monitoring Results: Pond D Upper Migration Zone, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

MW1	08/08/2007		0.096	88.000	0.140	7.100	14.000	340.000
	09/10/2007		0.100	95.000	0.002	6.900	17.000	370.000
	10/15/2007					7.000		
		07103111-1	0.150	94.000	0.084		33.000	360.000
	11/05/2007		0.120	96.000	0.032	6.700	38.000	350.000
	12/10/2007					6.600		380.000
		07122239-1	0.120	96.000	0.042		29.000	380.000
	01/07/2008					6.800		
		08011897-1	0.092	73.000	0.050		54.000	330.000
	02/18/2008					7.100		
		08022938-1	0.098	53.000	0.048		39.000	230.000
	03/10/2008					[6.100]		
		08032268-1	0.093	47.000	0.046		33.000	240.000
	04/07/2008					6.800		
		08042166-1	0.120	33.000	0.007		22.000	170.000
	05/12/2008					7.000		
		08052529-1	0.160	43.000	0.130		25.000	200.000
	06/10/2008					6.800		
		08062618-1	0.180	37.000	0.025		16.000	160.000
	07/08/2008					6.900		
		08072242-1	0.150	73.000	[0.180]		26.000	320.000
	08/11/2008					6.700		
		08082425-1	0.130	92.000	[0.220]		21.000	340.000
	09/08/2008					6.800		
		08092188-1	0.100	82.000	0.025		25.000	330.000
	10/06/2008					7.100		
		08101954-1	0.110	93.000	0.110		33.000	340.000
	11/04/2008					7.000		
		08111694-1	0.110	91.000	0.044		45.000	380.000
	12/02/2008					[6.100]		
		08121591-1	0.130	86.000	0.150		43.000	360.000

Hutsonville Ash Impoundment
Table 2-6a. Groundwater Monitoring Results: Pond D Upper Migration Zone, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
Limit			State Std 2.000		0.150	6.500 - 9.000	400.000	1,200.000
MW10	01/14/2002		0.160	94.000	0.017		32.000	370.000
	06/30/2002							370.000
	09/17/2002	02092695-7	0.098	90.000	0.100	7.110	31.000	380.000
	12/19/2002	02123013-5	0.200	86.000	0.004	7.060	38.000	330.000
	02/05/2003	03021653-8	0.079	76.000	0.001	7.210	38.000	310.000
	05/05/2003	03051599-6	0.076	80.000	0.002	7.200	38.000	270.000
	07/07/2003	03071766-7	0.092	89.000	0.022	7.200	44.000	340.000
	10/13/2003	03102279-5	0.120	100.000	0.019	7.000	36.000	450.000
	03/02/2004	04031476-6	0.064	100.000	0.008	7.100	31.000	410.000
	04/04/2004	04041382-3	0.086	100.000	0.029	7.100	29.000	390.000
	08/03/2004	04081328-10	0.130	120.000	0.045	7.000	29.000	450.000
	10/04/2004	04101561-10	0.160	110.000	0.040	7.100	31.000	470.000
	03/14/2005	05032818-9	0.150	93.000	0.008	7.100	33.000	400.000
	04/19/2005	05043119-7	0.068	130.000	0.024	6.950	32.000	430.000
	03/06/2006					6.800		
	06/20/2006					7.070		
	07/10/2006					7.000		
	11/06/2006					[6.400]		
	03/21/2007	07033395-6	0.085	86.000	0.002		32.000	330.000
	06/11/2007					6.900		
	08/08/2007					7.000		
	11/12/2007					7.100		
	03/11/2008					[5.900]		
		08032485-1	0.059	80.000	0.002		23.000	300.000
	06/23/2008					6.900		
		08064092-2	0.140	85.000	0.014		26.000	310.000
	09/15/2008					6.700		
	10/21/2008					6.900		
		08103771-1	0.350	95.000	0.007		24.000	350.000

Hutsonville Ash Impoundment
Table 2-6a. Groundwater Monitoring Results: Pond D Upper Migration Zone, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
	Limit		State Std 2.000		0.150	6.500 - 9.000	400.000	1,200.000
MW11R	01/14/2002		[3.700]	240.000	[2.800]		[730.000]	[1,300.000]
	06/30/2002							1,200.000
	09/19/2002	02092792-4	[6.600]	150.000	[3.400]	7.150	390.000	850.000
	12/13/2002	02122525-3	[7.000]	250.000	[0.880]	7.090	[690.000]	[1,300.000]
	03/18/2003	03032481-4	[5.600]	220.000	[0.380]	7.000	[590.000]	1,100.000
	05/12/2003	03052186-4	[5.800]	220.000	[0.590]	7.200	[590.000]	1,100.000
	08/04/2003	03081508-8	[2.600]	220.000	[0.520]	7.200	[650.000]	1,200.000
	10/13/2003	03102279-6	[2.800]	220.000	[0.700]	6.700	[650.000]	1,200.000
	02/23/2004	04022960-4	[2.800]	240.000	[1.200]	[6.000]	[720.000]	1,200.000
	04/04/2004	04041354-8	[4.900]	240.000	[0.270]	6.800	[650.000]	[1,300.000]
	07/12/2004	04072337-9	[5.800]	260.000	[0.320]		[670.000]	[1,300.000]
	11/08/2004	04112264-8	[8.000]	230.000	[0.240]	6.800	[650.000]	[1,300.000]
	01/04/2005	05011545-9	[4.300]	290.000	[0.850]	6.700	[680.000]	[1,300.000]
	03/13/2006					[6.300]		
	06/20/2006					6.830		
	08/07/2006					6.800		
	10/25/2006					6.800		
	02/27/2007					[6.100]		
	06/20/2007					6.700		
	07/11/2007					6.600		
	11/12/2007					6.900		
	03/11/2008	08032485-4	[18.000]	240.000	[0.370]		[580.000]	1,100.000
	03/12/2008					6.900		
	06/23/2008					6.700		
		08064092-4	[15.000]	260.000	[0.910]		[590.000]	1,200.000
	09/08/2008	08092188-6	[10.000]	140.000	[0.450]		[640.000]	[1,300.000]
	09/15/2008					6.600		
	10/14/2008					7.000		

Hutsonville Ash Impoundment
Table 2-6a. Groundwater Monitoring Results: Pond D Upper Migration Zone, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
Limit			State Std					
			2.000		0.150	6.500 - 9.000	400.000	1,200.000
MW6	01/14/2002		[15.000]	130.000	[1.400]		270.000	740.000
	06/30/2002							710.000
	09/19/2002	02092792-1	[15.000]	130.000	[3.600]	7.000	200.000	690.000
	12/13/2002	02122525-1	[16.000]	130.000	[1.300]	6.910	240.000	640.000
	03/18/2003	03032481-3	[11.000]	170.000	0.007	6.700	[450.000]	880.000
	05/12/2003	03052186-3	[8.200]	150.000	0.004	7.000	360.000	880.000
	08/04/2003	03081508-6	[13.000]	150.000	0.080	7.000	330.000	780.000
	10/13/2003	03102279-1	[15.000]	140.000	[0.290]	6.900	300.000	770.000
	02/23/2004	04022960-7	[14.000]	150.000	[0.880]	7.400	310.000	790.000
	04/04/2004	04041354-6	[11.000]	140.000	[0.890]	6.900	310.000	810.000
	07/12/2004	04072337-7	[12.000]	160.000	[1.700]		360.000	900.000
	11/08/2004	04112264-6	[14.000]	140.000	[0.590]	6.700	380.000	900.000
	01/04/2005	05011545-7	[15.000]	140.000	[0.970]	7.200	380.000	890.000
	03/13/2006					6.800		
	06/20/2006					6.840		
	08/07/2006					6.700		
	10/25/2006					6.500		
	02/27/2007					6.500		
	06/20/2007					6.600		
	07/11/2007					6.900		
	11/12/2007					6.800		
	03/11/2008					[6.200]		
		08032485-3	[15.000]	190.000	0.083		[460.000]	930.000
	06/23/2008					6.800		
		08064092-1	[16.000]	200.000	[0.420]		[510.000]	980.000
	09/15/2008					6.700		
	10/14/2008					6.700		

Hutsonville Ash Impoundment
Table 2-6a. Groundwater Monitoring Results: Pond D Upper Migration Zone, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
Limit			State Std 2.000		0.150	6.500 - 9.000	400.000	1,200.000
MW7	01/15/2002		[2.300]	150.000	0.100		220.000	770.000
	07/01/2002							720.000
	09/18/2002	02092792-7	[2.200]	180.000	0.052	6.890	240.000	760.000
	12/19/2002	02123013-2	[2.500]	180.000	[0.220]	6.910	250.000	790.000
	03/19/2003	03032570-1	0.500	130.000	0.020	7.000	160.000	570.000
	06/02/2003	03061314-6	1.800	150.000	0.024	7.300	220.000	790.000
	08/11/2003	03082176-1	[2.100]	170.000	0.018	7.020	220.000	790.000
	10/13/2003	03102279-2	[2.200]	180.000	0.120	7.000	240.000	820.000
	02/23/2004	04022960-5	[2.100]	190.000	0.022	6.900	280.000	880.000
	04/19/2004	04042676-1	2.000	180.000	0.051	6.800	310.000	970.000
	08/02/2004	04081328-6	2.000	200.000	[0.160]	6.800	310.000	950.000
	10/04/2004	04101561-7	[2.600]	210.000	0.120	6.900	300.000	1,000.000
	03/15/2005	05032818-6	1.400	150.000	0.012	7.050	220.000	730.000
	03/27/2006					[6.400]		
	06/26/2006					6.680		
	10/09/2006					6.700		
	02/19/2007					6.700		
	06/20/2007					6.600		
	09/10/2007					7.000		
	10/22/2007					7.100		
	06/29/2008					6.900		
		08071070-1	1.700	190.000	0.095		250.000	800.000
	09/15/2008					6.800		
	10/08/2008					6.700		
		08102352-1	1.700	200.000	0.078		280.000	860.000

Hutsonville Ash Impoundment
Table 2-6a. Groundwater Monitoring Results: Pond D Upper Migration Zone, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

Well Id	Date Sampled	Lab Id	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
	Limit		State Std 2.000		0.150	6.500 - 9.000	400.000	1,200.000
MW8	01/15/2002		[14.000]	330.000	[3.200]		[790.000]	[1,800.000]
	07/01/2002							[1,400.000]
	09/19/2002	02092792-2	[10.000]	320.000	[3.800]	6.920	[790.000]	[1,300.000]
	12/19/2002	02123013-4	[11.000]	320.000	[3.600]	6.970	[740.000]	[1,600.000]
	03/17/2003	03032351-2	[12.000]	390.000	[2.900]	7.000	[960.000]	[1,700.000]
	06/18/2003	03062696-1	[12.000]	360.000	[2.500]	7.400	[940.000]	[1,800.000]
	08/11/2003	03082176-3	[14.000]	360.000	[2.500]	7.093	[960.000]	[1,800.000]
	10/13/2003	03102279-4	[13.000]	370.000	[2.200]	7.100	[930.000]	[1,800.000]
	02/23/2004	04022960-8	[13.000]	340.000	[4.700]	7.000	[820.000]	[1,800.000]
	04/19/2004	04042676-3	[12.000]	310.000	[2.300]	7.000	[870.000]	[1,800.000]
	08/02/2004	04081328-8	[11.000]	300.000	[2.100]	6.900	[800.000]	[1,500.000]
	10/04/2004	04101561-8	[11.000]	200.000	[1.300]	6.900	[620.000]	1,200.000
	03/16/2005	05032818-8	[13.000]	310.000	[2.200]	7.440	[940.000]	[1,600.000]
	03/27/2006					6.900		
	06/19/2006					6.850		
	07/10/2006					6.900		
	10/04/2006					6.900		
	02/12/2007					6.900		
	05/13/2007					6.800		
	07/09/2007					7.000		
	10/22/2007					7.000		
	06/29/2008					6.700		
		08071070-3	[18.000]	320.000	[3.000]		[770.000]	[1,500.000]
	07/21/2008					6.800		
		08073732-2	[16.000]	330.000	[2.500]		[750.000]	[1,600.000]
	10/08/2008					[6.300]		
		08102352-3	[14.000]	310.000	[2.400]		[740.000]	[1,400.000]

Hutsonville Ash Impoundment
Table 2-6b. Groundwater Monitoring Results: Pond D Deep Alluvial Aquifer, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

		Limit	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
		State Std	2.000		0.150	6.500 - 9.000	400.000	1,200.000
Well Id	**Date Sampled**	**Lab Id**						
MW115D	04/11/2005	05042061-3	0.022	59.000	[0.730]	7.410	55.000	320.000
	06/26/2006					7.400		
	10/09/2006					7.400		
	02/19/2007					7.200		
	06/20/2007					7.400		
	09/12/2007					7.100		
	10/22/2007					7.200		
	06/29/2008					7.200		
		08071070-5	0.100	57.000	0.008		34.000	240.000
	09/16/2008					7.200		
		08093137-2	0.054	68.000	[0.760]		38.000	330.000
	10/14/2008					7.000		

Hutsonville Ash Impoundment
Table 2-6b. Groundwater Monitoring Results: Pond D Deep Alluvial Aquifer, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

		Limit	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
		State Std	2.000		0.150	6.500 - 9.000	400.000	1,200.000
Well Id	**Date Sampled**	**Lab Id**						
MW115S	04/11/2005	05042061-4	0.020	75.000	[0.200]	7.500	46.000	340.000
	06/26/2006					7.160		
	10/09/2006					7.100		
	02/19/2007					6.700		
	06/20/2007					7.000		
	09/12/2007					7.300		
	10/22/2007					7.500		
	06/29/2008					7.300		
		08071070-6	0.083	57.000	[0.610]		31.000	250.000
	09/16/2008					7.200		
		08093137-3	0.065	75.000	[3.300]		14.000	350.000
	10/08/2008					7.100		
		08102352-6	0.110	67.000	[1.200]		43.000	310.000

Hutsonville Ash Impoundment
Table 2-6b. Groundwater Monitoring Results: Pond D Deep Alluvial Aquifer, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

		Limit	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
		State Std	2.000		0.150	6.500 - 9.000	400.000	1,200.000
Well Id	**Date Sampled**	**Lab Id**						
MW121	01/15/2002		0.110	70.000	[2.000]		34.000	340.000
	09/19/2002	02092792-6	0.082	77.000	[1.400]	7.430	40.000	340.000
	12/19/2002	02123013-8	0.067	78.000	[1.200]	7.310	38.000	340.000
	03/17/2003	03032351-3	0.200	83.000	[0.930]	7.300	65.000	340.000
	06/17/2003	03062509-1	0.052	74.000	[0.820]	7.600	62.000	370.000
	08/11/2003	03082176-5	0.110	71.000	[1.100]	7.484	52.000	310.000
	10/13/2003	03102279-9	0.075	56.000	[0.760]	7.500	30.000	280.000
	02/23/2004	04022960-1	0.085	86.000	[2.100]	7.300	27.000	470.000
	04/19/2004	04042676-5	0.099	72.000	[1.200]	7.300	19.000	340.000
	08/02/2004	04081328-9	0.180	72.000	[1.400]	7.400	24.000	350.000
	10/04/2004	04101561-12	0.084	77.000	[1.400]	7.400	23.000	350.000
	03/16/2005	05032818-13	0.060	57.000	[0.640]	7.440	34.000	250.000
	03/27/2006					7.000		
	06/19/2006					7.350		
	07/10/2006					7.580		
	10/04/2006					7.200		
	02/12/2007					7.280		
	05/13/2007					7.200		
	07/09/2007					7.400		
	10/22/2007					7.000		
	06/29/2008					7.000		
		08071070-4	0.180	51.000	[0.640]		33.000	210.000
	07/21/2008					6.800		
		08073732-5	0.086	50.000	[0.680]		23.000	230.000
	10/08/2008					6.800		
		08102352-5	0.120	58.000	[0.680]		18.000	260.000

Hutsonville Ash Impoundment
Table 2-6b. Groundwater Monitoring Results: Pond D Deep Alluvial Aquifer, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

		Limit	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
		State Std	2.000		0.150	6.500 - 9.000	400.000	1,200.000
Well Id	**Date Sampled**	**Lab Id**						
MW14	01/14/2002		1.400	170.000	[0.380]		230.000	780.000
	06/30/2002							900.000
	09/18/2002	02092792-9	0.190	180.000	[0.530]	7.000	230.000	790.000
	12/13/2002	02122525-5	0.570	180.000	[0.500]	6.920	210.000	740.000
	03/18/2003	03032481-5	0.730	160.000	[0.510]	7.000	120.000	570.000
	05/12/2003	03052186-5	1.000	180.000	[0.480]	7.000	230.000	830.000
	08/11/2003	03082176-4	0.400	160.000	[0.410]	7.345	180.000	740.000
	10/13/2003	03102279-8	0.630	170.000	[0.510]	7.300	200.000	810.000
	02/23/2004	04022960-3	1.400	180.000	[0.430]	6.800	190.000	810.000
	04/04/2004	04041354-7	1.500	170.000	[0.400]	6.900	190.000	780.000
	08/03/2004	04081328-12	1.000	180.000	[0.450]	6.900	200.000	810.000
	11/08/2004	04112264-10	1.100	170.000	[0.510]	6.900	180.000	760.000
	03/15/2005	05032818-12	0.880	160.000	[0.350]	6.920	220.000	780.000
	03/13/2006					6.800		
	06/20/2006					7.500		
	10/25/2006					6.600		
	02/27/2007					6.800		
	05/13/2007					6.700		
	09/10/2007					7.200		
	11/12/2007					6.700		
	03/17/2008					6.600		
		08032889-1	0.480	160.000	[0.500]		140.000	650.000
	06/23/2008					7.100		
		08064092-5	0.910	180.000	[0.560]		170.000	690.000
	09/16/2008					6.700		
		08093137-1	0.370	150.000	[0.480]		120.000	650.000
	10/21/2008					6.700		
		08103771-3	0.540	170.000	[0.570]		140.000	670.000

Hutsonville Ash Impoundment
Table 2-6b. Groundwater Monitoring Results: Pond D Deep Alluvial Aquifer, 2002-2008

Date Range: 01/01/2002 to 12/31/2008

		Limit	B, tot, mg/L	Ca, tot, mg/L	Mn, tot, mg/L	pH (field), std	SO4, tot, mg/L	TDS, mg/L
		State Std	2.000		0.150	6.500 - 9.000	400.000	1,200.000
Well Id	**Date Sampled**	**Lab Id**						
MW7D	01/15/2002		0.240	88.000	[0.620]		58.000	420.000
	07/01/2002							420.000
	09/18/2002	02092792-8	0.083	71.000	[0.750]	7.410	51.000	370.000
	12/19/2002	02123013-3	0.140	67.000	[0.750]	7.380	31.000	320.000
	03/19/2003	03032570-2	0.089	66.000	[0.760]	7.300	51.000	350.000
	06/02/2003	03061314-7	0.088	68.000	[0.680]	7.700	60.000	390.000
	08/11/2003	03082176-2	0.140	69.000	[0.660]	7.530	59.000	370.000
	10/13/2003	03102279-3	0.110	66.000	[0.640]	7.500	44.000	320.000
	02/23/2004	04022960-6	0.110	89.000	[0.770]	7.400	68.000	430.000
	04/19/2004	04042676-2	0.067	85.000	[0.830]	7.300	61.000	440.000
	08/02/2004	04081328-7	0.091	81.000	[0.570]	7.000	47.000	360.000
	10/04/2004	04101561-9	0.210	85.000	[0.660]	7.500	36.000	420.000
	03/15/2005	05032818-7	0.062	61.000	[0.450]	7.530	42.000	280.000
	03/27/2006					6.800		
	06/26/2006					7.300		
	10/09/2006					6.900		
	02/19/2007					7.200		
	06/20/2007					7.100		
	09/10/2007					7.300		
	10/22/2007					7.300		
	06/29/2008					7.000		
		08071070-2	0.680	130.000	[1.600]		75.000	530.000
	09/15/2008					7.000		
	10/08/2008					7.000		
		08102352-2	0.180	75.000	[0.540]		35.000	320.000

Table 3-1 - Closure Alternatives Screening Summary
Pond D Closure Alternatives Report
Hutsonville Power Station
Ameren Services

NRT PROJECT NO.: 1954/2.3
BY: EJT CHKD BY: BRH
DATE: 4/22/09 DATE: 4/23/09

Category	*Alternative*	*Description*	*Construction / Implementation Feasibility*	*Effectiveness*	*Relative Cost*		*Carry Forward (Yes/No)*
					Capital	*Annual O &M*	
Groundwater Management	**Site Monitoring w/ No Groundwater Collection**	Establish groundwater monitoring program for Pond D to evaluate trends in groundwater quality.	The groundwater monitoring network is already in place - additional wells can be added as necessary to enhance the monitoring network.	This option will not prevent off-site migration of impacted groundwater.	**QUARTERLY MONITORING CURRENTLY PERFORMED, NO ADDITIONAL COST** Quarterly monitoring continues at the site and monitoring would be required for any groundwater management or final cover alternative.		**NO** At a minimum, site monitoring will be performed. Additional groundwater management alternatives may be incorporated with site monitoring.
	Collection Trench	A groundwater collection trench would be installed south of Pond D to collect impacted groundwater. A perforated pipe in the trench would drain by gravity to sumps containing pumps designed to transfer collected groundwater to the Interim Pond (Pond B).	A hydraulic analysis would need to be performed to model additional loading to the sluice water system and evaluate compliance with the existing NPDES permit for outfall #002.	Collection of groundwater and management through Pond B for eventual discharge to the Wabash River via outfall #002 will prevent off-site migration of impacted groundwater.	**$800,000** Cost could increase substantially (2 to 5 times) if treatment of extracted groundwater is required.	**$47,000** O & M would continue for an undetermined period	**YES** This alternative could effectively prevent off-site migration of impacted groundwater. Capital costs are lower than other groundwater management alternatives considered.
	Ash Stabilization	Ash fill is stabilized and solidified using one of several reagents to form a cement-like matrix (monolith) that immobilizes ash constituents, increases strength, and decreases permeability.	Stabilization process would result in a substantial increase in volume (typically 20 - 40 %). Bench scale test needed to determine specific applicability and performance for minimal leaching of contaminants and may demonstrate that stabilization is not a feasible option.	Stabilized/solidified ash monolith would minimize leaching, but concentrations of certain trace constituents, such as selenium, may increase with pH, making performance difficult to predict. Long term monitoring would be required to evaluate effectiveness.	**$20,000,000** Very high cost groundwater management option.	**$5,000** O & M costs would be similar to those associated with a final cover.	**NO** Capital cost is too high compared to other groundwater management alternatives with less technical uncertainty and same or better effectiveness.
	Ash Removal and Disposal, Recycling at an Off-Site Facility, or Beneficial Re-Use	Ash is excavated and transported to an appropriate landfill; moved to appropriate sites for recycling; or excavated and re-used on site. Recycling may include incorporation into cement, for use in agricultural setting as a source of minerals, or as flowable fill in slurry form.	Excavation involves standard construction equipment. Excavation of saturated ash may require shoring, dewatering, and use of dragline bucket or mudcat, and is likely not technically or economically feasible. This alternative would likely require profiling of the ash waste for disposal in an appropriate landfill or identification of large-volume users of mixed ash. Recycling may require grading or sorting of ash. Based on prior testing, excavated ash from Pond D may not meet criteria for beneficial re-use.	Removal of ash is an effective means of source control (i.e., source elimination) provided that saturated ash is removed, and removal of saturated ash may be very difficult due to its depth below the water table.	**$23,000,000 to $34,000,000** Very high capital cost groundwater management alternative. Range of costs represents partial removal (saturated ash only and overburden replacement) to total removal of ash. Incremental increases in general fill or ash disposal/recycling costs would cause significant increases in capital costs for this alternative.	**None to $5,000** O & M costs would be associated with those for a final cover if partial excavation was performed.	**NO** Capital cost is too high compared to other groundwater management alternatives with less technical uncertainty and same or better effectiveness.
	Pond D Reconstruction (Ash Excavation; Install Liner and Leachate Collection System; Ash Replacement)	Ash is excavated and moved to facilitate reconstruction of impoundment to minimize infiltration, leachate generation, and groundwater impacts; separate ash from water table; and control erosion.	Reconstruction would require excavation and off-site disposal or relocation of all ash in Pond D. As discussed above, excavation of saturated ash is likely not technically or economically feasible. Clean fill would have to be placed to re-establish the base of the impoundment at least 5 feet above the historical high water table. Potential for significant regulatory issues for permitting since reconstruction project could be considered establishing a new disposal unit.	Reconstruction could be an effective means of source control; however a viable method for removing ash up to 15 feet below the water table would be needed for this option to be seriously considered - effectiveness would be greatly reduced, particularly in terms of preventing off-site migration of impacted groundwater, if saturated ash could not be removed.	**NOT EVALUATED** Due to construction feasibility; very high anticipated capital costs.		**NOT EVALUATED** Due to construction feasibility, very high anticipated capital costs, and potential for significant regulatory issues.
	Containment Using a Low-Permeability Vertical Barrier	A vertical barrier constructed of low-permeability materials would be constructed downgradient or surrounding Pond D.	A slurry wall may not be feasible between Pond D and the Wabash River due to spatial constraints and buried utilities. Installation of a sheet pile wall may be feasible depending on depth. A low-permeability vertical barrier requires a low-permeability key-in formation to create an effective barrier to groundwater flow. Based on the *Slurry Wall Study* , prepared by Hanson Engineers, Inc. (1984), and slug tests performed at the site, the sandstone bedrock present at the upland portion of the site would not provide a competent key-in formation for a low-permeability vertical barrier.	A low-permeability vertical barrier would not be effective at this site since a competent key-in formation is not present in all areas.	**NOT EVALUATED** Due to lack of effectiveness.		**NOT EVALUATED** This option would not be effective for groundwater management at this site.
Final Cover	**Geomembrane**	Pond D is covered with a geomembrane to prevent direct contact, control infiltration of surface water, reduce leachate generation, and provide erosion control. A 3-foot thick soil layer would be needed over the geomembrane to drain infiltrated surface water from above the geomembrane, protect the geomembrane from weathering and maintenance activities on the surface of the final cover, and support vegetation.	Geomembranes are readily available and have been installed at other coal ash management facilities to reduce surface water infiltration and leachate generation. Limitations to overcome include raising the subgrade beneath the geomembrane to prevent surface water from ponding on the final cover and to promote runoff to the Wabash River or the Drainage Collection Pond (Pond C).	A geomembrane cover would effectively minimize infiltration and resulting leachate generation from Pond D. Additionally, the cover would provide protection from erosion and prevent direct contact with ash.	**$3,900,000** Lowest cost cover alternative meeting the closure objective of minimizing infiltration. Capital costs sensitive to surface water management options and related cover grading plans / fill costs.	**$5,000** O & M costs associated with maintaining vegetation, 3-foot protective soil layer, and repairing erosion damage.	**YES** Capital costs are lower than compacted clay, and geomembrane has greater effectiveness than either the pozzolanic or earthen cover alternatives.

Table 3-1 - Closure Alternatives Screening Summary
Pond D Closure Alternatives Report
Hutsonville Power Station
Ameren Services

NRT PROJECT NO.: 1954/2.3
BY: EJT CHKD BY: BRH
DATE: 4/22/09 DATE: 4/23/09

Category	*Alternative*	*Description*	*Construction / Implementation Feasibility*	*Effectiveness*	*Relative Cost*		*Carry Forward (Yes/No)*
					Capital	*Annual O &M*	
Final Cover (continued)	**Compacted Clay**	Pond D is covered with compacted clay to prevent direct contact, control infiltration of surface water, reduce leachate generation, and provide erosion control.	Compacted clay has been installed at other fly ash management facilities to reduce surface water infiltration and leachate generation. A local source for clay would have to be identified and may not be available. There would be site grading and drainage limitations to overcome similar to geomembrane, although less general fill would be required because the compacted clay layer is thicker than the geomembrane layer.	A compacted clay cover would effectively reduce surface water infiltration resulting in reduced leachate generation from Pond D. Additionally, similar to a geomembrane cover, the clay cover would provide protection from erosion and prevent direct contact with ash.	**$4,200,000** Highest cost cover alternative meeting the closure objective of minimizing infiltration. When compared to geomembrane, compacted clay is not a cost-competitive cover option.	**$5,000** O & M costs associated with maintaining vegetation, 3-foot protective soil layer, and repairing erosion damage.	**NO** Highest cost final cover option. Additional capital cost not warranted since geomembrane has similar feasibility / effectiveness.
	Layered Earthen	A layered earth cover is constructed from on-site earthen materials to prevent direct contact, reduce infiltration of surface water, reduce leachate generation, and provide erosion control.	A layered earthen cover could be readily constructed from on-site materials. There would be site grading and drainage limitations to overcome similar to geomembrane.	A layered earthen cover will allow more surface water infiltration and resulting leachate generation from Pond D than a geomembrane or compacted clay cover. The layered earthen cover would provide erosion control if vegetated property and would prevent direct contact with ash.	**$2,900,000** Lowest cost cover alternative.	**$5,000** O & M costs associated with maintaining vegetation, 3-foot protective soil layer, and repairing erosion damage.	**NO** This alternative is less effective than the geomembrane and compacted clay alternatives.
	Pozzolanic Fly Ash	Pond D is covered with a pozzolanic fly ash cover to prevent direct contact, control infiltration of surface water, reduce leachate generation, and provide erosion control. Fly ash would be mixed with stabilizing reagents (e.g. lime, Portland cement, Class C fly ash) to form a cement-like, low-permeability layer. Constructed with 3 feet of pozzolanic fly ash mixture (low-permeability layer) followed by 3 feet of soil (protective layer).	Construction of a pozzolanic fly ash cover could potentially use fly ash already on site in Pond A and result in a significant cost savings for materials. Mix design testing was unable to identify a mix that achieves a permeability lower than $1x10^{-6}$ cm/s with adequate strength.	A pozzolanic fly ash cover would reduce surface water infiltration and leachate generation from Pond D, provide erosion control, and prevent direct contact with ash, although not to the same degree as a geomembrane or compacted clay cover.	**$4,000,000** Only slightly more expensive than the geomembrane cover. However, capital cost for the cover could be evaluated versus the benefit of creating an additional 110,000 yd^3 capacity in Pond A.	**$5,000** O & M costs associated with maintaining vegetation, 2-foot protective soil layer, and repairing erosion damage.	**NO** This alternative is less effective than the geomembrane and compacted clay alternatives.
Surface Water Management	**Route Surface Water East Toward Wabash River**	The grade of Pond D would be adjusted to promote gravity drainage of surface water toward the Wabash River.	Technically and administratively feasible - the grade of Pond D could be readily adjusted to route surface water toward the Wabash River. Can be constructed if adequate source(s) of fill are identified in close proximity to the site.	This would be an effective surface water management option that could be readily integrated with a final cover.	**NOT EVALUATED** Anticipated to be significantly more expensive than routing surface water to both the east (Wabash River) and west (Pond C).		**NO** Routing all surface water to the Wabash River would require excess fill compared to other alternatives.
	Route Surface Water West Toward Pond C	The grade of Pond D would be adjusted to promote gravity drainage of surface water toward Pond C.	Technically and administratively feasible - the grade of Pond D could be readily adjusted to route surface water towards Pond C. Can be constructed if adequate source(s) of general fill are identified in close proximity to the site. This surface water management option would require less fill than routing surface water towards the Wabash River. A box culvert has already been constructed to allow surface water drainage from Pond D to Pond C.	This would be an effective surface water management option that could be readily integrated with a final cover. If combined with an earthen cover, swales designed to route surface water may have to be lined with a geomembrane.	**NOT EVALUATED** Anticipated to be significantly more expensive than routing surface water to both the east (Wabash River) and west (Pond C).		**NO** Routing all surface water to Pond C would require excess fill compared to the other alternatives.
	Route Surface Water East and West, Towards the Wabash River and Pond C	The grade of Pond D would be adjusted to promote gravity drainage of surface water on the west side of Pond D toward Pond C and on the east side of Pond D to the Wabash River	Technically and administratively feasible - the grade of Pond D could be readily adjusted to route surface water towards Pond C and the Wabash River. Can be constructed if adequate source(s) of general fill are identified in close proximity to the site. This surface water management option would require the least amount of fill to construct. A box culvert has already been constructed to allow surface water drainage from Pond D to Pond C.	This would be an effective surface water management option that could be readily integrated with a final cover. If combined with an earthen cover, swales designed to route surface water may have to be lined with a geomembrane.	**SEE FINAL COVER OPTIONS** Fill required for grade adjustment to route surface water drainage towards Pond C and the Wabash River is already included as part of the final cover estimates. Actual costs would likely be less than routing surface water exclusively towards the Wabash River or Pond C.		**YES** This surface water management alternative requires the least amount of fill needed to route surface water off of Pond D; it has been incorporated within the final cover alternative estimates.

Table 3-2 - Areal Extent and Volumes of Unsaturated and Saturated Ash In Pond D

Pond D Closure Alternatives Report
Hutsonville Power Station
Ameren Services

NRT PROJECT NO.: 1954/2.3
BY: GRL/ EJT/ KJB CHKD BY: CAR/ EJT
DATE: O-7/05, U-4/09

Site Specific Parameters	Unit	Unlined Ash Impoundment (Pond D)
Total Volume of Ash	CY	950,000
Volume of Unsaturated Ash	CY	670,000
Volume of Saturated Ash	CY	280,000
Areal Extent of Ash	SF	966,000
	ACRES	22
Areal Extent of Saturated Ash	SF	790,000
	ACRES	18
Thickness of Unsaturated Ash	FT	11-31
Thickness of Saturated Ash	FT	5-14
Depth to Bottom of Saturated Ash	FT	11-31

Source Notes:

1. Total estimated area for saturated ash: areal extent ~ 790,000 ft^2, average thickness ~ 9.5 ft, average depth to bottom of saturated ash ~ 25 ft.
2. Based on above estimates: 280,000 yd^3 saturated ash (790,000 ft^2 x 9.5 ft).
3. Total estimated area for ash: areal extent ~ (22 acres) 966,000 ft^2, average thickness estimated from Geoprobe boring logs (20.9 feet).
4. Based on above estimates: 750,000 yd^3 ash (966,000 ft^2 x average thickness) + 80,000 yd^3 transferred in 2004 + 120,000 yd^3 transferred in 2006-2007= 950,000 yd^3.
5. Total ash volume includes unsaturated ash (550,000 yd^3) and saturated ash (280,000 yd^3).

CY = Cubic yards
SF = Square Feet

Table 3-3 - Final Cover Alternatives Material Balance Analysis

Pond D Closure Alternatives Report
Hutsonville Power Station
Ameren Services - Hutsonville, Illinois

NRT PROJECT NO.: 1954/2.3
BY: CAR/ KJB CHKD BY: EJT
DATE: O-7/05, U-4/09

				Final Cover Alternative			
Fill Utilization	**Fill Origin**	**Calculation**	**Unit**	**Clay**	**Pozzolanic**	**Geosynthetic**	**Earthen**
Establish Grade	Fly Ash Stockpile[3] (V_{as})	[A] - Assumption 8	CY	50,500	50,500	50,500	50,500
	Additional Imported Fill[4]	[B = L - (A + C + D + E + F + G + H + I)]	CY	700	700	86,100	86,100
	Beneficial Reuse Ash	[C] - Assumption 9	CY	--	--	20,000	20,000
Low Permeability Layer[5] (V_{fc})	Clay	[D] - Assumption 5	CY	105,400	--	--	--
	Cement	[E] - 5% of Pozzolanic Cover (dry weight basis)	CY	--	2,500	--	--
	Fly Ash-Pozzolanic Mix	[F = D - E]	CY	--	102,900	--	--
Final Protective Layer[6] (V_{pl})	Beneficial Reuse Ash	[G] - Assumption 9	CY	20,000	20,000	--	--
	Imported Rooting Zone Soil	[H = Assumption 6 - G - I]	CY	85,400	85,400	105,400	87,800
	Sand Drainage Layer[7]	[I] - Assumption 7	CY	--	--	--	17,600
Total Imported Rooting Zone		[J = H + I]	CY	85,400	85,400	105,400	105,400
Total Fill Volume for Pond D[1]		[K] - Assumption 1	CY	262,000	262,000	262,000	262,000

Assumptions and References:

1. The *Total Fill Volume for Pond D* was calculated from design grades with minimum 5% final cover slope for drainage, existing grades established by aerial survey performed by Connor & Connor on April 14, 2005 including an estimate of capacity below standing water of 5,000 yd^3 and estimate of current ash volume provided by Ameren Energy Generating; the calculated *Total Fill Volume for Pond D* was approximately 262,000 yd^3.
2. Final cover material estimates are included as part of estimated volume of fill to make Pond D grades.
3. All material balance estimates assume the ash stockpile will be used as fill beneath the final cover.
4. Additional imported fill is required if $V_{as} + V_{fc} + V_{pl} < 357{,}000\ yd^3$.
5. Low permeability layer volume (105,400 CY) estimated assuming an approximate 22 acre cover area with 3' thick cover; clay and pozzolanic final covers only.
6. Final protective layer volume (105,400 CY) estimated using an approximate 22 acre cover area with 3' thick cover; required for ALL final cover alternatives.
7. For the earthen cover, the final protective layer consists of: 1) a 6" sand drainage layer, and 2) a 2.5' rooting zone layer.
8. Fly ash stockpile volume (50,500 CY) estimate calculated from elevation 453 feet and above.
9. Beneficial ash volume estimated by Hutsonville Power Station personnel at approximately 20,000 yd^3.

CY = Cubic yards

APPENDIX A

SITE INVESTIGATION APPENDICES

APPENDIX A-1

SOIL BORING LOGS

CENTRAL ILLINOIS DRILLING COMPAN
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. B-1
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION PLAN PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-14-84 — COMPLETED 2-14-84 — DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
456.5		0.0	30						
455.6	See #A	0.0							
453.4	Lt. brn. sandy silt, wf. clay, occas. f-c sand, occas. f. gravel roots moist-v. moist	3.1		1-2-3	1	ss	18"	1.0 2.4	
	Lt. br. m-c sand, wf. occas. f-m gravel tr. silt		5	6-5-7	2	ss	17	--	
450.1	wet	6.4							
448.4	Lt. brn. sandstone moist	8.1		6-54-40/2"	3	ss	14	2.2	
447.4	Lt.-gray sandstone	9.1		65-35/1"	4	ss	7	--	WATER 2-14-84
	END OF BORING 9.1'		10						DD 6.0 8:30am BAR 7.0 8:55am AAR-- WL 6.5 9:05am F-c gravel 5.0'- Screen 9.0'-4.0' 2" PVC Pipe 4.0' Gravel 9.1'-3.0' Bentonite 3.0'-1 Plug 1.5'-surfac Water level 4.0 ar 2 #A Blk. clayey s wf. tr. f. sand occas. organic fibers topsoil moist
			15						

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-2
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION PLM PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-10-84 — COMPLETED 2-10-84 — DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	OD	NOTES
453.3		0.0	30						
452.9	See #A	0.4							
451.2	Brn. silty sand fill v. moist	2.1		8-8-6	1	ss	18"	2.4	
	Brn. m-c sand, wf. m-c gravel tr. silt v. moist		5	7-5-3	2	ss	17	--	
				3-3-3	3	ss	16	--	WATER 2-10-84
444.9		8.4							DD 8.0 8:00am BAR 11.0 10:30a AAR --- WL 7.0 2:10pm
	Brn.-gray m-c sand, wf. m. gravel wet		10	3-4-7	4	ss	14	--	Screen 18.0-5. 2"PVC pipe 5.0 3.0' surfac Gravel 21.5'-1 Bentonite 4.0' Plug 2.0'-surf.
				8-7-0	5	ss	17	--	
439.2		14.1							
	Brn.-gray m-c sand, wf. f-m gravel		15	6-8-10	6	ss	17	--	#A Blk. coal refuse 4" wf. occas. silt fi wet
436.0	wet	17.3		10-13-13	7	ss	17	--	
	Gray silty clay, wf. tr. f. sand, occas. f. gravel till moist		20	5-10-13	8	ss	18	4.2	

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-2
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION Per Plan
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-10-84 COMPLETED 2-10-84 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
453.3		0.0	30						
431.8		21.5		5-7-11	0	SS	18"	4.0	
	END OF BORING 21.5'								

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-2
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION P-5 PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-9-84 COMPLETED 2-9-84 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.		NOTES
452.1		0.0	30						
451.7	See #A	0.4							
	Rust brn. silty sand, fill v. moist			4-6-8	1	ss	14"	--	
			5	4-3-4	2	ss	16	--	
445.8		6.3							
444.5	Brn. f-c gravel, wf. m-c sand, occas. sandstone wet	7.6		8-19-11	3	ss	18	--	WATER 1-9-84 DD 5.5' 2:30pm BAR 6.0' 2:45p AAR WL 5.0' 4:45p
443.2	F-m sand v. moist	8.9							
442.7	See #B	9.4		15-85/5"	4	ss	17	--	
	END OF BORING 9.4'		10						
			15						

#A Blk. coal refuse, 4" clay wf. silt fill v. moist

#B Brn. sandst wf. f-m sand w

Screen 9.4'-4
2"PVC Pipe 4.4
3.
Gravel 9.4'-4
Bentonite 4.0'
2.5'
Plug 1.5'-sur
Grout 2.5'-1.
4"standpipe 3.
3.9' st

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-4
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-13-84 — COMPLETED 2-13-84 — DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
454.4		0.0	30						
453.1	Blk. asphalt 1.0" F-m gravel 1.0", brn, clayey silt wf, f-m gravel pavement materials moist	1.3							
451.3	Blk. silt, wf. f-c gravel fill moist	3.1		5-5-7	1	ss	16"	--	
448.5	Brn. silty sand, wf. occas. f-m gravel moist	5.9	5	4-3-3	2	ss	18	0.9	
446.2	Br. f-m sand wf. silt v. moist	8.2		3-3-4	3	ss	18	--	WATER 2-13-84
443.5	Br. f-m gravel, wf. c-m sand, silt wet	10.9	10	3-3-3	4	ss	17	0.6	DD 8.0 9:45am BAR 8.0 10:30am AAR --- DL 7.5 11:45am
	Lt.-br. sandstone			23-77/5"	5	ss	11	--	Screen 12.5'-5. 2"PVC Pipe 5.0'-3.0'
441.0		13.4		100/4"	6	ss	4	4.5t	Gravel 13.4'-4. Bentonite 4.0'-2.0'
	END OF BORING 13.4'		15						Plug 2.0'-surf.

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. K-5
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO. —
LOCATION PER PLAN
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING —
DATE STARTED 2-13-84 — COMPLETED 2-13-84 — DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
452.3		0.0	30						
451.1	1" coal refuse, brn. clayey silt, wf. f-c gravel occas. organic fibers fill moist	1.2		4-5-5	1	ss	14"	--	
449.2	See #A	3.1							
446.4	Brn. f. sand, wf. occas. c. sand, f. gravel moist v. moist	5.8	5	3-2-4	2	ss	17	0.4	WATER 2-13-84 DD 8.0 2:50pm BAR 11.0 3:50pm AAR ------- WL 6.5' 5:45pm
443.9	Br. f-m sand, wf/ c sand wet	8.4		3-3-4	3	ss	18	0.6	
441.7	Brn. m-c sand, wf. f-c gravel occas. blk. coal refuse mottling	10.6	10	3-4-4	4	ss	18	0.9 1.6	Old metal drain pipe 1.0' west boring running from road to station
436.1	Brn.-gray m-c sand, wf. f-m gravel wet	16.2	15	5-6-11	6	ss	12	--	Screen 18.0'-5. 2" PVC pipe 5.0 3.0' stick Gravel 18.0'-4. Bentonite 4.0'. Backfilled 19.2 18.0' wf. gray Plug 2.0'-surf- 1-4" standpipe
435.4	Brn.-gray sandstone, wf f-c gravel occas. f-c sand v. moist	16.6		16-15-24		ss	12	--	#A Brn. gray s m-c sand, wf. f-c gravel, o white rock fi wet
				----27-28		ss	6	--	
433.1	Gray sandstone	19.2		30-70/2"	8	ss	8	4.5t	
	END OF BORING 19.2'		20						

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. m-6
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-8-84 COMPLETED 2-9-84 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
438.9		0.0	30						
437.7	Brn. clayey silt wf. tr. f-m sand, occas.	1.2							
	organic fibers moist Brn. clayey silt, wf. f-m sand, occas. f gravel moist			1-2-4	1	ss	13"	1.2	
435.5		3.4							
	Gray-brn. silty clay, wf. tr. f. sand, occas. f. gravel moist								WATER 2-8-84
433.3		5.6	5	3-4-5	2	ss	16	--	DP 8.0 9:20am
	Brn. f-c gravel wf. clay, c. sand moist								BAR 9.0 10:30am AAR ---- WL 6.0 1:00pm
431.6		7.3		8-8---	3A	ss	12	--	
431.0	Br. sand, tr. sandstone	8.0		----15	3B	ss	6	--	
430.5	Br. f-m sand wet	8.4							Screen 11.4'-5.(2" PVC pipe 5.0 5.0' stic
	Lt. br. sandstone, wf. f. sand		10	80-20/1"	4	ss	7	--	Gravel 11.4'-4.(Bentonite 4.0'-2 Plug 2.0'-surfa Standpipe 3.0'-(
427.5		11.4		100/4.	5	ss	4.5	--	
	END OF BORING 11.4'		15						
			20						

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-7
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-8-84 COMPLETED 2-8-84 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
437.9		0.0	30						
436.5	Br. clayey silt, wf. tr. f. sand, occas. organic fibers moist	1.4							
434.0	Br. clayey silt, sand, wf. occas. blk. sandy silt moist	3.9		3-2-7	1	ss	17"	--	
	Lt. brn.-brn. sandy silt, wf. clay		5	2-3-4	2	ss	14	--	
429.8	moist	8.1		3-3-5	3	ss	16	1.7	WATER 2-8-84
	Brn. sandy silt, wf. tr. clay		10	2-2-3	4	ss	14	1.2	DD 11.5 11:45a BAR 11.5 3:00p AAR ---- WL 11.5 5:15p
425.0	very moist	12.9		0-0-3	5	ss	15	1.3	Screen 25.0'-1 2" PVC pipe 15 5.0' stick u Gravel 25.0'-1 Bentonite 14.0 12.0 Plug 2.0'-surf Bentonite-clay 12.0'-2.0' Standpipe 3.0' 5.1' stick
	Brn. silt, wf. f. sand		15	2-2-4	6	ss	16	1.7	
420.3	very moist-wet	17.6		2-2-3	7	ss	18	1.4	
			20	0-1-3	8	ss	17	1.2	

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-7
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-8-84 COMPLETED 2-8-84 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
437.9		0.0	30						
416.5	Brn. sandy silt wf.	21.4							
	lenses, f. sand wet								
	Brn. f. sand								
414.5	wet	23.4							
	Brn. f-c gravel, wf.								
	m-c sand, tr. silt			7-7-9	9	SS	12"	--	
412.9	wet	25.0							
	END OF BORING 25.0'								

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-8
PROJECT NAME HUTSONVILLE POWER PLANT CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-7-84 COMPLETED 2-7-84 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
439.4		0.0	30						
438.1	Brn. clayey silt, wf. tr. f. sand, occas. organic fibers moist	1.3							
436.3	Brn. silty sand	3.1		2-5-7	1	ss	18"	1.6	
	Brn. silty sand, wf. tr. f. sand moist		5	2-3-5	2	ss	17	1.4	
				3-5-5	3	ss	18	3.2	WATER 2-7-84
431.0		8.4							
	Brn. clayey silt, wf. tr. f. sand moist		10	2-3-3	4	ss	18	1.8	DD 13.0 11:45a BAR 19.0 3:45p AAR ------ WL 12.0 8:30a 2-8-84
428.5		10.9							
	Brn. gray clayey silt, wf. tr. f. sand, sm. gray silt pockets moist			2-2-2	5	ss	18	1.2	Screen 21.5'-1 Gravel 21.5'-1 Bentonite 15.5 13.5
			15	2-2-3	6	ss	18	1.7	Clay & Bentoni 13.5'-4.0' 2" PVC pipe 16 4.9' stick up Bentonite ceme grout 4.0'-2.0 Plug 2.0'-surf Standpipe 3.0'
422.0		17.4		1-2-2	7	ss	18	1.2	
	Brn. sandy silt, wf. occas. f. sand lens								
419.6	wet very moist	19.8	20	0-1-2	8	ss	18	1.2	Baled well at 5:15pm 2-9-84 11.0' water le

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. M-P
PROJECT NAME HUTSONVILLE POWER STATION CONTRACT NO.
LOCATION PER PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 8"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 2-7-84 COMPLETED 2-8-84 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
439.4		0.0	30						
417.9	Br. silty sand wet	21.5		0-0-0	9	SS	18"	1.1	
	END OF BORING 21.5'								

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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS — BORING NO. M-9
PROJECT NAME HUTSONVILLE POWER STATION — CONTRACT NO.
LOCATION 33.0' E. OF STAKE
DATUM — HAMMER WT. 140# — HAMMER DROP 30" — HOLE DIA. 8"
SURFACE ELEV. — CORE DIA. — CASING
DATE STARTED 2-14-84 — COMPLETED 2-14-84 — DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP	NOTES
452.0		0.0	30						
451.2	See #A	0.8							
450.7	See #B	1.3							
448.6	Brn. silty sand, wf. coal refuse, occas. f. gravel fill moist	3.4		5-10-10	1	ss	18"	2.3	#A Brn.-blk f-m sand, wf. coal refuse, 5.0" si wf. f. sand, oc organic fibers fill wet
446.1	Brn. sandy silt, wf. f-m gravel concrete fill moist	5.0	5	4-19-18	2	ss	14	--	
443.9	Brn. sandy silt, wf. ash coal refuse, tr. clay fill moist	8.1		2-1-2	3	ss	16	2.2	#B Brn. f-m sa wf. silt fill moist Water 2-14-84
441.4	Gray sandy silt, wf. occas. f. gravel wet	10.6	10	2-2-1	4	ss	10	1.0	DD 8.0 1:15pm BAR 17.0 2:30pm AAR --- WL 9.0 4:15pm
438.6	Brn. f. sand saturated	13.4		0-1-1	5	ss	8	--	Concrete fragme 3.5'-4.0'
436.5	Gray clayey silt, wf. f. sand, occas. f. gr vel	15.5	15	0-3-3	6	ss	14	2.3	Cobbles, concre 2.6'-3.0
435.6	Br. m-c sand, wf. f-c gravel wet	16.4							Screen 18.5'-8. 2" PVC pipe 8.5 3.0 stick up
433.2	Brn. sandstone	18.8		18-72-22/1"	7	ss	13	4.5	Gravel 18.0'-8. Bentonite 8.0'- Cement Grout 6. 4.
	END OF BORING 18.8'		20	100/3"	8	ss	0	--	Plug 2.0'-surfa Standpipe

Project Name/No.		Boring No.	Start Date	Page
AmerenCIPS - Hutsonville	249-3	MW-3D	10/6/98	1

Driller	Logged by:	End Date	Depth to Water
AEC, Indianapolis, IN	Steve Mueller/STMI	10/6/98	~6 Feet

Boring Depth	Boring Diameter	Surface Elevation	Drill Method	Northing
25.5 Feet	8* Inches	453.7 Feet	HSA/air-rotary	3860.230
Well Depth	**Well Diameter**	**TOC Elev.**	**Sample Method**	**Easting**
25.1 Feet	2-in I.D.	455.28 Feet	2-ft. split-spoon	3952.034

Sample	Blows/6 inches	Sample Depth (ft)	Recovery (%)	Graphic Log	Classification	Description	Well Completion	Comments
	1, 2, 3, 6		75		ML	SANDY SILT, little fine-grained gravel, trace coal fragments, medium stiff, dark brown, moist (topsoil)		5-ft by 4-in square steel stick-up casing to ~1.8 ft; concrete seal 0-3 ft.
	4, 4, 6, 4		88		SP	SAND, well sorted/rounded, fine-grained, quartz, loose, light brown, to medium brown, saturated below 6 ft		
	1, 2, 3, 5	5	75					
	2, 2, 2, 10		63		SW-GW	SILTY SAND & GRAVEL, poorly sorted, medium-grained sand, fine-grained subangular to subround gravel, loose, light gray, saturated		Bentonite/cement grout 3-16 ft; 1/4-in bentonite chips 16-17 ft.
	2, 2, 3, 5		50					
		10			Ss	SANDSTONE, fine-grained, quartz		
		15						Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 20.1-25.1 ft; #7 fine silica sand 17-18 ft; #5 silica sand pack 18-25.5 ft.
		20						
		25				END OF BORING - 25.5 feet		* 4-in diam. borehole drilled 16-25.5 ft using air-hammer.
		30						

Project Name/No.		Boring No.	Start Date	Page
AmerenCIPS - Hutsonville	249-3	MW-7D	10/5/98	1

Driller	Logged by:	End Date	Depth to Water
AEC, Indianapolis, IN	Steve Mueller/STMI	10/5/98	~10 Feet

Boring Depth	Boring Diameter	Surface Elevation	Drill Method	Northing
45.0 Feet	8 Inches	437.5 Feet	HSA	3175.915

Well Depth	Well Diameter	TOC Elev.	Sample Method	Easting
44.3 Feet	2-in I.D.	438.45 Feet	2-ft. split-spoon	5676.110

Sample	Blows/6 inches	Sample Depth (ft)	Recovery (%)	Graphic Log	Classification	Description	Well Completion	Comments
						CLAYEY SILT, medium plasticity, trace roots fibers, soft, medium brown, moist, saturated below 10 ft.		
	1, 1, 2, 3	5	75					5-ft by 4-in square steel stick-up casing to ~1.3 ft; concrete seal 0-3 ft.
	1, 1, 1, 2	10	100		ML			
	1, 1, 2, 3	15	100					
	0, 0, 1, 2	20	100			SILTY SAND, well sorted/rounded, fine-grained, quartz, grades from clayey silt above, loose, medium brown, saturated		
	3, 3, 4, 9	25	75		SP			Bentonite/cement grout 3-35 ft.
	5, 8, 6, 8	30	75			SILTY SAND & GRAVEL, well sorted medium-grained quartz sand, trace coarse sand, fine-grained angular to subangular gravel, medium dense, pale brown, saturated		
					SP-GP			

Project Name/No.		Boring No.	Start Date	Page
AmerenCIPS - Hutsonville	249-3	MW-7D	10/5/98	2

Driller	Logged by:	End Date	Depth to Water
AEC, Indianapolis, IN	Steve Mueller/STMI	10/5/98	~10 Feet

Boring Depth	Boring Diameter	Surface Elevation	Drill Method	Northing
45.0 Feet	8 Inches	437.5 Feet	HSA	3175.915

Well Depth	Well Diameter	TOC Elev.	Sample Method	Easting
44.3 Feet	2-in I.D.	438.45 Feet	2-ft. split-spoon	5676.110

Sample	Blows/6 inches	Sample Depth (ft)	Recovery (%)	Graphic Log	Classification	Description	Well Completion	Comments
	sand heave		0					Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 39.3-44.3 ft; #7 fine silica sand 35-38 ft; #5 silica sand pack 38-45 ft.
	sand heave	40	0					
	16, 25, 7, 11	45	75		ML	CLAYEY SILT, medium plasticity, trace sand, stiff, brown, moist END OF BORING - 45 feet		
		50						
		55						
		60						
		65						

Project Name/No.		Boring No.	Start Date	Page
AmerenCIPS - Hutsonville	249-3	MW-10	10/7/98	1

Driller	Logged by:	End Date	Depth to Water
AEC, Indianapolis, IN	Steve Mueller/STMI	10/7/98	~2.5 Feet

Boring Depth	Boring Diameter	Surface Elevation	Drill Method	Northing
11 Feet	8 Inches	452.9 Feet	HSA	4730.478

Well Depth	Well Diameter	TOC Elev.	Sample Method	Easting
10.7 Feet	2-in I.D.	454.23 Feet	2-ft. split-spoon	2559.807

Sample	Blows/6 inches	Sample Depth (ft)	Recovery (%)	Graphic Log	Classification	Description	Well Completion	Comments
	1, 2, 2, 2		50		ML	CLAYEY SILT, vegetated with grass, soft, dark brown to black, moist (topsoil)		5-ft by 4-in square steel stick-up casing to ~1.5 ft.
	1, 2, 2, 6		50		SP	SILTY SAND, well sorted/rounded, fine-grained, quartz, loose, yellowish orange with dark orange lamina (2-3 mm), saturated below ~2.5 ft		
	1, 2, 6, 25	5	100					Bentonite/cement grout 0-3 ft; 1/4-in bentonite chips 3-4 ft.
	5, 20, 25, 50		63		SP	SILTY SAND, well sorted/rounded, fine-grained, quartz, laminated, dense, light gray to rust colored, predominantly light gray below 7.5 ft, saturated (weathered bedrock)		
		10			Ss	SANDSTONE, fine-grained, quartz		Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 5.7-10.7 ft; #5 silica sand pack 4-11 ft.
						END OF BORING - 11 feet		
		15						
		20						
		25						
		30						

Project Name/No.		Boring No.	Start Date	Page
AmerenCIPS - Hutsonville	249-3	MW-10D	10/7/98	1

Driller	Logged by:	End Date	Depth to Water
AEC, Indianapolis, IN	Steve Mueller/STMI	10/7/98	~2.5 Feet

Boring Depth	Boring Diameter	Surface Elevation	Drill Method	Northing
21.5 Feet	8 Inches	452.9 Feet	HSA	4729.427

Well Depth	Well Diameter	TOC Elev.	Sample Method	Easting
21.3 Feet	2-in I.D.	454.65 Feet	see MW-10 log	2564.715

Sample	Blows/6 inches	Sample Depth (ft)	Recovery (%)	Graphic Log	Classification	Description	Well Completion	Comments
					ML	CLAYEY SILT*, vegetated with grass, soft, dark brown to black, moist (topsoil)		5-ft by 4-in square steel stick-up casing to ~2.0 ft.
			see MW-10		SP	SILTY SAND*, well sorted/rounded, fine-grained, quartz, loose, yellowish orange with dark orange lamina (2-3 mm), saturated below ~2.5 ft		Bentonite/cement grout 0-13 ft; 1/4-in bentonite chips 13-14 ft.
		5			SP	SILTY SAND*, well sorted/rounded, fine-grained, quartz, laminated, dense, light gray to rust colored, predominantly light gray below 7.5 ft, saturated (weathered bedrock)		
		10				SANDSTONE, fine-grained, quartz, becomes medium-grained, trace gravel clasts, increasingly well cemented/hard (very difficult to auger) below 20 ft.		Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 16.3-21.3 ft; #7 silica sand 14-15 ft; #5 silica sand pack 15-21.5 ft.
		15	drill cuts		Ss			
		20						
	50 (1")		1"			END OF BORING - 21.5 feet		* based on MW-10 boring log
		25						
		30						

Project Name/No.		Boring No.	Start Date	Page
AmerenCIPS - Hutsonville	249-3	MW-11	10/6/98	1

Driller	Logged by:	End Date	Depth to Water
AEC, Indianapolis, IN	Steve Mueller/STMI	10/7/98	~6 Feet

Boring Depth	Boring Diameter	Surface Elevation	Drill Method	Northing
15.0 Feet	8 Inches	443.8 Feet	HSA	3371.329

Well Depth	Well Diameter	TOC Elev.	Sample Method	Easting
14.5 Feet	2-in I.D.	445.45 Feet	2-ft. split-spoon	4451.486

Sample	Blows/6 inches	Sample Depth (ft)	Recovery (%)	Graphic Log	Classification	Description	Well Completion	Comments
	1, 2, 3, 4		63		ML	SANDY SILT, little fine-grained gravel, trace coal fragments, medium stiff, medium brown, moist (topsoil)		5-ft by 4-in square steel stick-up casing to ~2.0 ft.
	1, 2, 6, 8		63		SM	SILTY SAND, medium- to coarse-grained, quartz, loose, light brown, moist		
	3, 5, 25, 50	5	75		SW-GW	SILTY SAND & GRAVEL, poorly sorted, dense, light brown, saturated		Bentonite/cement grout 0-3 ft; 1/4-in bentonite chips 3-4 ft.
						SANDSTONE		
		10			Ss			Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 4.5-14.5 ft; #5 silica sand pack 4-15 ft.
		15				END OF BORING - 15 feet		
		20						
		25						
		30						

Project Name/No.		Boring No.	Start Date	Page
AmerenCIPS - Hutsonville	249-3	MW-12	10/8/98	1

Driller	Logged by:	End Date	Depth to Water
AEC, Indianapolis, IN	Steve Mueller/STMI	10/8/98	~12 Feet

Boring Depth	Boring Diameter	Surface Elevation	Drill Method	Northing
17 Feet	8 Inches	455.5 Feet	HSA	4053.583

Well Depth	Well Diameter	TOC Elev.	Sample Method	Easting
16.9 Feet	2-in I.D.	456.74 Feet	2-ft. split-spoon	4637.976

Sample	Blows/6 inches	Sample Depth (ft)	Recovery (%)	Graphic Log	Classification	Description	Well Completion	Comments
	1, 1, 1, 1		63		ML	SANDY SILT, little clay, soft, dark brown, moist (topsoil)		5-ft by 4-in square steel stick-up casing to ~1.5 ft.
					Coal Ash	ASH, silty texture, soft, olive gray, moist		
	2, 3, 10, 8		100		GM	SILTY SAND & GRAVEL, poorly sorted, medium dense, light brown, moist (fill)		
	1, 1, 2, 3	5	63		SP	SAND, well sorted/rounded, fine-grained, quartz, loose, light brown, moist		
	2, 2, 4, 3		75					
	1, 2, 3, 2		50			SAND, poorly sorted, fine- to coarse-grained, subangular to subround, quartz, trace fine gravel, loose, light brown, saturated below ~12 ft		Bentonite/cement grout 0-3.5 ft; 1/4-in bentonite chips 3.5-5 ft.
	1, 1, 1, 2	10	75		SW			
	1, 2, 2, 3		75					Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 6.9-16.9 ft; #7 fine silica sand 5-6 ft; #5 silica sand pack 6-17 ft.
	2, 3, 3, 4	15	100					
	10, 10, 35, 50		50		ML	SILT, stiff, light brown, moist		
						END OF BORING - 17 feet (bedrock)		
		20						
		25						
		30						

Project Name/No.		Boring No.	Start Date	Page
AmerenCIPS - Hutsonville	249-3	MW-13	10/6/98	1

Driller	Logged by:	End Date	Depth to Water
AEC, Indianapolis, IN	Steve Mueller/STMI	10/6/98	~7 Feet

Boring Depth	Boring Diameter	Surface Elevation	Drill Method	Northing
16.5 Feet	8 Inches	456.4 Feet	HSA	3961.759

Well Depth	Well Diameter	TOC Elev.	Sample Method	Easting
16.0 Feet	2-in I.D.	458.03 Feet	2-ft. split-spoon	4241.200

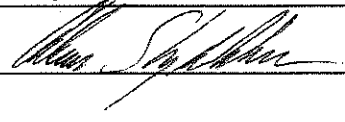
Sample	Blows/6 inches	Sample Depth (ft)	Recovery (%)	Graphic Log	Classification	Description	Well Completion	Comments
	1, 2, 3, 5		25		SM	SILTY SAND, with gravel, loose, dark brown, moist (topsoil)		5-ft by 4-in square steel stick-up casing to ~2.0 ft; concrete 0-3 ft.
		5			SP	SAND*, well sorted/rounded, fine- to medium-grained, quartz, light brown, saturated below ~9 ft. * based on drill cuttings and geologic log for geoprobe GP-4		Bentonite/cement grout 3-6.3 ft; 1/4-in bentonite chips 6.3-7 ft.
	1, 2, 2, 2	10	50		SW-GW	CLAYEY SAND & GRAVEL, poorly sorted, fine- to coarse-grained sand, fine-grained subangular gravel, loose, light brown, saturated		Sch. 40 PVC casing flush-threaded to 0.01-in factory-slotted PVC screen 9-14 ft; #7 fine silica sand 7-8 ft; #5 silica sand pack 8-16.5 ft.
		15			Ss	SANDSTONE		
						END OF BORING - 16.5 feet		
		20						
		25						Unslotted casing/sediment sump 14-16 ft.
		30						

SOIL BORING LOG INFORMATION
Form – General Use Rev. 8-2000

Facility/Project Name *AMEREN Energy Generating – Hutsonville Power Plant*		**License/Permit/Monitoring Number**	**Boring Number** *MW-11R*
Boring Drilled By (Firm name and name of crew chief) *Boart Longyear* *Randy Radke*		**Date Drilling Started** *10/03/01*	**Date Drilling Completed** *10/03/01*	**Drilling Method** *HSA*
Facility Well No.	**Unique Well No.** / **Common Well Name**	**Final Static Water Level** *Feet MSL*	**Surface Elevation** *440.920 Feet MSL*	**Borehole Diameter** *8.25 inches*
Boring Location **State Plane**	*3217.083* **Feet N** *4654.729* **Feet E**	**Lat** **Long**	**Local Grid Location (If applicable)** ☐ N ☐ E ☐ S ☐ W	
County *Crawford*		**Civil Town/City/ or Village** *Hutsonville*		

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
MW-11R 0-2	18	2 3 4 6	2	0'–5' FILL, gray with orange mottling, coarse sand with clay, dry friable	FILL									
MW-11R 2.5-4.5	18	3 4 6 6	4	grades to sand with gravel, coarse										
MW-11R 5-7	20	3 4 4 5	6	5'–8' SAND, orange, poorly graded, coarse	SP									
MW-11R 7.5-9.5	14	2 3 4 3	8	8'–10' SAND with GRAVEL, brown, poorly graded, rounded, fine gravel/coarse sand	SP									
MW-11R 10-12	18	2 2 3 2	10	10'–11'6" SAND, poorly graded, medium to coarse	SP									
MW-11R 12.5-14.5	20	2 3 3 3	12	11'6"–16' SAND with GRAVEL, brown, poorly graded, rounded, fine gravel/coarse sand	SP									
MW-11R 15-17	3	50/3	14											
			16	*EOB @ 16' Auger Refusal*										
			18											
			20											
			22											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature  Firm **Natural Resource Technology, Inc.**

SOIL BORING LOG INFORMATION
Form – General Use Rev. 8-2000

Facility/Project Name *AMEREN Energy Generating – Hutsonville Power Plant*			**License/Permit/Monitoring Number**		**Boring Number** *MW-14*
Boring Drilled By (Firm name and name of crew chief) *Boart Longyear* *Randy Radke*			**Date Drilling Started** *10/03/01*	**Date Drilling Completed** *10/03/01*	**Drilling Method** *HSA*
Facility Well No.	**Unique Well No.**	**Common Well Name**	**Final Static Water Level** *Feet MSL*	**Surface Elevation** *440.930 Feet MSL*	**Borehole Diameter** *8.25 inches*
Boring Location **State Plane**	*2811.508* **Feet N** *5325.781* **Feet E**		**Lat** **Long**	**Local Grid Location (If applicable)** ☐ N ☐ E ☐ S ☐ W	
County *Crawford*			**Civil Town/City/ or Village** *Hutsonville*		

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			2	0'–7'6" SILT, brown (10YR 4/3), moist, non-plastic										
MW-14 2.5–4.5	18	2 3 2 3	4		ML									
MW-14 5–7	18	1 1 2 2	6											
MW-14 7.5–9.5	18	1 2 1 2	8	7'6"–12'6" SILT with SAND, brown (10YR 4/3), low plasticity, moist										
MW-14 10–12	24	1 1 1 1	10	yellowish brown (10YR 5/4), increase plasticity to medium	ML									
MW-14 12.5–14.5	18	1 1 1 2	12	12'6"–18'6" LEAN CLAY, brown (7.5YR 4/2), 10–15% grey/orange mottling, medium plasicity										
MW-14 15–17	22	1 1 1 1	14		CL									
MW-14 17.5–19.5	18	1 1 1 1	16											
MW-14 20–22	18	1 1 1 1	18	18'6"–26' SAND with SILT, wet, non-plastic										
MW-14 22.5–24.5	20	2 2 3 3	20	23'6"–24' SAND seam, medium	SM									
			22		SP SM									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm **Natural Resource Technology, Inc.**

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
	20		26	24'–26' SAND with SILT, as above	SM									
MW-14 25-27	18	1 2 2 3												
			28	26'–38' SAND with GRAVEL, coarse sand, platy fine gravel, poorly graded										
MW-14 27.5-29.5	18	2 3 3 4		gravel becomes rounded	SP									
			30											
MW-14 30-32	20	3 3 4 5		4" LEAN CLAY with Gravel seam, gray (5Y 5/1), rounded, fine, 2–7% shell fragments	CL									
			32											
MW-14 32.5-34.5	18	3 3 5 5	34		SP									
			36		SP									Advance Hydropunch discrete water sampler
			38											
				EOB @ 39'										Drillers note: sand and gravel as above
			40											
			42											
			44											
			46											
			48											
			50											
			52											
			54											
			56											
			58											
			60											
			62											

SOIL BORING LOG INFORMATION
Form – General Use Rev. 8-2000

Facility/Project Name *AMEREN Energy Generating – Hutsonville Power Plant*			**License/Permit/Monitoring Number**	**Boring Number** *TW*
Boring Drilled By (Firm name and name of crew chief) *Boart Longyear* *Randy Radke*			**Date Drilling Started** *10/02/01*	**Date Drilling Completed** *10/02/01*	**Drilling Method** *HSA*
Facility Well No.	**Unique Well No.**	**Common Well Name**	**Final Static Water Level** *Feet MSL*	**Surface Elevation** *437.814 Feet MSL*	**Borehole Diameter** *8.25 inches*
Boring Location **State Plane**	*3717.203* **Feet N** *5605.471* **Feet E**		**Lat** **Long**	**Local Grid Location (if applicable)** ☐ N ☐ E ☐ S ☐ W	
County *Crawford*			**Civil Town/City/ or Village** *Hutsonville*		

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			2	0'–5'8" SILT with SAND, very dark brown (10YR 2/2), grades from topsoil, trace organics throughout	ML									
TW 2.5–4.5	20	2 2 3 3	4											
TW 5–7	18	2 1 2 4	6	5'8"–23' LEAN CLAY, brown (10YR 4/3), medium plasticity, moist										
TW 7.5–9.5	16	1 1 1 2	8	weak red (2.5Y 5/3), trace orange mottling										
TW 10–12	20	1 1 1 1	10											
TW 12.5–14.5	18	1 1 1 1	12	trace horizontal fracture, wet										
TW 15–17	18	1 1 1 1	14	5–10% fine sand	CL									
TW 17.5–19.5	20	1/24	16											
TW 20–22	24	1/24	18	very dark gray (2.5Y 3/1), trace wood and white shell fragments										
TW 22.5–24.5	10	1/24	20											
			22											
				23'–25'6" SAND, very dark gray (2.5Y 3/1),	SP									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm **Natural Resource Technology, Inc.**

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
	10	1/24		medium, loose, wet	SP									
TW 25-27	18	2 2 2 2	26	25'6"–26' LEAN CLAY, as above	CL									
				26'–27'6" SAND with GRAVEL, poorly graded, coarse sand, fine gravel, rounded	SP									
TW 27.5-29.5	20	3 5 9 10	28	27'6"–31' SAND, gray/black and white, poorly graded, medium to coarse, increased coarsness with depth	SP									
TW 30-32	20	4 6 9 9	30											
				31'–32'6" SAND and GRAVEL, coarse sand, poorly graded, fine gravel, rounded	SP									
TW 32.5-34.5	12	1 1 1 1	32	32'6"–39'6" SAND, gray, poorly graded, medium to coarse, 5–15% gravel	SP									
TW 35-37	24	2 2 3 4	34											
TW 37.5-39.5	24	3 6 6 10	36											
			38											
			40	*EOB @ 39'6"*										
			42											
			44											
			46											
			48											
			50											
			52											
			54											
			56											
			58											
			60											
			62											

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N R T

SOIL BORING LOG

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Ameren Hutsonville Power Station Drilling		TW-115s

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Steve Boart Longyear	5/1/2004	5/1/2004	hollow stem auger

Unique Well No.	Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		TW-115s	Feet MSL	438.4 Feet MSL	8.3 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐ | Lat ___ ° ___ ' ___ " | Local Grid Location ☒ N ☒ E

State Plane N, E S/C/N | Long ___ ° ___ ' ___ " | 398046.72 Feet ☐ S 1176886.34 Feet ☐ W

1/4 of 1/4 of Section , T R

Facility ID	County	State	Civil Town/City/ or Village
			Hutsonville

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
			0	0'-36' Drilled without sampling-see log TW-115d for complete description.			CL				
			5				SC				
			10								
			15				CH				
			20								
			25				CL				
			30				GP				
			35				SW				
				END OF BORING AT 36' Well set at 35'			SW				

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm		
Paula Richardson	Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072	Tel: (262) 523-9000 Fax: (262) 523-9001

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N R T

SOIL BORING LOG

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Ameren Hutsonville Power Station Drilling		TW-115d

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Steve Boart Longyear	4/29/2004	5/1/2004	hsa, core

Unique Well No.	Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		TW-115d	Feet MSL	438.4 Feet MSL	8.3 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐

State Plane N, E S/C/N

1/4 of 1/4 of Section , T R

Lat ° ' "

Long ° ' "

Local Grid Location ☒ N ☒ E

398052.56 Feet ☐ S 1176882.3 Feet ☐ W

Facility ID	County	State	Civil Town/City/ or Village
			Hutsonville

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
1 SS	24 12			0'-3.5' SANDY CLAY, very dark greyish brown (10 YR 3/2), very fine sand, moist			CL				
2 SS	24 24										
3 SS	24 24		5	3.5'-6' CLAYEY SAND mottled grey-brown to tan, very fine sand, moist			SC				
4 SS	24 24			6'-22' FAT CLAY, brown (10 YR 4/3), soft, plastic, moist			CH				
5 SS	24 24										
6 SS	24 4		10								
7 SS	24 24			wet at 13'							
8 SS	24 24		15								

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature		Firm		
Paula Richardson	Paula Richardson	Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072	Tel: (262) 523-9000 Fax: (262) 523-9001	

Natural Resource Technology

N R T

Boring Number **TW-115d** Page 2 of 5

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
9 SS	24 24			6'-22' FAT CLAY, brown (10 YR 4/3), soft, plastic, moist at 16' color change to olive grey (5Y 5/2)			CH				
10 SS	24 24										
11 SS	24 24		20	at 19.8' 2" sand seam, very fine sand 20'-22' trace very fine sand							
12 SS	24 24			22'-22.9' SANDY CLAY			CL				
13 SS	24 0			22.9'-32' POORLY GRADED GRAVEL WITH SAND, olive grey (5Y 5/2), rounded, very fine to fine sand			GP				
14 SS	24 8		25								
15 SS	24 7										
16 SS	24 4		30								
17 SS	24 5			32'-33' WELL GRADED SAND fine to coarse, trace rounded gravel			SW				
18 SS	24 14		35	33'-36' WELL GRADED SAND WITH GRAVEL, very fine to coarse sand, fine to medium gravel, rounded			SW				
19 SS	24 8			36'-39' POORLY GRADED SAND very fine to medium, trace gravel, rounded			SP				
20 SS	24 14										
21 SS	24 11		40	39'-40' WELL GRADED SAND WITH GRAVEL, fine to coarse gravel and sand			SW GW				

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
22 SS	24 12			40'-42' WELL GRADED GRAVEL WITH SAND, fine to coarse sand, fine to coarse gravel, rounded			GW				
				42'-58' WELL GRADED SAND fine to coarse sand, trace gravel, rounded							
23 SS	24 12			2" gravelly sand seam, fine to coarse gravel at 44'							
			45								
24 SS	24 13										
25 SS	24 14										
26 SS	24 13		50				SW				
27 SS	24 16										
28 SS	24 15										
			55								
29 SS	24 9										
30 SS	24 3			58'-70' WELL GRADED GRAVEL WITH SAND, fine to coarse sand, fine to coarse gravel, rounded							
			60								
31 SS	24 7										
32 SS	24 24						GW				
33 SS	24 12										
			65								
34 SS	24 4										

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
35 SS	24 0			58'-70' WELL GRADED GRAVEL WITH SAND, fine to coarse sand, fine to coarse gravel, rounded			GW				
36 SS	24 6		70	70'-74' WELL GRADED SAND fine to coarse			SW				
37 SS	24 4										
38 SS	24 0			74'-88' Logged from cuttings,WELL GRADED GRAVEL WITH SAND fine to coarse sand, fine to coarse gravel							Gravel starts coming up in cuttings.
39 SS	24 0		75								
40 SS	24 0										
41 SS	24 0		80				GW				
42 SS	24 0										
43 SS	24 0										
44 SS	24 0		85								
45 SS	24 12			88'-90' WELL GRADED SAND very fine to medium			SW				
46 CORE	180		90	90'-105' SHALE, grey-blue, friable, moist			SHALE				

Natural Resource Technology

N R T

Boring Number **TW-115d** Page 5 of 5

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
			95	90'-105' SHALE, grey-blue, friable, moist			SHALE				
			100								
			105	END OF BORING AT 105' Well set at 87'							

Natural Resource Technology

N R T

SOIL BORING LOG

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Ameren Hutsonville Power Station Drilling		TW-116

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Steve Boart Longyear	4/26/2004	4/28/2004	hsa, core

Unique Well No.	Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		TW-116	Feet MSL	437.5 Feet MSL	8.3 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐ | Lat ___ ° ___ ' ___ " | Local Grid Location

State Plane N, E S/C/N | Long ___ ° ___ ' ___ " | ☒ N 896034.1384 Feet ☐ S ☒ E 1175442.33 Feet ☐ W

1/4 of 1/4 of Section , T R

Facility ID	County	State	Civil Town/City/ or Village
			Hutsonville

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
1 SS	24 24			0'-3.5' SILT, very dark greyish brown (10 YR 3/2), rootlets to 6", firm, slightly moist			ML				
2 SS	24 12										
3 SS	24 24			3.5'-4.8' SILTY CLAY, very dark greyish brown, firm, slightly moist			CL/ML				
4 SS	24 24		5	4.8'-16' FAT CLAY, dark yellowish brown (10YR 4/4), soft, moist							
5 SS	24 24										
6 SS	24 24		10				CH				
7 SS	24 24										
8 SS	24 24		15	at 14' very moist							

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm		
Paula Richardson	Paula Richardson	Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072	Tel: (262) 523-9000 Fax: (262) 523-9001

Natural Resource Technology

N R T

Boring Number **TW-116** Page 2 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
9 SS	24 24			16'-20.5' SANDY LEAN CLAY, olive brown (2.5 Y 4/3), very fine sand, soft, wet			CL				
10 SS	24 24		20	color change to dark grey (2.5 Y 4/1)							
				20.5'-26.5' CLAYEY SAND, dark grey, very fine sand, wet			SC				
11 SS	24 24		25								
				26.5'-30' CLAYEY GRAVEL, fine gravel, few shell fragments, wet			GC				
12 SS	24 18		30	30'-60' WELL GRADED SAND olive brown (2.5 Y 4/4), fine to coarse, subangular to rounded, wet			SW				
13 SS	24 12		35								
14 SS	24 0		40								

Natural Resource Technology

N R T

Boring Number **TW-116** Page 3 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				30'-60' WELL GRADED SAND olive brown (2.5 Y 4/4), fine to coarse, subangular to rounded, wet							
15 SS	24 10		45								
16 SS	24 12		50				SW				
17 SS	24 6		55								
18 SS	24 2		60	60'-79' SHALE, grey-blue, slightly moist, friable			SHALE				
19 CORE	180		65								

Natural Resource Technology

N R T

Boring Number **TW-116** Page 4 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
			70	60'-79' SHALE, grey-blue, slightly moist, friable			SHALE				
			75	coal seam at 79', bit plugged-no water circulation for coring			COAL				
				END OF BORING AT 79.2' Well set at 30'							

Natural Resource Technology

N R T

SOIL BORING LOG

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Ameren Hutsonville Power Station Drilling		TW-117

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Steve Boart Longyear	4/28/2004	4/29/2004	hollow stem auger

Unique Well No.	Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		TW-117	Feet MSL	435.0 Feet MSL	8.3 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐
State Plane N, E S/C/N
1/4 of 1/4 of Section , T R
Lat ° ' "
Long ° ' "
Local Grid Location ☒ N ☒ E
895267.78 Feet ☐ S 1179053.33 Feet ☐ W

Facility ID	County	State	Civil Town/City/ or Village
			Hutsonville

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
1 SS	24 12			0'-6' SANDY LEAN CLAY, dark olive brown (2.5 Y 3/3), very fine sand, slightly moist							
2 SS	24 24						CL				
3 SS	24 0		5								
4 SS	24 24			6'-7.8' FAT CLAY, dark olive brown, high toughness and plasticity, moist			CH				
5 SS	24 10			7.8'-25' POORLY GRADED SAND dark yellowish brown (10 YR 4/4), very fine, wet							
6 SS	24 12		10				SP				
7 SS	24 10		15								

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Paula Richardson | Firm Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072 | Tel: (262) 523-9000 Fax: (262) 523-9001

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N R T

Boring Number **TW-117** Page 2 of 4

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				7.8'-25' POORLY GRADED SAND dark yellowish brown (10 YR 4/4), very fine, wet trace shell fragments at 16'							
8 SS	24 0		20				SP				
9 SS	24 8		25	25'-26' WELL GRADED SAND fine to medium, coarsens downward			SW				
				26'-35' WELL GRADED GRAVEL, trace sand and shell fragments, rounded							
10 SS	24 4		30	grey clay in shoe of split spoon			GW				
11 SS	24 6		35	35'-60' WELL GRADED SAND fine to coarse			SW				
12 SS	24 5		40								

Natural Resource Technology

N R T

Boring Number **TW-117** Page 3 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				35'-60' WELL GRADED SAND fine to coarse							
13 SS	24 14		45								
14 SS	24 17		50				SW				
15 SS	24 0		55								
16 SS	24 0		60	60'-75' Logged from drill cuttings POORLY GRADED GRAVEL coarse, rounded			GP				Went to larger sample interval due to drilling conditions.
			65								

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N R T

Boring Number **TW-117** Page 4 of 4

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				60'-75' Logged from drill cuttings,POORLY GRADED GRAVEL, coarse, rounded			GP				
			70								
			75								
17 SS	24 0			75'-90' Logged from drill cuttings,WELL GRADED SAND WITH GRAVEL							No samples attempted after 77 feet due to drilling conditions.
			80				SW				
			85								
			90								
18 SS	6 2			90'-90.5' SHALE			SHALE				
				END OF BORING AT 90.5' Well set at 20'							

Natural Resource Technology

N R T

SOIL BORING LOG

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Ameren Hutsonville Power Station Drilling		TW-118

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Steve Boart Longyear	5/4/2004	5/4/2004	hollow stem auger

Unique Well No.	Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		TW-118	Feet MSL	437.0 Feet MSL	8.3 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐

State Plane N, E S/C/N

1/4 of 1/4 of Section , T R

Lat ° ' "

Long ° ' "

Local Grid Location ☒ N ☒ E

898090.86 Feet ☐ S 1177978.73 Feet ☐ W

Facility ID	County	State	Civil Town/City/ or Village
			Hutsonville

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	USCS Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
1 SS	24 24			0'-3' SILT, brown (7.5 YR 4/2)							
2 SS	24 24						ML				
3 SS	24 24			3'-5' dark reddish grey (5 YR 4/2), trace sand wet at 4'							
			5	5'-6' WELL GRADED SAND light reddish brown (5 YR 6/3), medium to fine			SW				
4 SS	24 24			6'-7.5' SILT, brown (7.5 YR 4/2)			ML				
5 SS	24 18			7.5'-10' POORLY GRADED SAND WITH SILT			SP-SM				
			10								
6 SS	24 24			10'-26' POORLY GRADED SAND brown (7.5 YR 5/2), medium grained							
7 SS	24 24						SP				
8 SS	24 16										
			15								

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Paula Richardson

Firm Natural Resource Technology, Inc.
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Natural Resource Technology

N R T

Boring Number **TW-118** Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				10'-26' POORLY GRADED SAND brown (7.5 YR 5/2), medium grained							
9 SS	24 12		20				SP				
10 SS	24 12			@ 22' coarse sand with few gravel							
			25								
				END OF BORING AT 26' Well set at 25'							

Natural Resource Technology

N R T

SOIL BORING LOG

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Ameren Hutsonville Power Station Drilling		TW-119

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Steve Boart Longyear	5/1/2004	5/3/2004	hsa, core

Unique Well No.	Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		TW-119	Feet MSL	435.4 Feet MSL	8.3 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐ — State Plane N, E S/C/N — 1/4 of 1/4 of Section , T R — Lat ° ' " Long ° ' " — Local Grid Location ☒ N 896030.54 Feet ☐ S ☒ E 1181339.05 Feet ☐ W

Facility ID	County	State	Civil Town/City/ or Village
			Hutsonville

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
1 SS	24 18			0'-4' SILTY CLAY, very dark greyish brown (10 YR 3/2), firm, moist							
2 SS	24 20			color change to dark greyish brown (2.5 Y 4/2)			CL/ML				
3 SS	24 24		5	4'-11.7' FAT CLAY, dark greyish brown, soft, moist							
4 SS	24 21			at 6' very moist							
5 SS	24 24			at 9' wet			CH				
6 SS	24 24		10								
7 SS	24 16			11.7'-41' POORLY GRADED SAND mottled orange brown and grey brown, very fine, wet at 12' color change to dark yellowish brown (10 YR 4/4)			SP				
			15								

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature		Firm	
Paula Richardson	Paula Richardson	Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072	Tel: (262) 523-9000 Fax: (262) 523-9001

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N R T

Boring Number **TW-119** Page 2 of 5

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				11.7'-41' POORLY GRADED SAND mottled orange brown and grey brown, very fine, wet							
8 SS	24 6		20								
9 SS	24 0		25				SP				
10 SS	24 11		30	very fine to medium sand							
11 SS	24 12		35	very fine to fine sand							
12 SS	24 22		40								

Natural Resource Technology

N R T

Boring Number **TW-119** Page 3 of 5

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				41'-45' WELL GRADED SAND, very fine to coarse, trace rounded gravel			SW				
13 SS	24 17		45	45'-60' POORLY GRADED SAND very fine to medium							
14 SS	24 12		50				SP				
15 SS	24 0		55								
16 SS	24 0		60	60'-80' Logged by drill cuttings,WELL GRADED SAND WITH GRAVEL to WELL GRADED GRAVEL WITH SAND			SW				Gravel starts coming up in cuttings
17 SS	24 0		65								

Natural Resource Technology

N R T

Boring Number **TW-119** Page 4 of 5

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				60'-80' Logged by drill cuttings,WELL GRADED SAND WITH GRAVEL to WELL GRADED GRAVEL WITH SAND			SW				
18 SS	24 0		70								
19 SS	24 0		75								
20 CORE	84 24		80	80'-100' SHALE, grey to black, laminated, poorly lithified, no circulation of drilling water							
21 CORE	72 30		85								
			90								

Natural Resource Technology

N R T

Boring Number **TW-119** Page 5 of 5

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
22 CORE	84 54		95	80'-100' SHALE, grey to black, laminated, poorly lithified, no circulation of drilling water							
			100	END OF BORING AT 100' Well set at 20'							

Natural Resource Technology

N R T

SOIL BORING LOG

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Ameren Hutsonville Power Station Drilling		TW-120

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Steve Boart Longyear	5/3/2004	5/4/2004	hollow stem auger

Unique Well No.	Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
		TW-120	Feet MSL	446.8 Feet MSL	8.3 inches

Local Grid Origin ☒ (estimated: ☐) or Boring Location ☐

State Plane N, E S/C/N

1/4 of 1/4 of Section , T R

Lat ° ' "

Long ° ' "

Local Grid Location ☒ N ☒ E

898614.91 Feet ☐ S 1180157.14 Feet ☐ W

Facility ID	County	State	Civil Town/City/ or Village
			Hutsonville

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
1 SS	24 17			0'-0.5' TOPSOIL 0.5'-14' POORLY GRADED SAND brownish yellow (10 YR 6/6), medium							
2 SS	24 15										
3 SS	24 15		5								
4 SS	24 12						SP				
			10	color change to reddish yellow (7.5 YR 6/6), moist							
5 SS	24 10		15	14'-36' POORLY GRADED SAND WITH GRAVEL, reddish yellow, medium sand, rounded gravel, moist			SP				

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Paula Richardson Firm Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072 Tel: (262) 523-9000 Fax: (262) 523-9001

Natural Resource Technology

N R T

Boring Number **TW-120** Page 2 of 2

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth From Surface (feet)	Soil/Rock Description And Geologic Origin For Each Major Unit	Hand Pen (tsf)	Field Moisture Condition	U S C S Symbol	Graphic Log	PID/FID (ppm)	Well Diagram	RQD/ Comments/ Lab Test
				14'-36' POORLY GRADED SAND WITH GRAVEL, reddish yellow, medium sand, rounded gravel, moist							
6 SS	24 24		20	wet at 19'							
7 SS	24 24		25				SP				
8 SS	24 24		30								
9 SS	24 24		35	34'-36' coarse sand							
				END OF BORING AT 36' Well set at 35'							

APPENDIX A-2

MONITORING WELL COMPLETION REPORTS AND ABANDOMENT LOG

HANSON ENGINEERS INCORPORATED

MONITORING WELLS

M-1

ELEVATION 456.5

PIPE & SCREEN

7' pipe	459.5 - 452.5
5' screen	452.5 - 447.5

BACKFILL MATERIALS

concrete grout collar	456.5 - 455.0
bentonite seal	455.0 - 453.5
1/8" gravel pack	453.5 - 447.4

M-2

ELEVATION 453.3

PIPE & SCREEN

8' pipe	456.3 - 448.3
13' screen	448.3 - 435.3

BACKFILL MATERIALS

concrete grout collar	453.3 - 451.3
bentonite seal	451.3 - 449.3
1/8" gravel pack	449.3 - 431.8

HANSON ENGINEERS INCORPORATED

MONITORING WELLS

M-3

ELEVATION 452.1

PIPE & SCREEN

7.9'	pipe	455.6 - 447.7
5'	screen	447.7 - 442.7

BACKFILL MATERIALS

concrete grout collar	452.1 - 450.1
bentonite seal	450.1 - 448.1
1/8" gravel pack	442.7 - 448.1

M-4

ELEVATION 454.4

PIPE & SCREEN

8'	pipe	457.4 - 449.4
7.5'	screen	449.4 - 441.9

BACKFILL MATERIALS

concrete grout collar	454.4 - 452.4
bentonite seal	452.4 - 450.4
1/8" gravel pack	450.4 - 441.0

HANSON ENGINEERS INCORPORATED

MONITORING WELLS

M-5

ELEVATION 452.3

PIPE & SCREEN

8'	pipe	455.3 - 447.3
13'	screen	447.3 - 434.3

BACKFILL MATERIALS

concrete grout collar	452.3 - 450.3
bentonite seal	450.3 - 448.3
1/8" gravel pack	448.3 - 433.1

M-6

ELEVATION 438.9

PIPE & SCREEN

10'	pipe	443.9 - 433.9
6.4'	screen	433.9 - 427.5

BACKFILL MATERIALS

concrete grout collar	438.9 - 436.9
bentonite seal	436.9 - 434.9
1/8" gravel pack	434.9 - 427.5

HANSON ENGINEERS INCORPORATED

MONITORING WELLS

M-7

ELEVATION 437.9

PIPE & SCREEN

20'	pipe	442.9 - 422.9
10'	screen	422.9 - 412.9

BACKFILL MATERIALS

concrete grout collar	437.9 - 435.9
bentonite & auger cutting	435.9 - 425.9
bentonite seal	425.9 - 423.9
1/8" gravel pack	423.9 - 412.9

M-8

ELEVATION 439.4

PIPE & SCREEN

21.4'	pipe	444.3 - 422.9
5.0'	screen	422.9 - 417.9

BACKFILL MATERIALS

concrete grout collar	439.4 - 437.4
bentonite & auger cutting	437.4 - 425.9
bentonite seal	425.9 - 423.9
1/8" gravel pack	423.9 - 417.9

HANSON ENGINEERS INCORPORATED

MONITORING WELLS

M-9

ELEVATION 452.0

PIPE & SCREEN

11.5'	pipe	455.0 - 443.5
10'	screen	443.5 - 433.5

BACKFILL MATERIALS

concrete grout collar	452 - 450
bentonite, cement & sand	450 - 446
bentonite seal	446 - 444
1/8" gravel pack	444 - 433.2

Natural Resource Technology

N R T

MONITORING WELL CONSTRUCTION

Facility/Project Name: Ameren Hutsonville Power Station Drilling	Local Grid Location of Well: 898046.72 ft. ☒ N. ☐ S. 1176886.34 ft. ☒ E. ☐ W.	Well Name: TW-115s
Facility License, Permit or Monitoring No.	Local Grid Origin ☒ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. / Well Number
Facility ID	St. Plane ft. N, ft. E.	Date Well Installed: 05/01/2004
Type of Well: Well Code 12/pz	Section Location: 1/4 of 1/4 of Sec. T. R.	Well Installed By: (Person's Name and Firm): Steve Boart Longyear
Distance from Waste/ Source: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ft. MSL

B. Well casing, top elevation 440.89 ft. MSL

C. Land surface elevation 438.4 ft. MSL

D. Surface seal, bottom 437.4 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0; Hollow Stem Auger ☒ 4 1; Other ☐

15. Drilling fluid used: Water ☐ 0 2; Air ☐ 0 1; Drilling Mud ☐ 0 3; None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis, if required):

E. Bentonite seal, top ft. MSL or ft.

F. Fine sand, top 410.4 ft. MSL or 28.0 ft.

G. Filter pack, top 409.4 ft. MSL or 29.0 ft.

H. Screen joint, top 408.4 ft. MSL or 30.0 ft.

I. Well bottom 403.4 ft. MSL or 35.0 ft.

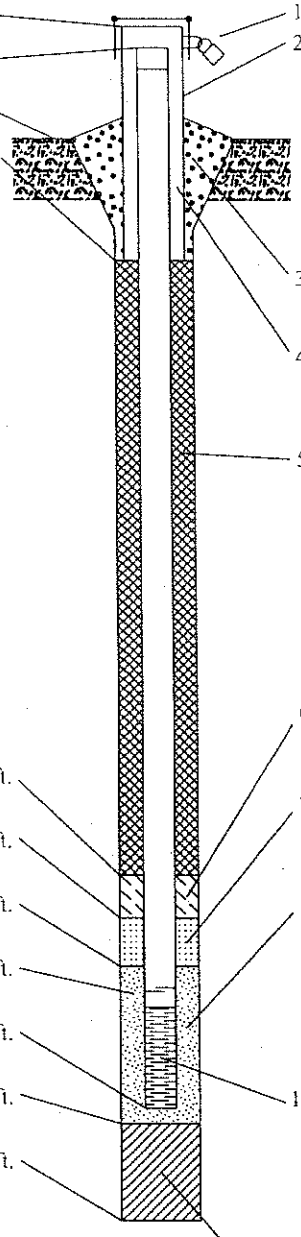
J. Filter pack, bottom 402.4 ft. MSL or 36.0 ft.

K. Borehole, bottom 402.4 ft. MSL or 36.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.33 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 0 4; Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe:

3. Surface seal: Bentonite ☒ 3 0; Concrete ☐ 0 1; Other ☐

4. Material between well casing and protective pipe: Sand; Bentonite ☐ 3 0; Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. Ft³ volume added for any of the above
f. How installed: Tremie ☐ 0 1; Tremie pumped ☐ 0 2; Gravity ☒ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 3 2
c. Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. #7 Badger
b. Volume added ft³

8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Badger
b. Volume added ft³

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3; Flush threaded PVC schedule 80 ☐ 2 4; Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1; Continuous slot ☐ 0 1; Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☒ 1 4; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Paula Richardson

Firm: Natural Resource Technology, Inc.
23713 W. Paul Road, Unit D, Pewaukee, WI 53072
Tel: (262) 523-9000
Fax: (262) 523-9001

Template: NRT WELL CONSTRUCTION - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

MONITORING WELL CONSTRUCTION

Facility/Project Name: Ameren Hutsonville Power Station Drilling	Local Grid Location of Well: 898052.56 ft. ☒ N. ☐ S. 1176882.3 ft. ☒ E. ☐ W.	Well Name: TW-115d
Facility License, Permit or Monitoring No.	Local Grid Origin ☒ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. / Well Number
Facility ID	St. Plane ft. N, ft. E.	Date Well Installed: 05/01/2004
Type of Well: Well Code 12/pz	Section Location: 1/4 of 1/4 of Sec. T. R.	Well Installed By: (Person's Name and Firm): Steve, Boart Longyear
Distance from Waste/Source: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ____ ft. MSL

B. Well casing, top elevation 440.80 ft. MSL

C. Land surface elevation 438.4 ft. MSL

D. Surface seal, bottom 437.4 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☒ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ☒ 41; rock core; Other ☒

15. Drilling fluid used: Water ☒ 02; Air ☐ 01; Drilling Mud ☐ 03; None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): Ameren well

E. Bentonite seal, top 361.4 ft. MSL or 77.0 ft.

F. Fine sand, top 358.4 ft. MSL or 80.0 ft.

G. Filter pack, top 357.4 ft. MSL or 81.0 ft.

H. Screen joint, top 356.4 ft. MSL or 82.0 ft.

I. Well bottom 351.4 ft. MSL or 87.0 ft.

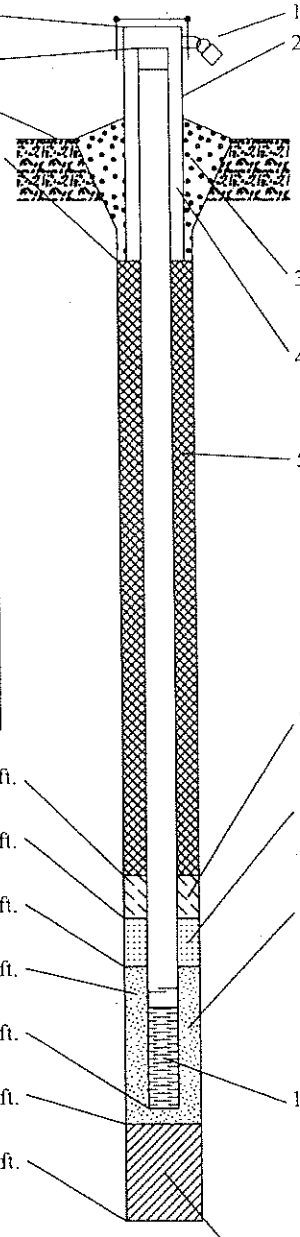
J. Filter pack, bottom 350.4 ft. MSL or 88.0 ft.

K. Borehole, bottom 333.4 ft. MSL or 105.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.33 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 04; ____ Other ☒
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____

3. Surface seal: Bentonite ☒ 30; Concrete ☐ 01; ____ Other ☐

4. Material between well casing and protective pipe: Sand; Bentonite ☐ 30; Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. ____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☒ 02; Gravity ☐ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 32
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. #7 Badger
b. Volume added ____ ft³

8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Badger
b. Volume added ____ ft³

9. Well casing: Flush threaded PVC schedule 40 ☒ 23; Flush threaded PVC schedule 80 ☐ 24; ____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11; Continuous slot ☐ 01; ____ Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☐ 14; Bentonite; Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Paula Richardson	Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072	Tel: (262) 523-9000 Fax: (262) 523-9001

Template: NRT WELL CONSTRUCTION - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

MONITORING WELL CONSTRUCTION

Facility/Project Name: Ameren Hutsonville Power Station Drilling	Local Grid Location of Well: 896034.1384 ft. ☒ N. ☐ S. 1175442.33 ft. ☒ E. ☐ W.	Well Name: TW-116
Facility License, Permit or Monitoring No.	Local Grid Origin ☒ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. / Well Number
Facility ID	St. Plane ft. N, ft. E.	Date Well Installed: 04/28/2004
Type of Well: Well Code 12/pz	Section Location: 1/4 of 1/4 of Sec. T. R.	Well Installed By: (Person's Name and Firm): Steve, Boart Longyear
Distance from Waste/Source: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ____ ft. MSL

B. Well casing, top elevation 439.77 ft. MSL

C. Land surface elevation 437.5 ft. MSL

D. Surface seal, bottom 436.5 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☒ GW ☐ SW ☒ SP ☐
SM ☐ SC ☒ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50
Hollow Stem Auger ☒ 41
rock core Other ☒

15. Drilling fluid used: Water ☒ 02 Air ☐ 01
Drilling Mud ☐ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No
Describe

17. Source of water (attach analysis, if required):
Ameren well

E. Bentonite seal, top ____ ft. MSL or ____ ft.

F. Fine sand, top 414.5 ft. MSL or 23.0 ft.

G. Filter pack, top 413.5 ft. MSL or 24.0 ft.

H. Screen joint, top 412.5 ft. MSL or 25.0 ft.

I. Well bottom 407.5 ft. MSL or 30.0 ft.

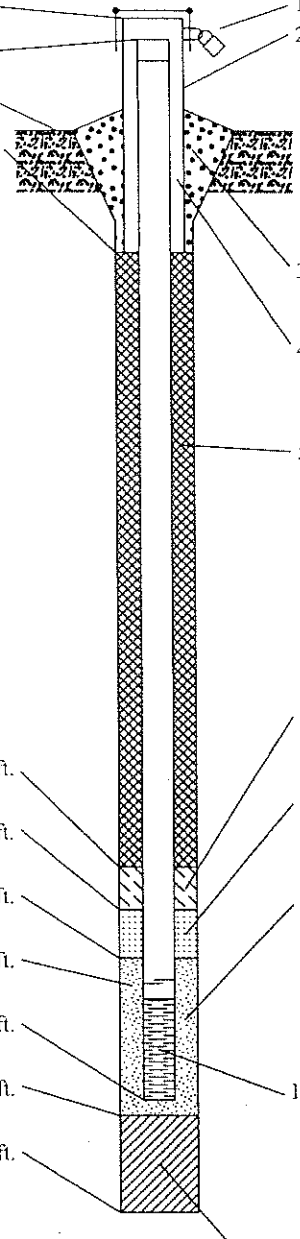
J. Filter pack, bottom 406.5 ft. MSL or 31.0 ft.

K. Borehole, bottom 358.5 ft. MSL or 79.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.33 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 04 Other ☒
d. Additional protection? ☐ Yes ☒ No
If yes, describe:
3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐
4. Material between well casing and protective pipe: Sand Bentonite ☐ 30 Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ... Bentonite slurry ☐ 31
d. ____ % Bentonite ... Bentonite-cement grout ☐ 50
e. ____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08
6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 32
c. Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. #7 Badger
b. Volume added ____ ft³
8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Badger
b. Volume added ____ ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 23
Flush threaded PVC schedule 80 ☐ 24
Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☐ 14
Bentonite, Stuff Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Paula Richardson	Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072	Tel: (262) 523-9000 Fax: (262) 523-9001

Template: NRT WELL CONSTRUCTION - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

MONITORING WELL CONSTRUCTION

Facility/Project Name: Ameren Hutsonville Power Station Drilling	Local Grid Location of Well: 895267.78 ft. ☒ N. ☐ S. 1179053.33 ft. ☒ E. ☐ W.	Well Name: TW-117
Facility License, Permit or Monitoring No.	Local Grid Origin ☒ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. / Well Number
Facility ID	St. Plane ft. N, ft. E.	Date Well Installed: 04/29/2004
Type of Well: Well Code 12/pz	Section Location: 1/4 of 1/4 of Sec. T. R.	Well Installed By: (Person's Name and Firm): Steve Boart Longyear
Distance from Waste/ Source: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ft. MSL

B. Well casing, top elevation 438.09 ft. MSL

C. Land surface elevation 435.0 ft. MSL

D. Surface seal, bottom 434.0 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0; Hollow Stem Auger ☒ 4 1; Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1 Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis, if required):

E. Bentonite seal, top ft. MSL or ft.

F. Fine sand, top 422.0 ft. MSL or 13.0 ft.

G. Filter pack, top 421.0 ft. MSL or 14.0 ft.

H. Screen joint, top 420.0 ft. MSL or 15.0 ft.

I. Well bottom 415.0 ft. MSL or 20.0 ft.

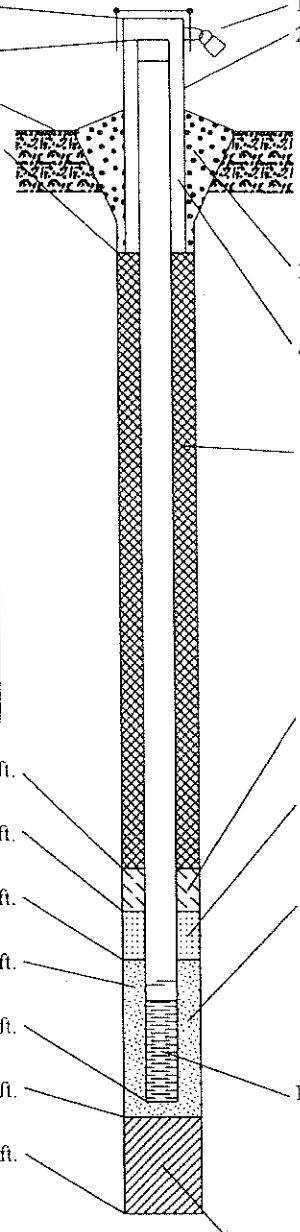
J. Filter pack, bottom 414.0 ft. MSL or 21.0 ft.

K. Borehole, bottom 345.0 ft. MSL or 90.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.33 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 0 4; Other ☒
d. Additional protection? ☐ Yes ☒ No
If yes, describe:

3. Surface seal: Bentonite ☒ 3 0; Concrete ☐ 0 1; Other ☐

4. Material between well casing and protective pipe: Sand — Bentonite ☐ 3 0; Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. ____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 0 1; Tremie pumped ☐ 0 2; Gravity ☒ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 3 2
c. Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. #7 Badger
b. Volume added ft³

8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Badger
b. Volume added ft³

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3; Flush threaded PVC schedule 80 ☐ 2 4; Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1; Continuous slot ☐ 0 1; Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): Slurry — None ☐ 1 4; Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Paula Richardson Paula Richardson	Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072	Tel: (262) 523-9000 Fax: (262) 523-9001

Template: NRT WELL CONSTRUCTION - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

MONITORING WELL CONSTRUCTION

Facility/Project Name: Ameren Hutsonville Power Station Drilling	Local Grid Location of Well: 898090.86 ft. ☒ N. ☐ S. 1177978.73 ft. ☒ E. ☐ W.	Well Name: TW-118
Facility License, Permit or Monitoring No.	Local Grid Origin ☒ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. / Well Number
Facility ID	St. Plane ft. N, ft. E.	Date Well Installed: 05/04/2004
Type of Well: Well Code 12/pz	Section Location: 1/4 of 1/4 of Sec. T. R.	Well Installed By: (Person's Name and Firm): Steve Boart Longyear
Distance from Waste/ Source: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☒ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ft. MSL

B. Well casing, top elevation 439.21 ft. MSL

C. Land surface elevation 437.0 ft. MSL

D. Surface seal, bottom 436.0 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe

17. Source of water (attach analysis, if required):

E. Bentonite seal, top ft. MSL or ft.

F. Fine sand, top 419.0 ft. MSL or 18.0 ft.

G. Filter pack, top 418.0 ft. MSL or 19.0 ft.

H. Screen joint, top 417.0 ft. MSL or 20.0 ft.

I. Well bottom 412.0 ft. MSL or 25.0 ft.

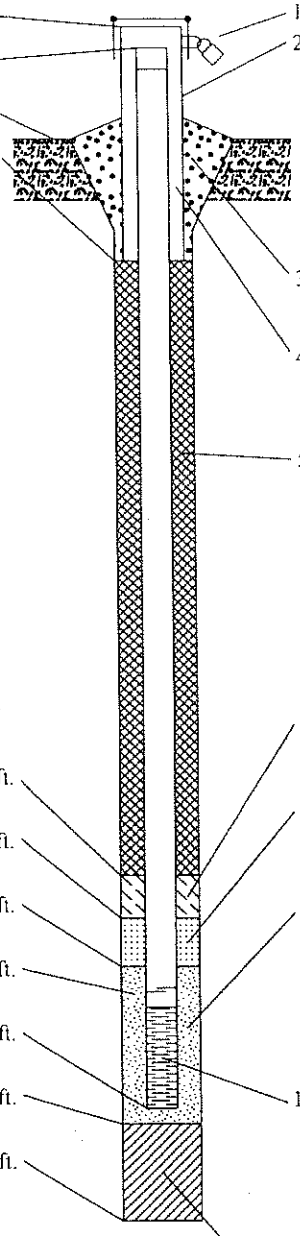
J. Filter pack, bottom 411.0 ft. MSL or 26.0 ft.

K. Borehole, bottom 411.0 ft. MSL or 26.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.33 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 0 4
Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe:

3. Surface seal: Bentonite ☒ 3 0
Concrete ☐ 0 1
Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 3 2
c. Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. #7 Badger
b. Volume added ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Badger
b. Volume added ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 1 1
Continuous slot ☐ 0 1
Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☒ 1 4
Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Paula Richardson

Firm: Natural Resource Technology, Inc.
23713 W. Paul Road, Unit D, Pewaukee, WI 53072
Tel: (262) 523-9000
Fax: (262) 523-9001

Template: NRT WELL CONSTRUCTION - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

MONITORING WELL CONSTRUCTION

Facility/Project Name: Ameren Hutsonville Power Station Drilling	Local Grid Location of Well: 896030.54 ft. ☒ N. ☐ S. 1181339.05 ft. ☒ E. ☐ W.	Well Name: TW-119
Facility License, Permit or Monitoring No.	Local Grid Origin ☒ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. / Well Number
Facility ID	St. Plane ft. N, ft. E.	Date Well Installed: 05/03/2004
Type of Well: Well Code 12/pz	Section Location: 1/4 of 1/4 of Sec. T. R.	Well Installed By: (Person's Name and Firm): Steve Boart Longyear
Distance from Waste/ Source: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☒ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ____ ft. MSL

B. Well casing, top elevation 438.12 ft. MSL

C. Land surface elevation 435.4 ft. MSL

D. Surface seal, bottom 434.4 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50 Hollow Stem Auger ☒ 41 rock core Other ☒

15. Drilling fluid used: Water ☒ 02 Air ☐ 01 Drilling Mud ☐ 03 None ☐ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Town of Hutsonville well

E. Bentonite seal, top ____ ft. MSL or ____ ft.

F. Fine sand, top 422.4 ft. MSL or 13.0 ft.

G. Filter pack, top 421.4 ft. MSL or 14.0 ft.

H. Screen joint, top 420.4 ft. MSL or 15.0 ft.

I. Well bottom 415.4 ft. MSL or 20.0 ft.

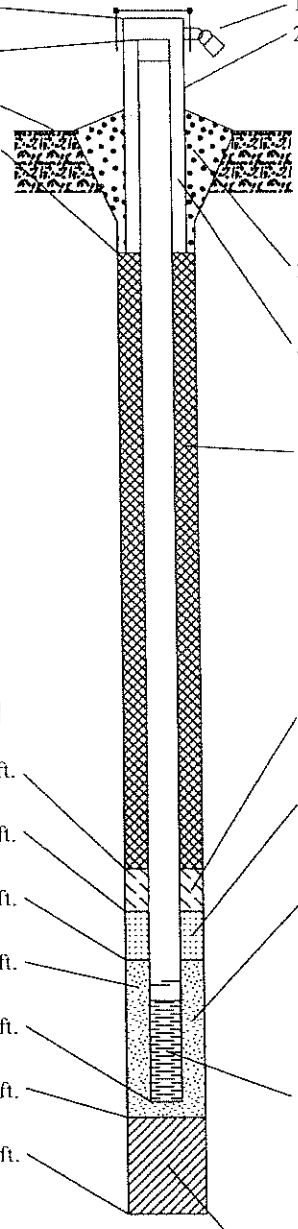
J. Filter pack, bottom 414.4 ft. MSL or 21.0 ft.

K. Borehole, bottom 335.4 ft. MSL or 100.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.33 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 04 Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____

3. Surface seal: Bentonite ☒ 30 Concrete ☐ 01 Other ☐

4. Material between well casing and protective pipe: Sand Bentonite ☐ 30 Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. ____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 Tremie pumped ☐ 02 Gravity ☒ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 32
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. #7 Badger
b. Volume added ____ ft³

8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Badger
b. Volume added ____ ft³

9. Well casing: Flush threaded PVC schedule 40 ☒ 23 Flush threaded PVC schedule 80 ☐ 24 Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11 Continuous slot ☐ 01 Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): bentonite, slurry None ☐ 14 Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Paula Richardson Paula Richardson

Firm: Natural Resource Technology, Inc.
23713 W. Paul Road, Unit D, Pewaukee, WI 53072
Tel: (262) 523-9000
Fax: (262) 523-9001

Template: NRT WELL CONSTRUCTION - Project: 1375 LOGS.GPJ

Natural Resource Technology

N R T

MONITORING WELL CONSTRUCTION

Facility/Project Name: Ameren Hutsonville Power Station Drilling	Local Grid Location of Well: 898614.91 ft. ☒ N. ☐ S. 1180157.14 ft. ☒ E. ☐ W.	Well Name: TW-120
Facility License, Permit or Monitoring No.	Local Grid Origin ☒ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. / Well Number
Facility ID	St. Plane ft. N, ft. E.	Date Well Installed: 05/04/2004
Type of Well: Well Code 12/pz	Section Location: 1/4 of 1/4 of Sec. T. R.	Well Installed By: (Person's Name and Firm): Steve Boart Longyear
Distance from Waste/Source: ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☒ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ____ ft. MSL

B. Well casing, top elevation 449.00 ft. MSL

C. Land surface elevation 446.8 ft. MSL

D. Surface seal, bottom 445.8 ft. MSL or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☒
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 50 / Hollow Stem Auger ☒ 41 / Other ☐

15. Drilling fluid used: Water ☐ 02 / Air ☐ 01 / Drilling Mud ☐ 03 / None ☒ 99

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 421.8 ft. MSL or 25.0 ft.

F. Fine sand, top 418.8 ft. MSL or 28.0 ft.

G. Filter pack, top 417.8 ft. MSL or 29.0 ft.

H. Screen joint, top 416.8 ft. MSL or 30.0 ft.

I. Well bottom 411.8 ft. MSL or 35.0 ft.

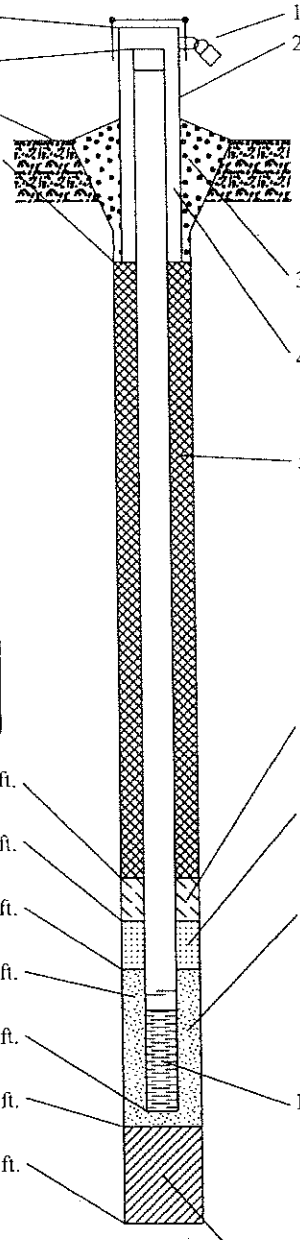
J. Filter pack, bottom 410.8 ft. MSL or 36.0 ft.

K. Borehole, bottom 410.8 ft. MSL or 36.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.33 in.

N. I.D. well casing 2.00 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 6.0 ft.
c. Material: Steel ☒ 04 / ____ / Other ☒
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____

3. Surface seal: Bentonite ☒ 30 / Concrete ☐ 01 / ____ / Other ☐

4. Material between well casing and protective pipe: Sand
Bentonite ☐ 30 / Other ☒

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 33
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 31
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 50
e. ____ Ft³ volume added for any of the above
f. How installed: Tremie ☐ 01 / Tremie pumped ☐ 02 / Gravity ☒ 08

6. Bentonite seal: a. Bentonite granules ☐ 33
b. ☐ 1/4 in. ☐ 3/8 in. ☐ 1/2 in. Bentonite chips ☐ 32
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. #7 Badger
b. Volume added ____ ft³

8. Filter pack material: Manufacturer, product name & mesh size
a. #40 Badger
b. Volume added ____ ft³

9. Well casing: Flush threaded PVC schedule 40 ☒ 23 / Flush threaded PVC schedule 80 ☐ 24 / ____ / Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☒ 11 / Continuous slot ☐ 01 / ____ / Other ☐
b. Manufacturer Boart Longyear
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): None ☒ 14 / ____ / Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Paula Richardson	Natural Resource Technology, Inc. 23713 W. Paul Road, Unit D, Pewaukee, WI 53072	Tel: (262) 523-9000 Fax: (262) 523-9001

Template: NRT WELL CONSTRUCTION - Project: 1375 LOGS.GPJ

Route to: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION

Facility/Project Name: Hutsonville Power Station	Local Grid Location of Well: ____ ft ☐N ☐S ____ ft ☐E ☐W	Well Name: MW-11R
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ____ ° ____ ' ____ " Long. ____ ° ____ ' ____ " or	Unique Well No. ____ DNR Well ID No. ____
Facility ID	St. Plane ____ ft. N, ____ ft. E. S/C/N	Date Well Installed: 10/03/2001 (m m d d y y y y)
Type of Well: Well Code 11 / MW	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____ T. ____ N, R ____ ☐E ☐W	Well Installed By: Name (first, last) and Firm: R. Radke; Boart Longyear
Distance from Waste/Source: 80 ft	Ent. Slds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☒ Sidegradient d ☐ Downgradient n ☐ Not Known
		Gov. Lot Number: ____

A. Protective pipe, top elevation ____ ft. MSL

B. Well casing, top elevation 443.55 ft. MSL

C. Land surface elevation 442.92 ft. MSL

D. Surface seal, bottom ____ ft. MSL or 0.5 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ ____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No
Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top ____ ft. MSL or 4.0 ft.

F. Fine sand, top ____ ft. MSL or 4.0 ft.

G. Filter pack, top ____ ft. MSL or 4.5 ft.

H. Screen joint, top ____ ft. MSL or 5.5 ft.

I. Well bottom ____ ft. MSL or 15.5 ft.

J. Filter pack, bottom ____ ft. MSL or 16.0 ft.

K. Borehole, bottom ____ ft. MSL or 16.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.375 in.

N. I.D. well casing 2.150 in.

1. Cap and lock? ■ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ■ 04; Other ☐ ____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3" Bumper Post

3. Surface seal: Bentonite ■ 30; Concrete ☐ 01; Other ☐ ____

4. Material between well casing and protective pipe: Bentonite ☐ 30; Other ■ SAND

5. Annular space seal: a. Granular/Chipped Bentonite ■ 33
b. ____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. ____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. ____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. ____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ■ 08

6. Bentonite seal: a. Bentonite granules ■ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite chips ☐ 32
c. ____ Other ☐ ____

7. Fine sand material: Manufacturer, product name & mesh size
a. #7 BADGER MATERIAL
b. Volume added ____ ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. #40 AMERICAN MATERIAL
b. Volume added ____ ft^3

9. Well casing: Flush threaded PVC schedule 40 ■ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ ____

10. Screen material: PVC
a. Screen type: Factory cut ■ 11; Continuous slot ☐ 01; Other ☐ ____
b. Manufacturer: Johnson
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ■ 14; Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: NATURAL RESOURCE TECHNOLOGY INC.

Route to: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other ☐

MONITORING WELL CONSTRUCTION

Facility/Project Name: Hurtsville Power STATION	Local Grid Location of Well: ____ ft ☐N ☐S ____ ft ☐E ☐W	Well Name: MW-14
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. / DNR Well ID No.
Facility ID	St. Plane ____ ft N, ____ ft E. S/C/N	Date Well Installed: 10/03/2001 (m m d d y y y y)
Type of Well: Well Code 12 / PZ	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____ T. ____ N. R ____ ☐E ☐W	Well Installed By: Name (first, last) and Firm: R. Radke / Board Conference
Distance from Waste/Source: 80 ft / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ■ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation _____ ft. MSL

B. Well casing, top elevation 943.35 ft. MSL

C. Land surface elevation 940.93 ft. MSL

D. Surface seal, bottom _____ ft. MSL or 0.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No

Describe _____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top _____ ft. MSL or 24.0 ft.

F. Fine sand, top _____ ft. MSL or 29.0 ft.

G. Filter pack, top _____ ft. MSL or 26.0 ft.

H. Screen joint, top _____ ft. MSL or 28.0 ft.

I. Well bottom _____ ft. MSL or 33.0 ft.

J. Filter pack, bottom _____ ft. MSL or 35.0 ft.

K. Borehole, bottom _____ ft. MSL or 39.0 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.35 in.

N. I.D. well casing 2.10 in.

1. Cap and lock? ■ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 3.0 ft.
c. Material: Steel ■ 04; Other ☐
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3" Bumper Post

3. Surface seal: Bentonite ■ 30; Concrete ☐ 01; Other ☐

4. Material between well casing and protective pipe: SAND
Bentonite ☐ 30; Other ■

5. Annular space seal: a. Granular/Chipped Bentonite ■ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ■ 08

6. Bentonite seal: a. Bentonite granules ■ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite chips ☐ 32
c. _____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. #7 BADGER
b. Volume added _____ ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. #40 American Material
b. Volume added _____ ft^3

9. Well casing: Flush threaded PVC schedule 40 ■ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐

10. Screen material: PVC
a. Screen type: Factory cut ■ 11; Continuous slot ☐ 01; Other ☐
b. Manufacturer: Johnson
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.

11. Backfill material (below filter pack): FORMATION COLLAPSE
None ☐ 14; Other ■

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: Natural Resource Technology Inc.

MONITORING WELL CONSTRUCTION

Route to: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐ _____

Facility/Project Name: Hutsonville Power Station	Local Grid Location of Well: _____ ft. ☐N. ☐S. _____ ft. ☐E. ☐W.	Well Name: TW
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ° ' " Long. ° ' " or	Unique Well No. _____ DNR Well ID No. _____
Facility ID _____	St. Plane _____ ft. N, _____ ft. E. S/C/N	Date Well Installed: 10/02/2001 (m m d d y y y y)
Type of Well: Well Code 12 / PZ	Section Location of Waste/Source: _____ 1/4 of _____ 1/4 of Sec. _____ T. _____ N. R _____ ☐E ☐W	Well Installed By: Name (first, last) and Firm: R. Radke; Boart Longyear
Distance from Waste/Source: 80 ft	Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ■ Downgradient n ☐ Not Known
		Gov. Lot Number: _____

A. Protective pipe, top elevation _____ ft. MSL
B. Well casing, top elevation 449.99 ft. MSL
C. Land surface elevation 437.81 ft. MSL
D. Surface seal, bottom _____ ft. MSL or 0.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ■
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis performed? ☐ Yes ■ No

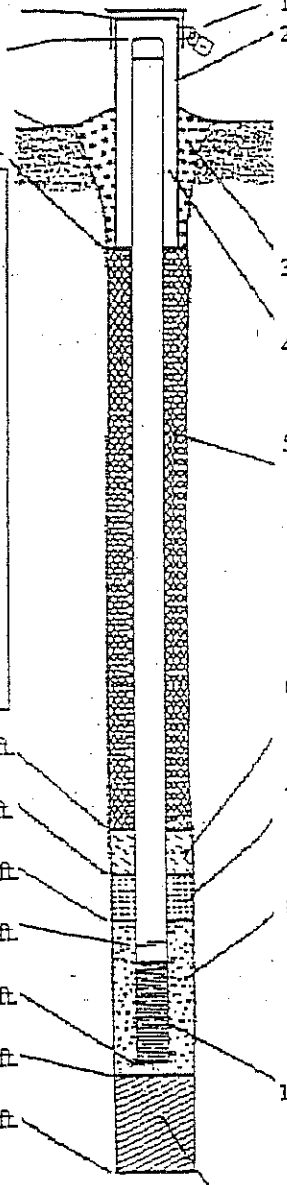
14. Drilling method used: Rotary ☐ 50; Hollow Stem Auger ■ 41; Other ☐ _____

15. Drilling fluid used: Water ☐ 02; Air ☐ 01; Drilling Mud ☐ 03; None ■ 99

16. Drilling additives used? ☐ Yes ■ No
Describe _____

17. Source of water (attach analysis, if required): _____

E. Bentonite seal, top _____ ft. MSL or 30.0 ft.
F. Fine sand, top _____ ft. MSL or 30.0 ft.
G. Filter pack, top _____ ft. MSL or 32.0 ft.
H. Screen joint, top _____ ft. MSL or 34.0 ft.
I. Well bottom _____ ft. MSL or 39.0 ft.
J. Filter pack, bottom _____ ft. MSL or 39.5 ft.
K. Borehole, bottom _____ ft. MSL or 39.5 ft.
L. Borehole, diameter 8.3 in.
M. O.D. well casing 2.35 in.
N. I.D. well casing 2.10 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 7.0 ft.
c. Material: Steel ■ 04; Other ☐ _____
d. Additional protection? ■ Yes ☐ No
If yes, describe: 3" Bumper Posts
3. Surface seal: Bentonite ■ 30; Concrete ☐ 01; Other ☐ _____
4. Material between well casing and protective pipe: Bentonite ☐ 30; Other ■ SAND
5. Annular space seal: a. Granular/Chipped Bentonite ■ 33
b. _____ Lbs/gal mud weight ... Bentonite-sand slurry ☐ 35
c. _____ Lbs/gal mud weight ..... Bentonite slurry ☐ 31
d. _____ % Bentonite ..... Bentonite-cement grout ☐ 50
e. _____ Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 01; Tremie pumped ☐ 02; Gravity ■ 08
6. Bentonite seal: a. Bentonite granules ■ 33
b. ☐1/4 in. ☐3/8 in. ☐1/2 in. Bentonite chips ☐ 32
c. _____ Other ☐ _____
7. Fine sand material: Manufacturer, product name & mesh size
a. #7 BADGER
b. Volume added _____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. #40 American Material
b. Volume added _____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ■ 23; Flush threaded PVC schedule 80 ☐ 24; Other ☐ _____
10. Screen material: PVC
a. Screen type: Factory cut ■ 11; Continuous slot ☐ 01; Other ☐ _____
b. Manufacturer Johnson
c. Slot size: 0.010 in.
d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ■ 14; Other ☐ _____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: _____ Firm: Natural Resource Technology Inc.

BOART LONGYEAR

Well/Boring Abandonment Form

NOV - 1 2001

Client	NRT
Location	Hutsonville, IL
Job Name	Hutsonville Project
Job Number	3410-1824
Well/Boring Number	MW-11
Date of Abandonment	10/03/01
Reason for Abandonment	Study Complete
Abandonment Done By	R. Radke

Hole Type:	[X] *Monitoring Well*	[ ] *Drillhole*	[ ] *Pumping Well*
Construction Type:	[X] *Drilled*	[ ] *Driven*	[ ] *Other* _____
Formation Type:	[X] *Unconsolidated*	[ ] *Bedrock*	
Sealing Method:	[X] *Gravity*	[ ] *Pumped*	[ ] *Other* _____
Sealing Materials:	[X] *Bentonite Chips*	[ ] *Cement-Bent Grout*	[ ] *Other* _____

Sealing Material	From (ft)	To (ft)	Quantity	Gallon(s) Bag(s)
Topsoil	*Surface*	0.5		Gallon(s)
Bentonite Chips	0.5	16.2	1	Bag(s)

Well Information ONLY

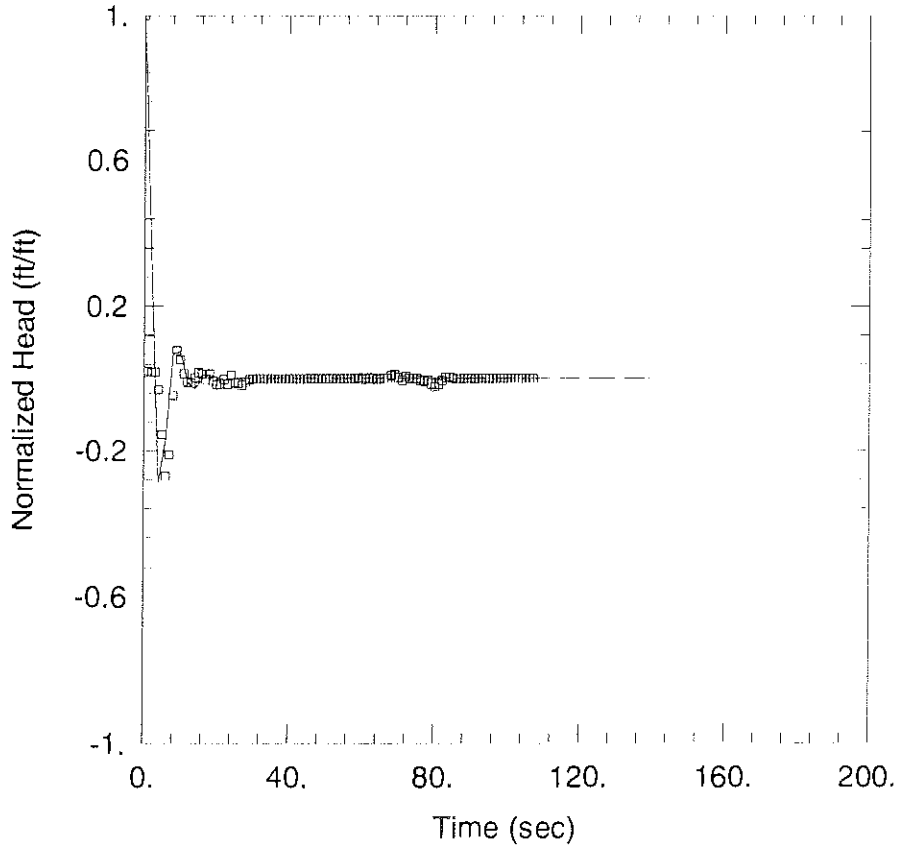
All measurements are from ground surface

			Yes	No
Total Well Depth	16.2 *Ft.*	Screen Removed		x
Casing Diameter	2 *In.*	Overdrilled		x
Casing Depth	16.2 *Ft.*	Casing Left in Place	x	
Depth to Water	8.95 *Ft.*	Casing Cut Below Surface	x	

Comments: _____

APENDIX A-3

SLUG TEST DATA



TW-115S SLUG OUT

Data Set: P:\...\1375 115s slug outA.aqt
Date: 05/11/05 Time: 15:21:28

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Ameren
Project: 1375
Location: Hutsonville, IL
Test Well: TW-115s
Test Date: 5/13/04

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 0.09332 cm/sec
C(D) = 0.3464

AQUIFER DATA

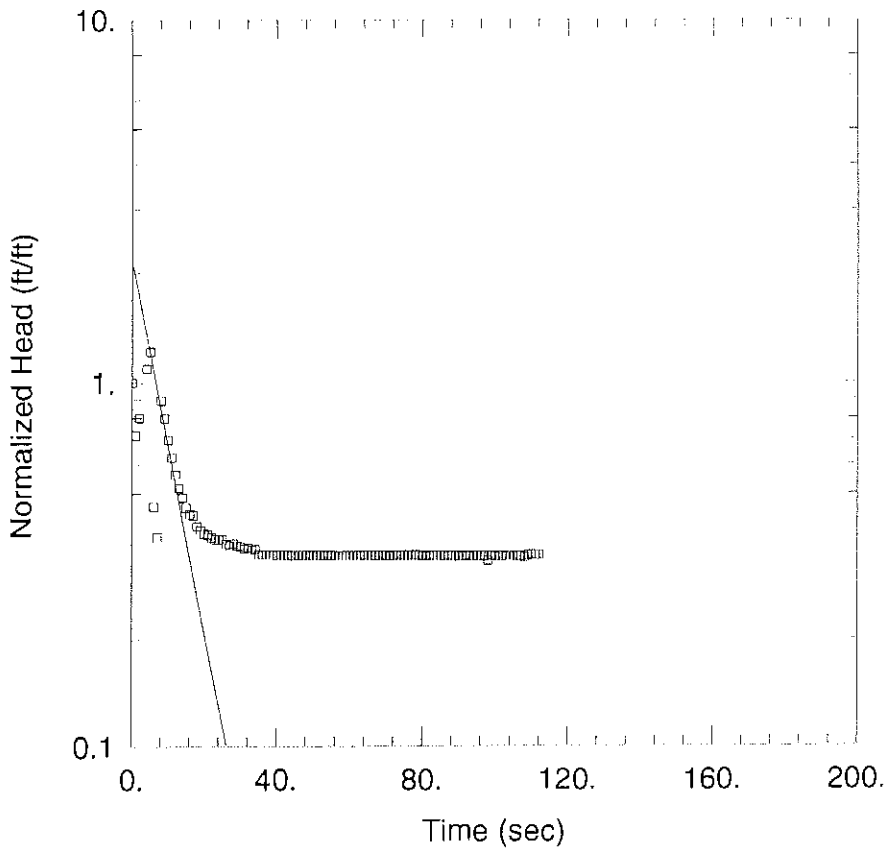
Saturated Thickness: 80. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (TW-115s)

Initial Displacement: 2.8 ft
Total Well Penetration Depth: 23.37 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 23.37 ft
Screen Length: 5. ft
Wellbore Radius: 0.0833 ft



TW-115D SLUG OUT

Data Set: P:\...\1375 115d slug outA.aqt
Date: 05/11/05 Time: 15:21:32

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Ameren
Project: 1375
Location: Hutsonville, IL
Test Well: TW-115d
Test Date: 5/13/04

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0117 cm/sec
y0 = 6.028 ft

AQUIFER DATA

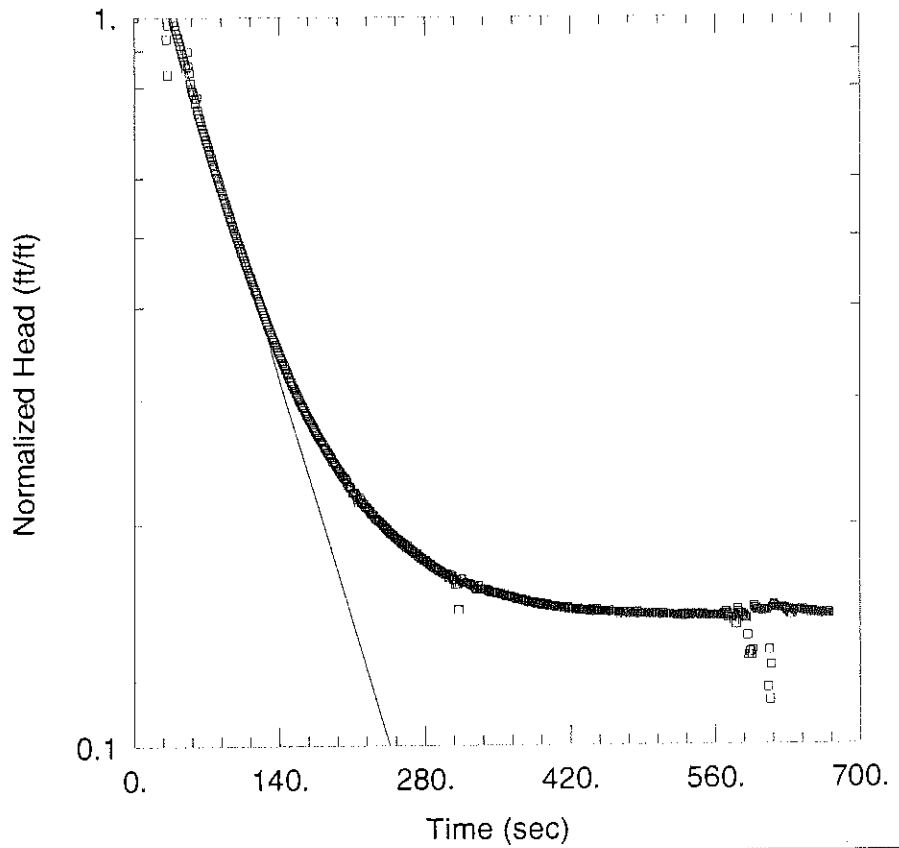
Saturated Thickness: 77. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (TW-115d)

Initial Displacement: 2.8 ft
Total Well Penetration Depth: 77. ft
Casing Radius: 0.0833 ft

Static Water Column Height: 77. ft
Screen Length: 5. ft
Wellbore Radius: 0.0833 ft



TW-116 SLUG OUT

Data Set: P:\...\1375 116 slug outA.aqt
Date: 05/11/05 Time: 15:21:22

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Ameren
Project: 1375
Location: Hutsonville, IL
Test Well: TW-116
Test Date: 5/13/04

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0004557 cm/sec
y0 = 4.116 ft

AQUIFER DATA

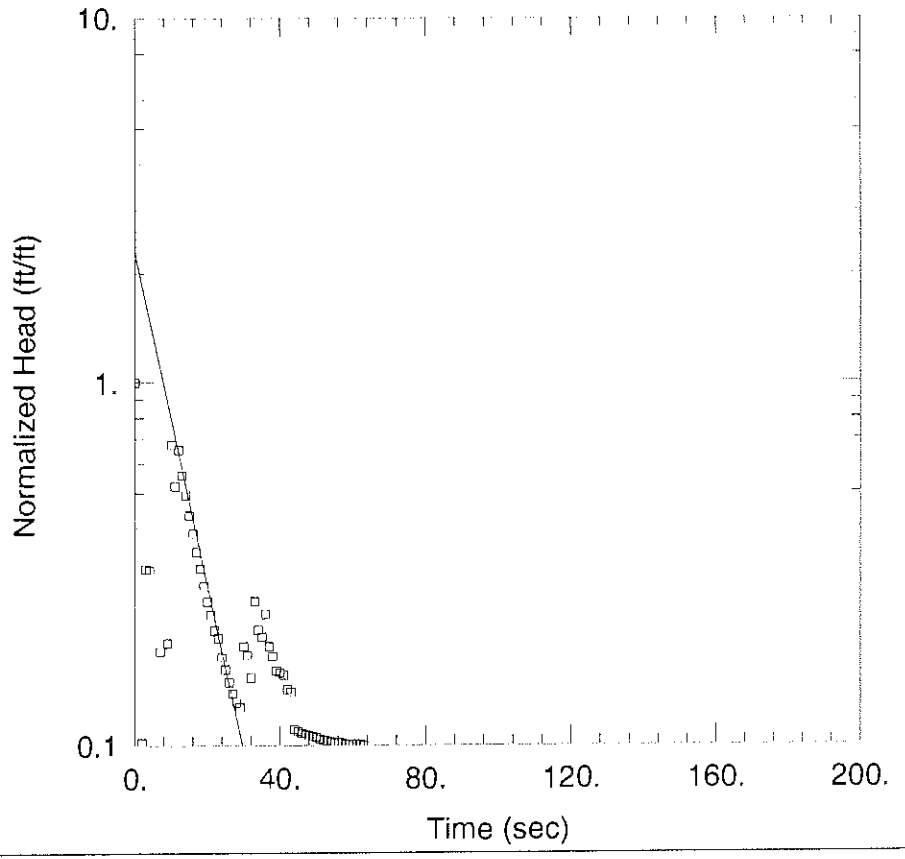
Saturated Thickness: 50. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (TW-116)

Initial Displacement: 2.8 ft
Total Well Penetration Depth: 20. ft
Casing Radius: 0.0833 ft

Static Water Column Height: 20. ft
Screen Length: 5. ft
Wellbore Radius: 0.354 ft



TW-117 SLUG OUT

Data Set: P:\...\1375 117 slug outA.aqt
Date: 05/11/05 Time: 15:21:18

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Ameren
Project: 1375
Location: Hutsonville, IL
Test Well: TW-117
Test Date: 5/13/04

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.006694 cm/sec
y0 = 6.341 ft

AQUIFER DATA

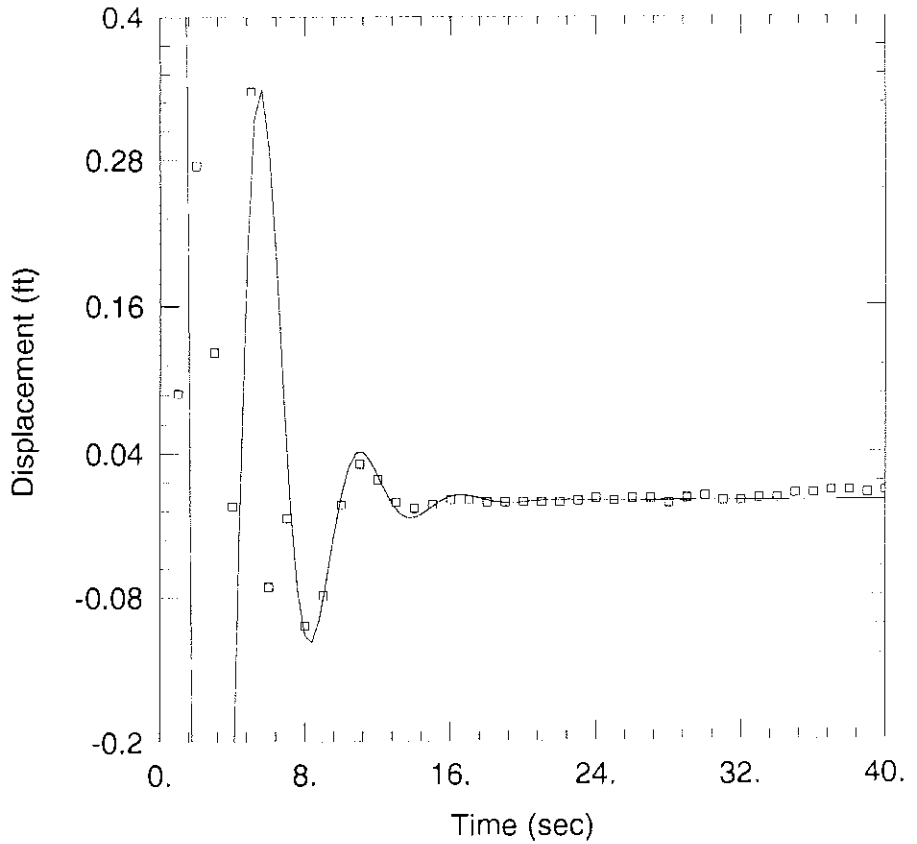
Saturated Thickness: 82. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (TW-117)

Initial Displacement: 2.8 ft
Total Well Penetration Depth: 12. ft
Casing Radius: 0.0833 ft

Static Water Column Height: 12. ft
Screen Length: 5. ft
Wellbore Radius: 0.0833 ft



TW-118 SLUG IN

Data Set: P:\...\1375 118 slug inA.aqt
Date: 05/11/05 Time: 15:21:14

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Ameren
Project: 1375
Location: Hutsonville, IL
Test Well: TW-118
Test Date: 5/13/04

SOLUTION

Aquifer Model: Confined
Solution Method: Butler

K = 0.1638 cm/sec
C(D) = 0.3179

AQUIFER DATA

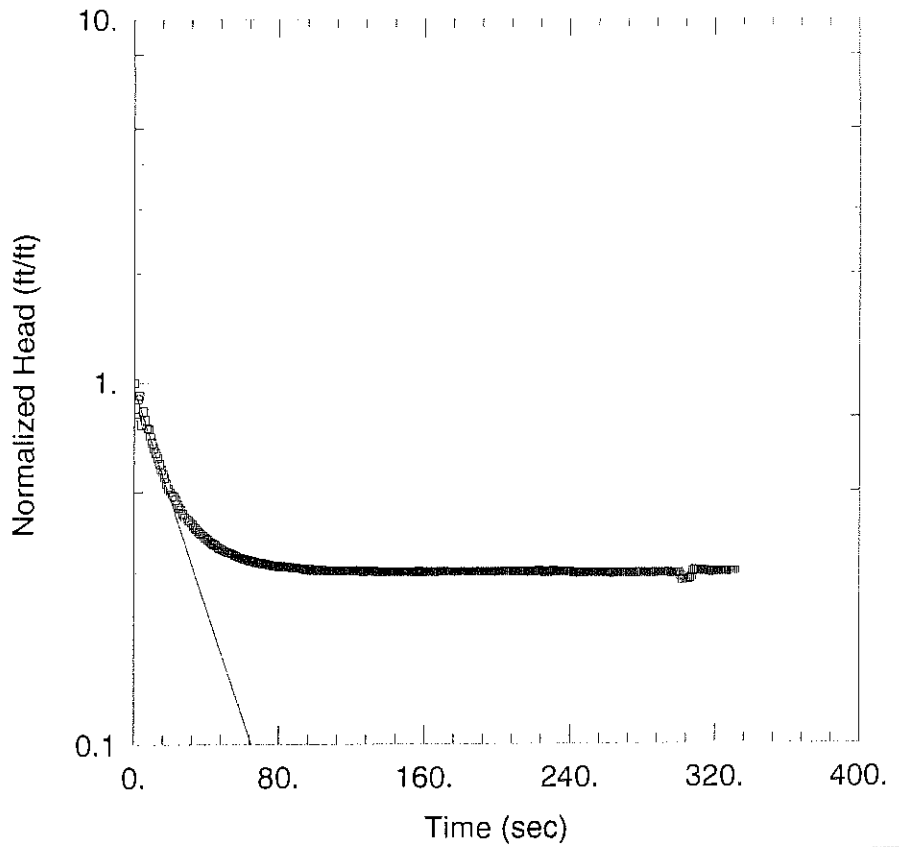
Saturated Thickness: 71. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (TW-118)

Initial Displacement: 2.8 ft
Total Well Penetration Depth: 16. ft
Casing Radius: 0.0833 ft

Static Water Column Height: 16. ft
Screen Length: 5. ft
Wellbore Radius: 0.0833 ft



TW-119 SLUG OUT

Data Set: P:\...\1375 119 slug outA.aqt
Date: 05/11/05 Time: 15:21:04

PROJECT INFORMATION

Company: Natural Resource Technology
Client: Ameren
Project: 1375
Location: Hutsonville, IL
Test Well: TW-119
Test Date: 5/13/04

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.002244 cm/sec
y0 = 2.69 ft

AQUIFER DATA

Saturated Thickness: 72. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (TW-119)

Initial Displacement: 2.8 ft
Total Well Penetration Depth: 13. ft
Casing Radius: 0.0833 ft

Static Water Column Height: 13. ft
Screen Length: 5. ft
Wellbore Radius: 0.0833 ft

APENDIX A-4

GROUNDWATER SAMPLING SOP (AEG)

Monitor Well Sampling Procedure

Purpose:
The procedure for Hutsonville Power Station's Monitor Well sampling is based on IEPA Sampling Procedure Instructions. These instructions are prepared to inform owners/operators of treatment, storage and disposal facilities of proper water sampling procedures. It is expected that by complying with these procedures it will help in obtaining analytical results consistent and comparable with those obtained by the Agency. The Monitoring Well sampling is completed on a monthly basis for Monitoring Wells 1 - 5, pH readings and sample filtration is complete at Hutsonville with the samples shipped to the CIPS Central Lab-Springfield (tested for TDS, Boron, Calcium, Hardness, Manganese, Sulfate, and Alkalinity).

Equipment Needed:

Pump and Tubing (Asco portable pump)
Monitor Well Sample Bottles (5 x 1 liter)
Water Level Indicator
Data Entry Sheet
Truck, Car or 12 V Battery
Timer/Stopwatch/Secondhand on watch
Depth = Volume Data Sheet
Adapter/Connector and cord used to hookup the battery to the pump
pH Meter/Probe
Cooler w/ ice (temperature >39*F)

Sampling Procedure:

1) Connect the Adapter to the battery and pump.
2) Use the Water Level Indicator to find the distance to the top of the water in the well.
   a) To do this, slowly lower the Water Level Indicator probe into the well. When the probe reaches the water you will hear the Water Level Indicator buzzer, indicating that water has been reached. When you hear the buzzer, pull back until it stops, and lower slow until the buzzer sounds again.
   b) Read the increments on the wire from the North side of the casing. (Increments in 100^{th} of an inch).
   c) This is the first entry on the Data Entry Sheet. (See below)
3) From this entry, calculate the volume of water in the well, by subtracting it from the well depth + casing height. Use the data sheet when calculating. From this result, use the chart to calculate the volume of water (gals) in the well. Record this value on the data sheet. If the value does not appear on the sheet, the following calculation may be used to estimate the volume of water in the well.

   feet of water x 0.1632 = est. volume of water in the well

4) With the pump on, drop the pump tubing into the well until the pump starts to pump water.
5) Pump at least one well casing volume of water from the monitor well prior to obtaining a water sample. This is to remove stagnant water in the well and obtain water more representative of the monitored aquifer.
   a) To do this, fill the 1L Monitor Well Sample Bottle, and note the time it takes to fill it. Multiply the time by 4. This is the time it takes for the pump, at a designeated setting, to pump 1 gallon of well water.
   b) Multiply the number of gallons of well water by the time it takes to fill one gallon. This is the amount of time it takes to pump the volume of well water out. Pump, at least, this volume of well water out. Record the amount removed on the data sheet.
   c) After removing the required volume of well water, the well should be sampled while it is recharging. The rechargeing of Hutsonville's wells range from instantaneous to approximately 15 min. depending on how dry the season has been.
6) Rinse the sample bottle at least 3 times with well water, fill, measure the pH, record pH, and place in a cooler of ice (only necessary if the temperature outside is more than 39º F).
7) Pull tubing out while pump is running to remove most of the remaining water in the tubing.
8) Repeat steps 1-7 for all remaining Monitor Wells (1-5).

Filtering Procedure:

1) All groundwater samples to be analyzed for <u>inorganic</u> parameters (metals) are to be filtered through a 0.45 micron Cellulose Nitrate filter membrane.
2) Obtain a clean 1 L fliter flask for each sample (5), a clean funnel, and a vacuum pump.

Hutsonville Monitoring Well Samples

Date:

Collected by:

MW #	Depth to top of Water	Calculations	Volume of Water in Well	Quantity Discharged before sampling	pH
1		11.50 -			
2		21.25 -			
3		12.42 -			
4		18.17 -			
5		20.67 -			

Remarks:

APPENDIX B

ALTERNATIVE COST SUMMARY SHEETS

GROUNDWATER MANAGEMENT ALTERNATIVE: Collection Trench

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3
Hutsonville Power Station — BY: KJB — CHKD BY: CAR
Ameren Services — DATE: 2/8/08 — DATE:

CONSULTING CAPITAL COSTS					SUB-TOTAL
Consulting					
Hydrogeologic Evaluation, Engineering Design, System Installation Oversight, Final System Documentatio					$150,000
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$150,000
30% Estimating Contingency					$45,000
TOTAL, CONSULTING CAPITAL COSTS					**$200,000**

CONSTRUCTION CAPITAL COSTS	QUANTITY	UNIT	UNIT COST	ITEM COST	SUB-TOTAL
General Construction					$181,600
Design Pump Test	1	LS	$25,000	$25,000	
Mob./Demob.	1	LS	$25,000	$25,000	
Erosion Controls	1	LS	$8,000	$8,000	
Site Vegetation Clearing	1	LS	$10,000	$10,000	
Pre-Engineering System Enclosure and Foundatior	1	LS	$40,000	$40,000	
PLC Control System and Electrical	1	LS	$30,000	$30,000	
Blend Overburden Trench Spoil Into Existing Grade	1,805	CY	$2.00	$3,600	
Startup/Testing	1	LS	$20,000	$20,000	
Documentation Surveying	1	LS	$10,000	$10,000	
Restoration of Disturbed Areas	1	LS	$10,000	$10,000	
South Collection Trench Constructior					$277,200
Collection Trench Excavation	3,300	CY	$6.00	$19,800	
Install (1") Washed River Rock	3,100	TONS	$20.00	$62,000	
Install 6"' Bentonite Seal	180	TONS	$90.00	$16,200	
Install General Fill to Grade	1,495	CY	$4.00	$6,000	
Install Groundwater Collection Sumps	5	EA	$10,000	$50,000	
Pumps for Groundwater Collection Sumps (2 Each)	10	EA	$3,000	$30,000	
6" HDPE Drain Tile For Collection Trench	2,750	LF	$8.00	$22,000	
8 oz. Geosynthetic liner	57,400	SF	$0.35	$20,100	
Underground Piping to Interim Pond B	2,580	LF	$8.00	$20,600	
Electrical and Control Wiring for Each Well	6,100	LF	$5.00	$30,500	
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$458,800
30% Estimating Contingency					$137,600
TOTAL, CONSTRUCTION CAPITAL COSTS					**$600,000**

TOTAL CAPITAL COSTS	**$800,000**

ANNUAL COSTS					
Annual O & M Costs					$36,000
O & M Sampling Labor & Equipment	1	LS	$5,000	$5,000	
Discharge Sampling Analytical	1	LS	$3,000	$3,000	
Annual Equipment Maintenance	1	LS	$8,000	$8,000	
Electric Costs	1	LS	$20,000	$20,000	
ANNUAL SUBTOTAL					$36,000
30% Estimating Contingency					$10,800
TOTAL ANNUAL COSTS					**$47,000**

ASSUMPTIONS

1. Groundwater collection via a 2,650 foot long collection trench sloped ≥1.0%) to two collection sumps; total groundwater extraction is about 10-25 GPM.
2. Trench design consists of 6" HDPE drain tile, a layer of geosynthetic, washed river rock, followed by 6" bentonite seal, backfilled to grade with general fill.
3. This options assumes no treatment of extracted groundwater and discharge directly to the Interim Pond and/or the Drainage Collection Pond.
4. Results of further hydrogeological assessment and design pump test could impact size and scope of the groundwater collection system.
5. Additional sources of estimated costs: RS Means Site Work & Landscape Cost Data.
6. Above is a preliminary estimate and may be revised if selected for final design.

GROUNDWATER MANAGEMENT ALTERNATIVE: Ash Stabilization

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3

Hutsonville Power Station — BY: CAR — CHKD BY: BRH

Ameren Services — DATE: 6/27/05 — EJT (5/19/05)

CONSULTING CAPITAL COSTS					SUB-TOTAL
Consulting					
Hydrogeologic Evaluation, Engineering Design, System Installation Oversight, Final System Documentatio					$500,000
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$500,000
30% Estimating Contingency					$150,000
TOTAL, CONSULTING CAPITAL COSTS					**$650,000**

CONSTRUCTION CAPITAL COSTS	QUANTITY	UNIT	UNIT COST	ITEM COST	SUB-TOTAL
Construction					$14,529,000
Bench Scale / Pilot Testing	1	LS	$50,000	$50,000	
Stabilization Drill Rig Mobilization/Demob.	1	LS	$250,000	$250,000	
Fencing and Erosion Control	1	LS	$20,000	$20,000	
Stabilizing Reagent Materials	280,000	CY	$19.00	$5,320,000	
Treatment Via Shallow Soil Mixing Rig (SSM)	280,000	CY	$30.00	$8,400,000	
Additional Testing/Quality Control	1	LS	$250,000	$250,000	
Regrade Overburden From SSM Treatment	112,000	CY	$2.00	$224,000	
Documentation Surveying	1	LS	$15,000	$15,000	
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$14,529,000
30% Estimating Contingency					$4,358,700
TOTAL, CONSTRUCTION CAPITAL COSTS					**$18,900,000**

TOTAL CAPITAL COSTS **$20,000,000**

ASSUMPTIONS

1. Total estimated area for saturated ash: areal extent ~ 790,000 ft^2, average thickness ~ 9.5 ft, average depth to bottom of saturated ash ~ 25 ft.
2. Based on above estimates 280,000 yd^3 (790,000 ft^2 x 9.5 ft) targeted for SSM treatment.
3. This estimate is for stabilization of saturated ash only.
4. See final cover estimates for costs associated with final landfill cover construction less backfill costs (overburden from SSM treatment used for fill).
5. Earthwork quantities based on a 1.6 ton : 1 cubic yard (CY) ratio; all earthwork quantities are approximate and need to be field verified during design.
6. Additional sources of estimated costs: previous ash landfill cover construction, RS Means Site Work & Landscape Cost Data.
7. Above is a preliminary estimate and may be revised if selected for final design.

GROUNDWATER MANAGEMENT ALTERNATIVE: Ash Removal and Disposal, Recycling, or Beneficial Reuse

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3

Hutsonville Power Station — BY: CAR — CHKD BY: BRH

Ameren Services — DATE: 6/27/05 — EJT (5/19/05)

CONSULTING CAPITAL COSTS	SUB-TOTAL
Consulting	
Hydrogeologic Evaluation, Engineering Design, System Installation Oversight, Final System Documentatio	$500,000
SUBTOTAL, CONSTRUCTION CAPITAL COSTS	$500,000
30% Estimating Contingency	$150,000
TOTAL, CONSULTING CAPITAL COSTS	**$650,000**

CONSTRUCTION CAPITAL COSTS	QUANTITY	UNIT	UNIT COST	ITEM COST	SUB-TOTAL
Construction					$17,345,000
Mob./Demob.	1	LS	$50,000.00	$50,000	
Site Facilities & Maintenance	1	LS	$8,000.00	$8,000	
Site Vegetation Clearing (22 acres)	22	ACRES	$1,000.00	$22,000	
Excavate Ash Overburden & Stockpile	550,000	CY	$4.00	$2,200,000	
Excavate Saturated Ash via Mudcat & Stockpile	280,000	CY	$7.00	$1,960,000	
Surface Water / Drainage Control / Erosion Controls	1	LS	$100,000.00	$100,000	
Import General Fill, Place & Compact	430,000	CY	$8.40	$3,612,000	
Off-Site Disposal/Recycling of Saturated Ash	280,000	CY	$25.50	$7,140,000	
Overburden Ash Replacement/Compaction/Regrade	550,000	CY	$4.00	$2,200,000	
Grain Size Analysis/Geotechnical Testing	1	LS	$16,000.00	$16,000	
Documentation Surveying	1	LS	$15,000.00	$15,000	
Revegetation (mulch, seed, fertilizer)	22	ACRES	$1,000.00	$22,000	
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$17,345,000
30% Estimating Contingency					$5,203,500
TOTAL, CONSTRUCTION CAPITAL COSTS					**$22,500,000**

TOTAL CAPITAL COSTS	**$23,000,000**

ASSUMPTIONS

1. Total estimated area for saturated ash: areal extent ~ 790,000 ft^2, average thickness ~ 9.5 ft, average depth to bottom of saturated ash ~ 25 ft (Table 3-2).
2. Based on above estimates: 280,000 yd^3 saturated ash (790,000 ft^2 x 9.5 ft); 550,000 yd^3 overburden ash (790,000 ft^2 x 15.5 ft+ 80,000 yd^3 - 2004 transfer) targeted for excavation (Table 3-2).
3. Estimate includes removal of saturated ash and replacement with clean fill to approximately 5 feet above the static water table ~ 430,000 yd^3.
4. Excavated saturated ash to be stockpiled, dried and disposed/recycled off-site; overburden ash to be replaced atop clean fill.
5. See landfill cap estimates for costs associated with final landfill cover construction less backfill costs (placement of additional fill will raise grade).
6. Earthwork quantities based on a 1.6 ton : 1 cubic yard (CY) ratio; all earthwork quantities are approximate and need to be field verified during design.
7. Based on numbers discussed during 6-15-01 meeting including: $4.00/ton to haul clean fill on-site.
8. Off-site disposal/recycling of ash cost based on previous cost estimates prepared by Hutsonville Power Station personnel for similar off-site disposal ($7.00/ton transportation, $7.40/ton disposal, $1.50/ton loading @ 1.6 tons/yd^3 ~ $25.50/$yd^3$).
   This cost could significantly increase with variable landfill pricing.
9. Additional sources of estimated costs: previous ash landfill cover construction, RS Means Site Work & Landscape Cost Data.
10. Above is a preliminary estimate and may be revised if selected for final design.

GROUNDWATER MANAGEMENT ALTERNATIVE: Ash Removal and Off-Site Disposal

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3

Hutsonville Power Station — BY: CAR — CHKD BY: BRH

Ameren Services — DATE: 6/27/05 — EJT (5/19/05)

CONSULTING CAPITAL COSTS	SUB-TOTAL
Consulting	
Hydrogeologic Evaluation, Engineering Design, System Installation Oversight, Final System Documentatio	$500,000
SUBTOTAL, CONSTRUCTION CAPITAL COSTS	$500,000
30% Estimating Contingency	$150,000
TOTAL, CONSULTING CAPITAL COSTS	**$650,000**

CONSTRUCTION CAPITAL COSTS	QUANTITY	UNIT	UNIT COST	ITEM COST	SUB-TOTAL
Construction					$25,558,000
Mob./Demob.	1	LS	$50,000.00	$50,000	
Site Facilities & Maintenance	1	LS	$8,000.00	$8,000	
Site Vegetation Clearing (22 acres)	22	ACRES	$1,000.00	$22,000	
Excavate Ash & Stockpile	550,000	CY	$4.00	$2,200,000	
Excavate Saturated Ash via Mudcat & Stockpile	280,000	CY	$7.00	$1,960,000	
Surface Water / Drainage Control / Erosion Controls	1	LS	$100,000.00	$100,000	
Off-Site Disposal/Recycling of Ash	830,000	CY	$25.50	$21,165,000	
Grain Size Analysis/Geotechnical Testing	1	LS	$16,000.00	$16,000	
Documentation Surveying	1	LS	$15,000.00	$15,000	
Revegetation (mulch, seed, fertilizer)	22	ACRES	$1,000.00	$22,000	
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$25,558,000
30% Estimating Contingency					$7,667,400
TOTAL, CONSTRUCTION CAPITAL COSTS					**$33,200,000**

TOTAL CAPITAL COSTS	**$34,000,000**

ASSUMPTIONS

1. Total estimated area for saturated ash: areal extent ~ 790,000 ft^2, average thickness ~ 9.5 ft, average depth to bottom of saturated ash ~ 25 ft.
2. Based on above estimates: 280,000 yd^3 saturated ash (790,000 ft^2 x 9.5 ft)
3. Total estimated area for ash: areal extent ~ (22 acres) 966,000 ft^2, average thickness estimated from Geoprobe boring logs (20.9 feet).
4. Based on above estimates: 830,000 yd^3 ash (966,000 ft^2 x average thickness [20.9 feet] + 80,000 yd^3 ash transfer in 2004).
5. Estimate includes removal of dry ash (550,000 yd^3) and saturated ash (280,000 yd^3).
6. All estimated areas and volumes are provided in Table 3-2.
7. Excavated ash and saturated ash to be stockpiled, dried and disposed/recycled off-site
8. This estimate does not include replacement of clean fill to an elevation above the static water table.
9. Earthwork quantities based on a 1.6 ton : 1 cubic yard (CY) ratio; all earthwork quantities are approximate and need to be field verified during design.
10. Off-site disposal/recycling of ash cost based on previous cost estimates prepared by Hutsonville Power Station personnel for similar off-site disposal ($7.00/ton transportation, $7.40/ton disposal, $1.50/ton loading @ 1.6 tons/yd^3 ~ $25.50/$yd^3$).
    This cost could significantly increase with variable landfill pricing.
11. Additional sources of estimated costs: previous final cover construction, RS Means Site Work & Landscape Cost Data.
12. Above is a preliminary estimate and may be revised if selected for final design.

FINAL COVER ALTERNATIVE: Geomembrane

Pond D Closure Alternatives Report
Hutsonville Power Station
Ameren Services

NRT PROJECT NO.: 1954/2.3
BY: CAR/ KJB CHKD BY: BRH/ EJT
DATE: O-6/05, U-4/09

CONSULTING CAPITAL COSTS	SUB-TOTAL
Consulting	
Hydrogeologic Evaluation, Engineering Design, System Installation Oversight, Final System Documentati	$400,000
SUBTOTAL, CONSTRUCTION CAPITAL COSTS	$400,000
30% Estimating Contingency	$120,000
TOTAL, CONSULTING CAPITAL COSTS	**$520,000**

CONSTRUCTION CAPITAL COSTS	QUANTITY	UNIT	UNIT COST	ITEM COST	SUB-TOTAL
Construction					$2,594,300
Mob./Demob.	1	LS	$25,000	$25,000	
Site Facilities & Maintenance (Erosion Controls)	1	LS	$8,000	$8,000	
Site Vegetation Clearing (22 acres)	22	ACRES	$1,000	$22,000	
Regrade Stockpiled Ash to Fill Depressions	50,500	CY	$2.00	$101,000	
4" Bedding Layer for PVC (Silty Sand)	12,000	CY	$12.00	$144,000	
Install 30 mil PVC Geomembrane Cover	966,000	SF	$0.23	$222,200	
Install 200 mil Geocomposite Drainage Layer	966,000	SF	$0.28	$270,500	
Place Rooting Zone to Complete Protective Layer	105,400	CY	$8.40	$885,400	
Place Beneficial Reuse Ash to Construct Grade	20,000	CY	$4.00	$80,000	
Place General Fill to Construct Grade	86,100	CY	$8.40	$723,200	
Grain Size Analysis/Geotechnical Testing	1	LS	$10,000	$10,000	
Site Drainage/piping	22	ACRES	$3,000	$66,000	
Documentation Surveying	1	LS	$15,000	$15,000	
Revegetation (mulch, seed, fertilizer)	22	ACRES	$1,000	$22,000	
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$2,594,300
30% Estimating Contingency					$778,300
TOTAL, CONSTRUCTION CAPITAL COSTS					**$3,400,000**

TOTAL CAPITAL COSTS	**$3,900,000**

ASSUMPTIONS

1. Total area of Pond D for final cover estimated at 966,000 SF, approximately 22 acres.
2. Geosynthetic Cover consists of: 4" Bedding layer - 30 mil PVC Geomembrane - 200 mil Geocomposite Drainage Layer - 3 foot Protective Soil Layer.
3. All estimated final cover alternative material quantities are provided in Table 3-3.
4. Earthwork quantities based on a 1.6 ton : 1 cubic yard (CY) ratio; all earthwork quantities are approximate and need to be field verified during design.
5. Above costs based on numbers discussed during 6-15-01 meeting including: $4.00/ton to haul clean fill on-site.
6. Additional sources of estimated costs: previous final cover construction, RS Means Site Work & Landscape Cost Data.
7. Above is a preliminary estimate and may be revised if selected for final design.

FINAL COVER ALTERNATIVE: Compacted Clay

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3

Hutsonville Power Station — BY: CAR/ KJB CHKD BY: BRH/ EJT

Ameren Services — DATE: O-7/05, U-4/09

CONSULTING CAPITAL COSTS					SUB-TOTAL
Consulting					
Hydrogeologic Evaluation, Engineering Design, System Installation Oversight, Final System Documentati					$450,000
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$450,000
30% Estimating Contingency					$135,000
TOTAL, CONSULTING CAPITAL COSTS					**$590,000**

CONSTRUCTION CAPITAL COSTS	QUANTITY	UNIT	UNIT COST	ITEM COST	SUB-TOTAL
Construction					$2,794,400
Mob./Demob.	1	LS	$25,000	$25,000	
Site Facilities & Maintenance (Erosion Controls)	1	LS	$8,000	$8,000	
Site Vegetation Clearing (22 acres)	22	ACRES	$1,000	$22,000	
Regrade Stockpiled Ash to Fill Depressions	50,500	CY	$2.00	$101,000	
Place Beneficial Reuse Ash for Protective Layer	20,000	CY	$4.00	$80,000	
Place Rooting Zone to Complete Protective Layer	85,400	CY	$8.40	$717,400	
Clay - Purchased, Delivered and Installed (3.0')	105,400	CY	$16.50	$1,739,100	
Place General Fill to Construct Grade	700	CY	$8.40	$5,900	
Grain Size Analysis/Geotechnical Testing	1	LS	$15,000	$15,000	
Site Drainage	22	ACRES	$2,000	$44,000	
Documentation Surveying	1	LS	$15,000	$15,000	
Revegetation (mulch, seed, fertilizer)	22	ACRES	$1,000	$22,000	
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$2,794,400
30% Estimating Contingency					$838,300
TOTAL, CONSTRUCTION CAPITAL COSTS					**$3,600,000**

TOTAL CAPITAL COSTS	**$4,200,000**

ASSUMPTIONS

1. Total area of Pond D for final cover estimated at 966,000 SF, approximately 22 acres.
2. Compacted Clay cover consists of: 3 foot Compacted Clay Layer - 3 foot Protective Soil Layer.
3. All estimated final cover alternative material quantities are provided in Table 3-3.
4. Earthwork quantities based on a 1.6 ton : 1 cubic yard (CY) ratio; all earthwork quantities are approximate and need to be field verified during design.
5. Above costs based on numbers discussed during 6-15-01 meeting including: $4.00/ton to haul clean fill on-site.
6. Additional sources of estimated costs: previous final cover construction, RS Means Site Work & Landscape Cost Data.
7. Above is a preliminary estimate and may be revised if selected for final design.

FINAL COVER ALTERNATIVE: Layered Earth

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3

Hutsonville Power Station — BY: CAR/ KJB CHKD BY: BRH/ EJT

Ameren Services — DATE: O-7/05, U-4/09

CONSULTING CAPITAL COSTS	SUB-TOTAL
Consulting	
Hydrogeologic Evaluation, Engineering Design, System Installation Oversight, Final System Documentatio	$250,000
SUBTOTAL, CONSTRUCTION CAPITAL COSTS	$250,000
30% Estimating Contingency	$75,000
TOTAL, CONSULTING CAPITAL COSTS	**$330,000**

CONSTRUCTION CAPITAL COSTS	QUANTITY	UNIT	UNIT COST	ITEM COST	SUB-TOTAL
Construction					$1,993,900
Mob./Demob.	1	LS	$25,000	$25,000	
Site Facilities & Maintenance (Erosion Controls)	1	LS	$8,000	$8,000	
Site Vegetation Clearing (22 acres)	22	ACRES	$1,000	$22,000	
Regrade Stockpiled Ash to Fill Depressions	50,500	CY	$2.00	$101,000	
Place Drainage Layer (6" Clean Sand)	17,600	CY	$12.00	$211,200	
Place Rooting Zone for Protective Layer	87,800	CY	$8.40	$737,500	
Place Beneficial Reuse Ash to Make Grade	20,000	CY	$4.00	$80,000	
Place General Fill to Construct Grade	86,100	CY	$8.40	$723,200	
Grain Size Analysis/Geotechnical Testing	1	LS	$5,000	$5,000	
Site Drainage	22	ACRES	$2,000	$44,000	
Documentation Surveying	1	LS	$15,000	$15,000	
Revegetation (mulch, seed, fertilizer)	22	ACRES	$1,000	$22,000	
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$1,993,900
30% Estimating Contingency					$598,200
TOTAL, CONSTRUCTION CAPITAL COSTS					**$2,600,000**

TOTAL CAPITAL COSTS	**$2,900,000**

ASSUMPTIONS

1. Total area of Pond D for final cover estimated at 966,000 SF, approximately 22 acres.
2. Earthen Cover Consists of: 6" Sand Drainage Layer (Capillary Barrier) - 2.5 foot Protective Soil Layer.
3. All estimated final cover alternative material quantities are provided in Table 3-3.
4. Earthwork quantities based on a 1.6 ton : 1 cubic yard (CY) ratio; all earthwork quantities are approximate and need to be field verified during design.
5. Above costs based on numbers discussed during 6-15-01 meeting including: $4.00/ton to haul clean fill on-site.
6. Additional sources of estimated costs: previous final cover construction, RS Means Site Work & Landscape Cost Data.
7. Above is a preliminary estimate and may be revised if selected for final design.

FINAL COVER ALTERNATIVE: Pozzolanic

Pond D Closure Alternatives Report — NRT PROJECT NO.: 1954/2.3

Hutsonville Power Station — BY: CAR/ KJB CHKD BY: BRH/ EJT

Ameren Services — DATE: O-6/05, U-4/09

CONSULTING CAPITAL COSTS	SUB-TOTAL
Consulting	
Hydrogeologic Evaluation, Engineering Design, System Installation Oversight, Final System Documentation Geotechnical Evaluation	$500,000
SUBTOTAL, CONSTRUCTION CAPITAL COSTS	$500,000
30% Estimating Contingency	$150,000
TOTAL, CONSULTING CAPITAL COSTS	**$650,000**

CONSTRUCTION CAPITAL COSTS	QUANTITY	UNIT	UNIT COST	ITEM COST	SUB-TOTAL
Construction					$2,576,717
Mob./Demob.	1	LS	$324,108	$324,108	
Site Facilities & Maintenance (Erosion Controls)	1	LS	$8,000	$8,000	
Regrade Stockpiled Ash to Fill Depressions	50,500	CY	$1.97	$99,485	
Excavate Ash From Pond A for Pozzolanic Mix	100,480	CY	$1.81	$181,869	
Blend Ash w/ Reagents to Form Pozzolanic Mix	100,480	CY	$1.86	$186,893	
Place 3.0' Pozzolanic Ash Final Cover	100,480	CY	$1.61	$161,773	
Place Fly Ash From Pond A to Construct Grade	700	CY	$3.42	$2,394	
Place Rooting Zone to Complete Protective Layer	100,480	CY	$9.31	$935,469	
Additional Construction Items Identified by VFL					
Dewatering	1	LS	$23,951	$23,951	
Reagent Cost - Cement[8]	6,345	TON	$95.00	$602,775	
Relocate Sluice Pipes and Supports	1	LS	$50,000	$50,000	
SUBTOTAL, CONSTRUCTION CAPITAL COSTS					$2,576,717
30% Estimating Contingency					$773,000
TOTAL, CONSTRUCTION CAPITAL COSTS					**$3,349,717**

TOTAL CAPITAL COSTS (Without Additional Excavation in Pond A)	**$4,000,000**

ASSUMPTIONS

1. Total area of Pond D for final cover estimated at 966,000 SF, approximately 22 acres.
2. Pozzolanic fly ash cover consists of: 3 foot Pozzolanic Fly ash Layer - 3 foot Protective Soil Layer.
3. Mix Design - 100% Fly Ash w/ 5% cement reagent (dry weight basis).
4. All estimated final cover alternative material quantities are provided in Table 3-3.
5. Earthwork quantities based on VFL Technology Corp., 2003 Estimates
6. Estimate 100,480 yd^3 of ash excavated from Pond A for pozzolanic final cover.
7. Costs for the pozzolanic fly ash cover construction based on estimates provided by VFL Technology Corporation in their letter dated May 9, 2002. Several line items from *Pozzolanic Fly Ash Final Cover (Initial Estimate)* are incorporated in this estimate as described below:
   Line Items: Site Vegetation Clearing (22 acres), Documentation Surveying, and Revegetation (mulch, seed, fertilizer) are included in *Mob./Demob.*
   Line Item: Load and Haul to Processing Plant is included in *Excavate Ash From Pond A for Pozzolanic Mix.*
   Line Items: Install Beneficial Reuse Ash for Protective Layer, Grain Size Analysis/Geotechnical Testing, and Site Drainage are included in *Install 3.0' Pozzolanic Ash Final Cover* and *Install General Fill to Compete Protective Layer*.
   Construction Capital Cost not included in VFL Estimate.
8. Reagent cost provided in VFL Technology Corporation, 2003.
9. Above is a preliminary estimate and may be revised if selected for final design - the consulting costs and estimating contingency provided in this spreadsheet are conservative.

APPENDIX C

POTABLE WELL SURVEY

NATURAL RESOURCE TECHNOLOGY

TECHNICAL MEMORANDUM

www.naturalrt.com

Date: **April 10, 2009**

Subject: **Potable Well Search, Hutsonville Power Station Pond D**

From: **Bruce Hensel**

On April 7, 2009, NRT searched for water supply well records within a 0.5-mile radius of Pond D using the Illinois State Geological Survey's (ISGS) online interactive map of well records[1]. Six wells were identified within a 0.5-mile radius of Pond D as shown on the figure and table below. On the figure, the Wabash River is shown in blue as the eastern boundary of the state, and the grid lines outline the map Sections, which are also numbered in the center of each Section. The City of Hutsonville is shown to the south by the brown shading at the southern end of Section 20, and the southeast portion of Pond D is shown as a small triangular shape near the center of the map. Wells are identified by blue dots, and the yellow numbers adjacent to wells indicate total borehole depths. A green line depicting the approximate 0.5-mile radius from Pond D is also shown on the figure. Because the Wabash River forms a hydrologic barrier in the area, the well survey was not conducted for areas east of the river (in Indiana).

- Wells 60, 61, and 64 (located in Section 20) are owned by Margaret Dement and are used for irrigation (field inspection verifies that there is no well in the position denoted by 64 on the ISGS map, the actual location is likely east of this point).
- Well number 66 (located in the north-central portion of Section 20) is also used for irrigation and is owned by Duane Wampler.
- Hutsonville Power Station Plant wells #1 and #2 are numbered 90 and 88 and located in the southeast corner of Section 17.

Based on the well log information, the two closest wells outside of the 0.5-mile radius are:

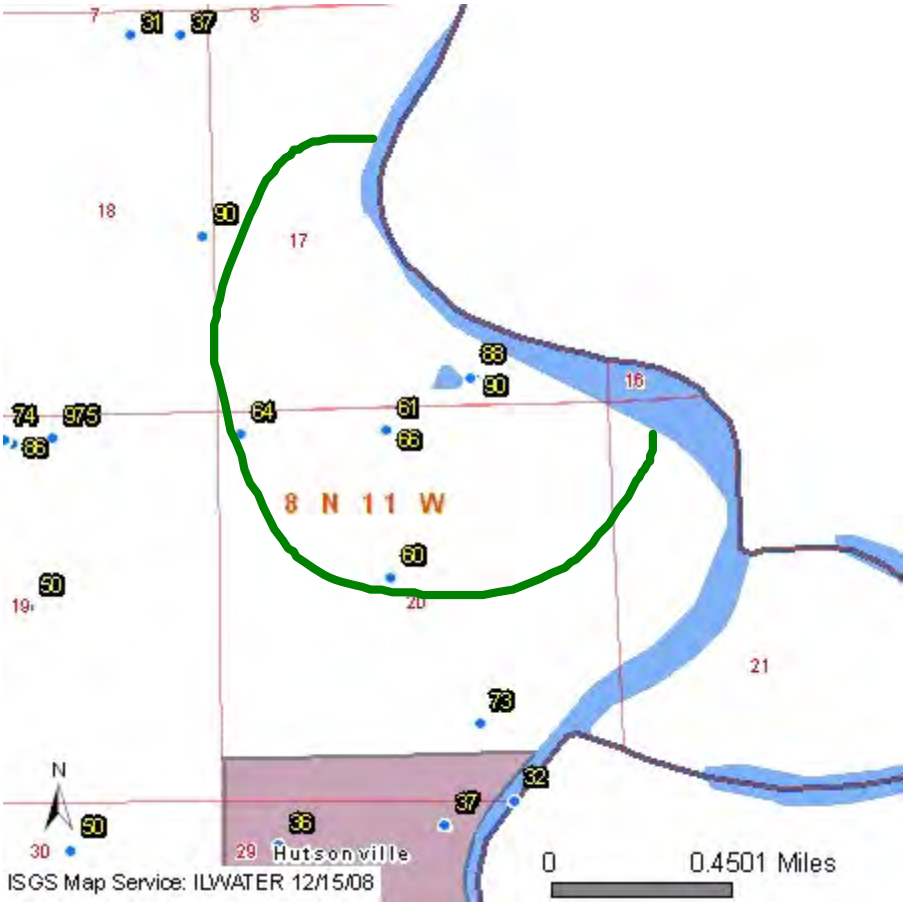
- Well 90 (located in Section 18, northwest of Pond D) is owned by Jim Allison, and is identified by the well log as a private water well.
- Well 73, a City of Hutsonville water supply well located in the southeast portion of Section 20; approximately one mile south of Pond D.

[1] Map and related well records from: http://ablation.isgs.uiuc.edu/website/ilwater/viewer.htm

In June 2005, the following landowners were identified near the power station property: J.P. Allison, J. Grimes, Slaughter, M. Kelly, and M. Dement. There are wells, outside the 0.5-mile radius, servicing three residences on the Allison property to the northwest, and the Grimes residence to the west. These wells are upgradient of both the Station and upgradient monitoring well MW10. There are no ISGS records for potable wells servicing residences on the Dement, Slaughter, and Kelly properties, nor were wellheads visible when the properties were field-checked by personnel from the Hutsonville Power Station in 2005. Furthermore, the buildings on these three parcels are more than 0.5-mile south of Pond D, and wells, if present, would be near the buildings and outside the 0.5-mile radius. Finally, the Dement residence is reportedly connected to the City of Hutsonville public water supply. This information suggests that the Dement, Slaughter, and Kelly properties do not have wells within 0.5 mile of Pond D.

Well Identification	Section T8N, R11W	Location to 0.5-mile Radius of Pond D	Owner Name	Borehole Depth (feet)	Screened Formation	Screen Depth (feet)	
						Top	Bottom
120332991300 Power Plant	17	Within Radius	C.I.P.S. Hutsonville Unit	90	Deep Alluvial	57*	87
120333386700 Power Plant	17	Within Radius	Central IL Public Serv. Co.	88	Deep Alluvial	31	61
120333519600 Irrigation	20	Within Radius	Dement, Margaret R.	64	Deep Alluvial	46*	61
120333666700 Irrigation	20	Within Radius	Wampler, Duane	66	Deep Alluvial	34	64
120333675600 Irrigation	20	Within Radius	DeMent, Margaret	60	Deep Alluvial	32	62*
120333689800 Irrigation	20	Within Radius	DeMent, Margaret	61	Deep Alluvial	40	60
120333440500 Municipal	20	Outside Radius	City of Hutsonville	73	Deep Alluvial	30*	60*
120333741100 Domestic	18	Outside Radius	Allison, Jim	90	Sandstone	30	90

*: Estimated value, information unclear on the ISGS log.


7
8
31
37
18
90
17
88
90
16
74
975
64
61
66
86
8 N 11 W
60
50
19
20
21
73
N
32
37
50
36
30
29
Hutsonville
0
0.4501 Miles
ISGS Map Service: ILWATER 12/15/08

ILLINOIS STATE GEOLOGICAL SURVEY

Irrigation Well	Top	Bottom
dark clay	0	2
sand & gravel	2	47
coarse sand	47	61
Total Depth		61

Casing: 16" PVC SCH 40 from -1' to 31'
16" PVC SAWED SCREEN from 31' to 61'

Screen: 30' of 16" diameter 32 slot

Grout: BENSEAL from 3 to 20.

Grout: GRAVEL PACK from 20 to 61.

Static level 9' below casing top which is 1' above GL

Location source: Location from permit

Permit Date: June 7, 2002 **Permit #:**

COMPANY Speth, James

FARM DeMent, Margaret

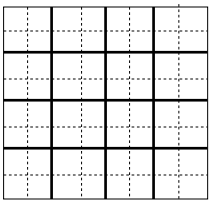
DATE DRILLED June 12, 2002 **NO.**

ELEVATION 0 **COUNTY NO.** 36898

LOCATION NE NE NW

LATITUDE 39.127799 **LONGITUDE** -87.658791

COUNTY Crawford **API 120333689800** **20 - 8N - 11W**



ILLINOIS STATE GEOLOGICAL SURVEY

Irrigation Well	Top	Bottom
topsoil	0	2
dry sand & gravel	2	22
coarse gray sand w/medium-large gravel	22	30
coarse gray sand with fine gravel	30	60
shale at	60	60
Total Depth		60

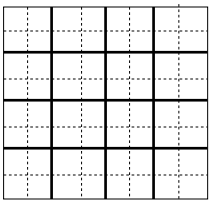
Casing: 12" SCH 40 PVC from 0' to 40'
Screen: 20' of 12" diameter .06 slot
Grout: BENTONITE from 0 to 30.
Water from sand & gravel at 20' to 60'.
Static level 23' below casing top which is 2' above GL
Pumping level 0' when pumping at 750 gpm for 0 hours

Address of well: same as above

Location source: Location from permit

Permit Date: January 19, 2000 **Permit #:**

COMPANY Hacker, Tim
FARM DeMent, Margaret
DATE DRILLED February 8, 2000 **NO.** 2
ELEVATION 0 **COUNTY NO.** 36756
LOCATION SE SE NW
LATITUDE 39.122411 **LONGITUDE** -87.658754
COUNTY **Crawford** **API** **120333675600** **20 - 8N - 11W**



ILLINOIS STATE GEOLOGICAL SURVEY

Irrigation Well	Top	Bottom
topsoil	0	3
silty dark clay	3	20
gray clay	20	25
coarse gray sand with fine-med gravel	25	66
gray clay at	66	66
Total Depth		66

Casing: 12" SCH 40 PVC from 0' to 32'
Screen: 3' of 12" diameter .06 slot
Grout: BENTONITE from 0 to 25.
Water from sand & gravel at 25' to 66'.
Static level 11' below casing top which is 1' above GL
Pumping level 0' when pumping at 1000 gpm for 0 hours

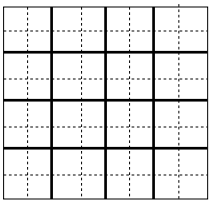
Additional location info: Lot: Subdivision: S of CIPS Power Plant

Address of well:
Hutsonville, IL

Location source: Location from permit

Permit Date: January 15, 1997 **Permit #:** 033-1-9

COMPANY Hacker, Tim
FARM Wampler, Duane
DATE DRILLED January 29, 1998 **NO.** 1
ELEVATION 0 **COUNTY NO.** 36667
LOCATION NE NE NW
LATITUDE 39.127799 **LONGITUDE** -87.658791
COUNTY **Crawford** **API** **120333666700** **20 - 8N - 11W**



ILLINOIS STATE GEOLOGICAL SURVEY

Irrigation Well	Top	Bottom
SS #66941 (0'-65')	0	0
top soil	0	1
fine brown sand	1	13
coarse brown sand	13	45
gravel & sand	45	64
Total Depth		64

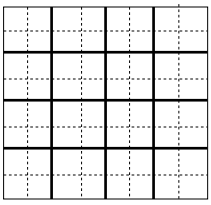
Casing: 16" PVC WC SCH 80 from 2' to 64'
Screen: 30' of 16" diameter .12 slot
Grout: BENTONITE from 0 to 0.
Water from sand & gravel at 0' to 0'.

Sample set # 66941 (0' - 65') Received: June 2, 1989

Location source: Location from permit

Permit Date: February 10, 1989 **Permit #:** 139628

COMPANY Erwin, Harold E.
FARM Dement, Margaret R.
DATE DRILLED March 24, 1989 **NO.**
ELEVATION 0 **COUNTY NO.** 35196
LOCATION NW NW NW
LATITUDE 39.12778 **LONGITUDE** -87.665637
COUNTY **Crawford** **API** **120333519600**



20 - 8N - 11W

ILLINOIS STATE GEOLOGICAL SURVEY

Municipal Water Supply	Top	Bottom
fine dark brown sand	0	5
fine to medium sand	5	30
fine/med sand & gvl	30	73
Total Depth		73

Casing: 10" STEEL 40.48#/FT from -5' to 61'
Screen: 15' of 10" diameter .07999999821186066 slot
Grout: CEMENT from 0 to 20.
Size hole below casing: 24"

Water from Alluvial at 77' to 61'.
Static level 245' below casing top which is 5' above GL
Pumping level 35' when pumping at 400 gpm for 5 hours

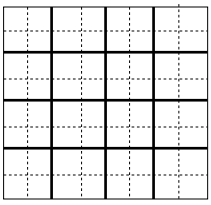
Permanent pump installed at 50' on June 24, 1987, with a capacity of 300 gpm

Additional location info: Lot: #3C Subdivision: Jacob A. Parker

Location source: Location from permit

Permit Date: June 1, 1987 **Permit #:** 132217

COMPANY Peterson, Steven R.
FARM Hutsonville, City of
DATE DRILLED June 24, 1987 **NO.** 4
ELEVATION 0 **COUNTY NO.** 34405
LOCATION 557'S line, 1855'E line of section
LATITUDE 39.117019 **LONGITUDE** -87.654743
COUNTY Crawford **API** 120333440500 **20 - 8N - 11W**



ILLINOIS STATE GEOLOGICAL SURVEY

Industrial Water Well	Top	Bottom
cinders, sand & clay	0	5
med to soft clay	5	22
soft gray clay	22	26
f-med s, gvl & bld	26	88
Total Depth		88

Casing: 26" .375 WALL from 0' to 57'
42" .375 WALL from -22' to 30'

Screen: 30' of 26" diameter .5 slot

Grout: CEMENT from 5 to 30.

Size hole below casing: 42"

Water from alluvial at 25' to 97'.

Static level 15' below casing top which is 0' above GL

Pumping level 22' when pumping at 826 gpm for 5 hours

Permanent pump installed at 60' on , with a capacity of 600 gpm

Driller's Log filed

Location source: Location from permit

Permit Date: August 26, 1983 **Permit #:** 109053

COMPANY Ruester, John T.

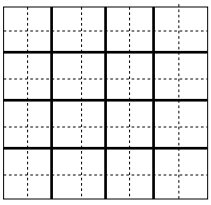
FARM Central Il Public Serv.Co.

DATE DRILLED October 28, 1983 **NO.** 4

ELEVATION 440GL **COUNTY NO.** 33867

LOCATION 350'S line, 150'W line of SE SW SE

LATITUDE 39.129677 **LONGITUDE** -87.654832



COUNTY **Crawford** **API** **120333386700** **17 - 8N - 11W**

ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
brown clay,very soft	0	20
gray clay very soft	20	25
crs sand & gravel w/bldr @ 40'(wtr brg)	25	54
gravel w/boulders very loose(wtr brg)	54	75
medium/fine sand very loose (wtr brg)	75	90
bedrock at	90	90
Total Depth		90

Casing: 42" from -1' to 30'
26" from -1' to 57'

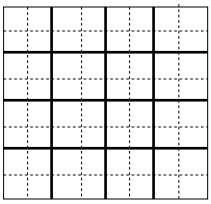
Screen: 30' of 26" diameter 6 slot
Water from sand & gravel at 25' to 87'.
Static level 18' below casing top which is 2' above GL
Pumping level 24' when pumping at 825 gpm for 3 hours

Driller's Log filed
Sample set # 60350 (0' - 85') Received: June 1, 1976

Location source: Location from permit

Permit Date: May 18, 1976 **Permit #:** 47367

COMPANY owner
FARM C.I.P.S.-Hutsonville Unit
DATE DRILLED May 25, 1976 **NO.** 3
ELEVATION 440TM **COUNTY NO.** 29913
LOCATION 350'S line, 1630'E line of SE
LATITUDE 39.129678 **LONGITUDE** -87.654686
COUNTY **Crawford** **API 120332991300** **17 - 8N - 11W**



ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	Top	Bottom
sandy clay	0	5
sand & gravel	5	8
gray hardpan	8	15
gray sandstone	15	51
gry shale	51	64
coal	64	68
gray shale	68	90
Total Depth		90

Casing: 5" PVC SDR 21 from -2' to 90'

Grout: BENTONITE from 0 to 30.
Water from sandstone at 15' to 51'.
Static level 11' below casing top which is 2' above GL
Pumping level 85' when pumping at gpm for 5 hours
Permanent pump installed at 85' on December 24, 2007, with a capacity of 10 gpm

Address of well: same as above

Location source: Location from permit

Permit Date: December 17, 2007 **Permit #:** 033-7-0

COMPANY Van Gilder, Richard E.
FARM Allison, Jim
DATE DRILLED December 20, 2007 **NO.**
ELEVATION **COUNTY NO.** 37411
LOCATION NE NE SE
LATITUDE 39.135033 **LONGITUDE** -87.66725
COUNTY **Crawford** **API** **120333741100** **18 - 8N - 11W**