HALEY ALDRICH

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REPORT ON

GROUNDWATER MONITORING PROGRAM
A.B BROWN GENERATING STATION SEDIMENTATION POND
WEST FRANKLIN, INDIANA

By Haley & Aldrich, Inc.
Greenville, South Carolina

for Southern Indiana Gas and Electric Company
Evansville, Indiana

File No. 129420-006
October 2017

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17 October 2017
File No. 129420-006

SIGECO Corporation
P.O. Box 209
Evansville, Indiana 47702-0209

Attention: Ms. Lisa C. Messinger

Subject: Groundwater Monitoring Program
A.B Brown Station
West Franklin, Indiana

Dear Ms. Messinger:

Haley & Aldrich, Inc. (Haley & Aldrich) is pleased to submit this Groundwater Monitoring Program (GMP) report for the A.B. Brown Generating Station Sedimentation Pond. This GMP was developed to comply with the United States Environmental Protection Agency (USEPA) Coal Combustion Residual (CCR) Rule dated 17 April 2015 (Rule), and is based on our review of the existing data on hydrogeology and groundwater quality and considering other site conditions at the A.B. Brown Generating Station. This GMP addresses the groundwater monitoring requirements specified in the CCR Rule, which requires monitoring for existing CCR management facilities, or units, and includes specifications for location of the monitoring wells, sampling and chemical analysis procedures, and collection of groundwater quality data for the Appendix III and Appendix IV list of constituents for statistical analysis to determine if the next step of groundwater monitoring (e.g. Assessment Monitoring) is required.

Sincerely yours,
HALEY & ALDRICH, INC.

Mark Miesfeldt
Hydrogeologist

Steven F. Putrich, P.E.
CCR Program Manager

Enclosures

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1. Introduction

Haley & Aldrich, Inc. (Haley & Aldrich) was retained by Southern Indiana Gas and Electric Company (SIGECO) to perform technical services associated with development of a groundwater monitoring program (GMP) that complies with the April 17, 2015 Coal Combustion Residuals (CCR) Rule (Rule) published by the U.S. Environmental Protection Agency (USEPA). Haley & Aldrich has prepared this GMP on behalf of SIGECO for the A.B. Brown Generating Station (Site) located in Posey County near the community of West Franklin. Under the CCR Rule, the first step in groundwater monitoring at existing CCR units is Detection Monitoring, which requires construction of an adequate groundwater monitoring network established in the uppermost aquifer from which a minimum of 8 rounds of representative hydrological and groundwater quality data can be obtained by October 17, 2017. This GMP was prepared in general accordance with the USEPA "Sampling and Analysis Plan Guidance and Template" (USEPA, 2000), to establish a groundwater monitoring program for the Site that complies with the groundwater monitoring requirements of the USEPA CCR Rule for existing CCR units. The groundwater monitoring requirements of the CCR Rule are provided in Appendix A of this document, as outlined in 40 CFR §257.90 through §257.98, including the accompanying list of constituents in Appendices III and IV for the analysis of groundwater.

There are three components that are referenced in the CCR Rule that together describe the groundwater monitoring activities being undertaken. One component is the GMP which provides a summary of relevant background information and Site geology and hydrogeology along with a detailed description of the groundwater monitoring network and sampling program. The second component is the Groundwater Sampling and Analysis Plan (GWSAP) which is based on the CCR Rule specifications in §257.93 and contains the sampling and chemical analysis procedures and processes that will be followed to obtain representative and technically defensible groundwater monitoring results. The third component presents the methods for the statistical analysis of the collected groundwater quality data as required by the Rule to determine whether a Statistically Significance Increase (SSI) of Appendix III constituents in the downgradient wells, compared to upgradient/background well(s), has occurred. The "Statistical Data Analysis Plan (SDAP) – A.B Brown Generating Station" is based on the CCR Rule-specified statistical methods in §257.93 paragraphs f(1) through f(5).

1.1 SITE SETTING

The Site is located in Posey County near the community of West Franklin, Indiana. The location of the Site is shown on Figure 1. The Site is located approximately 0.5 miles north of the Ohio River. The Site varies in elevation with natural ground surface elevations varying from 380 to 520-feet above mean sea level (msl). The higher elevations are generally to the north of the Site with surface topography dominated by a series of ridges separated by ravines. In general, surface topography across the site generally slopes to the west towards the western property boundary then to the south toward the Ohio River. Surface water runoff occurs via sheet flow to low lying areas or ravines which eventually lead to the Ohio River.

1.2 SITE HISTORY

The Site began operations in 1978 with the construction of a 250 MW generating unit. In 1985, an additional generating unit was added. Both units burn southern Indiana coal. SIGECO currently owns

the land and operates the station for supplying electric power to industrial, commercial, and residential customers in its service territory.

In accordance with the CCR Rule, individual monitoring systems have been designed and constructed for the three CCR management units that include: the Ash Pond, the Landfill, and the Sedimentation Pond (CCR management units). The Ash Pond was constructed and commissioned in 1978 by building an earthen dam across an existing valley. The surface area of the Ash Pond is approximately 159 acres. The Landfill is approximately 87-acres. The Sedimentation Pond receives water from the landfill and was constructed in 2015 with a composite liner across the base overlain by a riprap protective layer. A Site Index Map is provided as Figure 2. The groundwater sampling areas and the associated groundwater monitoring well networks are shown in Figure 3. Table 1 presents a summary of well construction information.

1.3 PREVIOUS INVESTIGATIONS

Three significant subsurface geotechnical and/or hydrogeological investigations have been completed at the Site dating back to 1993, after the construction of the generating station and CCR units and continuing through 2015. These studies generated subsurface data characterizing the Site geology and hydrogeology at the Landfill. In addition, to comply with the IDEM Landfill Permit, SIGECO has installed and sampled a network of groundwater monitoring wells in the vicinity of the Landfill. Haley & Aldrich reviewed the field sampling procedures, monitoring results, and well construction details and concluded that a sufficient amount of reliable hydrogeologic data was available to develop the CCR Rule compliant groundwater monitoring program for the Landfill outlined in this document. To design CCR Rule compliant groundwater monitoring programs for the Ash Pond and the Sedimentation Ponds, a hydrogeological characterization was conducted to interpret groundwater flow characteristics surrounding these units.

2. Site Geology and Hydrogeology

The regional geology and hydrogeology is described in the *Surficial Geologic Map of the Evansville Indiana, and Henderson, Kentucky, Area* prepared by the USGS 2009 and in the *May 2017 Groundwater Quality Data and Statistics* prepared by Cardno ATC in May 2017.

2.1 SITE GEOLOGY

The Ohio River valley contains fill and loess (windblown) deposits derived indirectly from continental ice sheets. These were deposited from meltwater heavily loaded with entrained sediments accumulated in the area on the Pennsylvanian age shale, limestone and sandstone bedrock. Westerly winds simultaneously deposited silty sediments. As a result, base levels of the valley floor increased in elevation and created natural levees and outwashes. These natural levees produced slackwater lakes which deposited thick sequences of silt and clay. When the ice sheets retreated, the sediment load in the Ohio River diminished and lowered base levels. Consequently, the river incised the slackwater lake sediments, sculpted lacustrine terraces, and deposited silty and clayey stream alluvium.

Soil borings drilled at the Site indicates that the uppermost geologic unit is comprised of unconsolidated alluvial deposits consisting of primarily silts and clays with discontinuous layers of sand. This unit overlies Pennsylvanian age sandstone which is commonly identified as the Inglefield Sandstone. Underlying the Inglefield Sandstone is low-permeability weathered shale and siltstone. The sandstone and shale unit has been eroded on the north side of the landfill where the underlying limestone unit was encountered.

2.2 SITE HYDROGEOLOGY

Hydrogeologic units are defined based on their ability to transmit groundwater or serve as confining units between zones of groundwater saturation. The uppermost aquifer at the Site occurs within unconsolidated alluvial deposits which consist primarily of silty clay containing discontinuous layers of sand. Beneath upland areas, or ridgelines the uppermost aquifer occurs in weathered sandstone, shale, or siltstone. Recharge to the surficial aquifer occurs through direct surface infiltration.

Piezometric data recorded from the monitoring wells installed on-Site shows that the configuration of the uppermost aquifer is primarily controlled by surface topography with some influence from the underlying weathered bedrock. Groundwater flow across the eastern portion of the Landfill is to the north and northeast. Beneath the western portion of the Landfill groundwater flow shifts to the north and northwest into a trough that flows to the southwest beneath the Sedimentation Ponds (Figure 3). Groundwater flow in the vicinity of the permitted Ash Pond is predominantly to the west with a component of flow to the northwest from the northern portion of the Ash Pond beneath the Landfill. Groundwater elevations vary seasonally but the groundwater flow patterns remain consistent.

Groundwater flow velocity in the uppermost aquifer beneath the CCR units was estimated using site-specific hydraulic conductivity obtained from slug testing and hydraulic gradients, and an assumed effective porosity of 25 percent. Hydraulic conductivity varied from 1E-3 cm/sec in the vicinity of the Landfill to 3E-4 cm/sec in the vicinity of the Sedimentation Ponds and the Ash Pond. The hydraulic gradient beneath and downgradient of the Landfill and the Ash Pond is 0.03 feet/foot and 0.04 feet/foot respectively. The hydraulic gradient lessens beneath and downgradient of the Sedimentation Pond

dropping to 0.004 feet/foot. Using the site-specific hydraulic conductivity and hydraulic gradients, and assuming an effective porosity of 25 percent the groundwater flow velocity in the vicinity of the CCR units is estimated as follows; 120 feet/year at the Landfill, 50 feet/year at the Ash Pond, and approximately 5 feet/year beneath and downgradient of the Sedimentation Pond.

3. Groundwater Monitoring Program

Haley & Aldrich developed the groundwater monitoring program outlined below after reviewing and evaluating the existing hydrogeologic and groundwater quality data provided by SIGECO, as well as the hydrogeological characterization data obtained by Haley & Aldrich, and considering the performance standards provided in the CCR Rule §257.91 (Appendix A). The groundwater monitoring program includes a sufficient number of wells installed at appropriate locations and depths to obtain representative groundwater samples from the uppermost aquifer. Groundwater sampling locations have been established to accurately characterize groundwater quality, not affected by potential releases from the CCR unit(s) as well as the quality of groundwater passing the waste boundary of the CCR units. New monitoring wells were installed at the three CCR units at the Site.

The three CCR facilities subject to the CCR Rule-required groundwater monitoring at the Site are; one Ash Pond, one landfill, and one sedimentation pond as depicted on Figure 2. Details of the groundwater monitoring program for the CCR units at the Site are further described below.

3.1 GROUNDWATER MONITORING NETWORK FOR THE ASH POND

The Ash Pond at the Site is located to the east of the generating station and coal pile area. As shown on Figure 3, groundwater flow in the uppermost aquifer around the Ash Pond flows generally flows to the west and northwest. With a minor component of flow to the east and south. Therefore, to properly monitor the Ash Pond, downgradient wells were installed along the perimeter of the unit. Haley & Aldrich concluded that the seven new downgradient monitoring wells (CCR-AP-1R, CCR-AP-2R, CCR-AP-3R, CCR-AP-4R, CCR-AP-5, CCR-AP-6 and CCR-AP-7R) located at the boundary of the unit, and screened in the uppermost aquifer, will adequately monitor the potential release and migration of ash constituents from the pond, should that occur. In July 2016 (CCR-AP-1R, CCR-AP-2R, CCR-AP-3R, CCR-AP-4R and CCR-AP-7R) were deepened to ensure that a sufficient amount of groundwater was available for sampling. The location of these seven downgradient groundwater monitoring wells is shown on Figure 4. Well placement has been determined based on interpretations of site-specific hydrogeology including groundwater flow directions and rates of groundwater movement. The groundwater monitoring well network for the existing Ash Pond complies with the Rule by monitoring the uppermost aquifer at the CCR management unit. Based on the groundwater flow pattern around the Ash Pond, the upgradient (unaffected by the CCR unit) background monitoring wells are identified as CCR-BK-1R and CCR-BK-2 located north of the generating station property as shown in Figure 4, which is also installed in the uppermost aquifer. The two upgradient wells provide spatial variability in the background groundwater quality and increases the statistical power of the data analysis. Therefore, the complete groundwater network for the CCR Rule for the Ash Pond consists of seven downgradient wells and two upgradient/background wells. A summary of the monitoring network for the Ash Pond along with well construction details is provided in Table 1.

3.2 GROUNDWATER MONITORING NETWORK FOR THE LANDFILL

For the Landfill, six downgradient groundwater monitoring wells (CCR-LF-1, CCR- LF -2, CCR- LF -3, CCR-LF -4, CCR- LF-5 and CCR- LF-6) were installed (see Figure 4). The same two upgradient/background wells identified for the Ash Pond (CCR-BK-1R and CCR-BK-2) will also be used as background wells for the Landfill, as they also fulfill the requirements of background wells for these units. Well placement has been determined based on interpretations of site-specific hydrogeology including groundwater flow

direction and rate of groundwater movement and exceeds the CCR Rule requirement for at least one background monitoring well. Groundwater quality for these upgradient/background wells is not impacted or affected by the CCR management units at the Site. The groundwater monitoring well network for the landfill has been designed to comply with the Rule by monitoring the uppermost aquifer at the CCR unit boundary. A summary of the monitoring network for the Site Landfill along with well construction details is provided in Table 1.

3.3 GROUNDWATER MONITORING NETWORK FOR THE SEDIMENTATION POND

For the Sedimentation Pond three downgradient groundwater monitoring wells (CCR-SP-1, CCR-SP-2 and CCR-SP-3) were installed (see Figure 4). The same two upgradient/background wells identified for the Ash Pond (CCR-BK-1R and CCR-BK-2) will also be used as background wells for the sedimentation ponds, as they also fulfill the requirements of background wells for these units. Well placement has been determined based on interpretations of site-specific hydrogeology including groundwater flow direction and rate of groundwater movement and exceeds the CCR Rule requirement for at least one background monitoring well. Groundwater quality in these upgradient/background wells is not impacted or affected by the CCR management units at the Site. The groundwater monitoring well network for the sedimentation pond has been designed to comply with the Rule by monitoring the uppermost aquifer at the CCR unit boundary. A summary of the monitoring network for the Site sedimentation pond along with well construction details is provided in Table 1.

3.4 MONITORING WELL CONSTRUCTION AND DOCUMENTATION

As described above, the Detection Monitoring program will include seven monitoring wells located around the Ash Pond (CCR-AP-1R, CCR-AP-2R, CCR-AP-3R, CCR-AP-4R, CCR-AP-5, CCR-AP-6 and CCR-AP-7R), six monitoring wells (CCR-LF-1, CCR- LF -2, CCR- LF -3, CCR- LF -4, CCR- LF-5 and CCR- LF-6) located around the Landfill, three monitoring wells (CCR-SP-1, CCR-SP-2 and CCR-SP-3) located around the Sedimentation Pond, along with two upgradient/background wells installed on the north side of the facility (CCR-BK-1R and CCR-BK-2). Boring logs and well construction diagrams for these wells are included in Appendix B.

Groundwater monitoring wells were constructed with 2-inch Inside Diameter (ID) Schedule 40 PVC casing; a 10-foot long, 0.01-inch machine slotted PVC screen; and a locking, steel, 5-foot long protective casing. Where possible, the well screen was placed so that the encountered water table was approximately five feet above the top of the well screen. Groundwater samples were collected from the mid-point of the well screen.

At each monitoring well, the top of the PVC well casing was surveyed by a registered Indiana surveyor to within 0.01 foot, and the ground surface was surveyed to 0.1 foot. The surveyed top of the well casing, identified on each well, is used for measuring and recording water levels. Each sample location was surveyed to North American Datum of 1988 (NAD88). A summary of the survey results for the monitoring wells, with horizontal and vertical coordinates, is provided in Table 1.

All downhole drilling equipment was cleaned prior to use at the next well location. Decontamination fluids was contained and placed into the Ash Pond. Well casing and screens were new and protected by factory packaging. Monitoring wells were installed according to the procedures described below.

Monitoring wells were installed using conventional hollow-stem auger drilling techniques. Soil sampling

was performed while advancing the borehole using standard split-spoon sampling on five-foot centers to provide samples for soil descriptions and to estimate the depth to groundwater. After the borehole was advanced approximately 15 feet below the water table, well casing and screen was placed through the augers to the bottom of the borehole. Filter sand was added by gravity to approximately 2 feet above the top of the well screen as the augers were withdrawn from the borehole. The filter pack was surged as the sand was emplaced to promote proper packing and to minimize the potential for settlement of the filter pack following placement of the bentonite seal. Approximately 2 feet of bentonite pellets was added by gravity above the sand pack to seal the well screen against surface water infiltration. A neat cement grout was emplaced by tremie pipe into the remaining annular space. Risers extend approximately 2 or 3 feet above the ground surface. The depth of the filter sand, bentonite seal, and annular space seal was carefully measured to 0.1 feet prior to the installation of the next layer. A locking steel protective casing was stabilized in place with a 3-foot by 3-foot square concrete pad sloping away from the casing at monitoring wells CCR-AP-1, CCR-AP-2 CCR-AP-4 through CCR-AP-7, and CCR-LF-1 through CCR-LF-6. A weep hole was drilled at the base of the protective casing just above the concrete pad to evacuate rainwater that may have entered the casing. One to three steel bollards were installed around each newly constructed, above grade, well to protect it from being damaged. To protect new wells installed in high traffic areas, the monitoring wells were completed below grade in vaults. These wells include CCR-AP-3 and CCR-SP-1 through CCR-SP-3.

The installed groundwater monitoring wells were developed after construction by surging and purging each well with a pump. The pump was decontaminated by submersing the pump and pumping through a soapy water solution, followed by a distilled water rinse. For wells that could not be purged dry, development was considered complete when a minimum of ten well volumes of groundwater was removed and purge water was free of turbidity. For wells that purge dry, a minimum of four well volumes of groundwater was removed.

4. Groundwater Sampling Program

This section includes an explanation of activities required to comply with the groundwater monitoring requirements outlined in the CCR Rule. Assessment Monitoring will only be implemented if one or more of the constituents listed in Appendix III of the Rule is detected at a SSI over background levels in a downgradient well located at the waste boundary of a CCR unit once the first 8 rounds of data have been collected, as specified in §257.93. Initiation of Corrective Measures in accordance with §257.96 will commence within 90 days of finding that constituents listed in Appendix IV have been detected at statistically significant levels exceeding the groundwater protection standard defined under §257.95(h) during the Assessment Monitoring.

4.1 DETECTION MONITORING

For existing CCR landfills and existing CCR impoundments Detection Monitoring is the first step in carrying out the groundwater monitoring program at a CCR facility, as required by §257.94 in the CCR Rule. An initial Detection Monitoring program is required to collect and analyze a minimum of eight independent samples from background and downgradient wells for the constituents listed in Appendix III and IV. The timeframe for completion of this initial step is no later than October 17, 2017. Procedures for sampling and chemical analysis methods are provided in a separate GWSAP. Similarly, methods for statistical analysis of the groundwater quality data will also be presented in a separate Statistical Data Analysis Plan (SDAP) for the Site. As described above, the Detection Monitoring program will include seven new monitoring wells located around the Ash Pond (CCR-AP-1R, CCR-AP-2R, CCR-AP-3R, CCR-AP-4R, CCR-AP-5, CCR-AP-6 and CCR-AP-7R) six new monitoring wells (CCR-LF-1, CCR- LF -2, CCR-LF -3, CCR- LF -4, CCR- LF-5 and CCR- LF-6) located around the landfill, three new monitoring wells (CCR-SP-1, CCR-SP-2 and CCR-SP-3) located around the sedimentation pond and two upgradient/background well on the north side of the facility (CCR-BK-1R and CCR-BK-2). Groundwater monitoring locations are shown on Figure 4.

4.1.1 Sampling Schedule and Frequency

The CCR Rule requires that a total of eight independent samples from each upgradient/background and downgradient monitoring well for each existing CCR landfill and surface impoundment must be collected no later than October 17, 2017.

The collection of the eight independent samples from each monitoring well has not been established within the Rule. SIGECO collected samples from background and downgradient monitoring wells beginning in June 2016 and approximately every two months thereafter, resulting in eight independent and representative samples being collected by the deadline of 17 October 2017. Groundwater sampling methods are described in the GWSAP.

4.1.2 Chemical Analysis

Groundwater samples collected for chemical analysis will be analyzed for constituents listed in Appendix III and Appendix IV of the Rule. Analytical methods are described in the GWSAP. The Appendix III and Appendix IV constituents consist of the following:

Appendix III Constituents	Appendix IV Constituents	
Boron	Antimony	Lead
Calcium	Arsenic	Lithium
Chloride	Barium	Mercury
Fluoride	Beryllium	Molybdenum
pH	Cadmium	Selenium
Sulfate	Chromium	Thallium
Total Dissolved Solids	Cobalt	Radium 226 and 228 combined
	Fluoride	

4.1.3 Sampling and Analysis Plan

The GWSAP identifies the site-specific activities and methodologies for groundwater sampling for the groundwater monitoring program as defined in §257.93 of the Rule. The GWSAP includes field data collection, sample collection, sample preservation and shipment, interpretation, laboratory analytical methods, and reporting for all groundwater sampling at each CCR unit. The administrative procedures and frequency for collection of groundwater elevation measurement, flow direction, and gradient are provided in the GWSAP.

Laboratory results from the eight initial Detection Monitoring events for each CCR unit will be statistically analyzed for each of the Appendix III constituents by selecting one of the statistical methods specified in paragraphs (f)(1) through (5) of §257.93 of the Rule. The statistical methods used for the evaluation of groundwater monitoring data are described in the SDAP. The SDAP identifies the appropriate statistical analyses to be applied to the groundwater quality data based on the sample population distribution as defined in §257.93 of the Rule, and guidance provided by USEPA in the RCRA Statistical Analysis of Groundwater Monitoring Data Unified Guidance Document (USEPA, 2009).

4.1.4 Trigger for Assessment Monitoring

Assessment Monitoring is triggered for the CCR unit when statistical analysis of the groundwater quality data collected under the Detection Monitoring program for constituents in Appendix III indicates that a SSI over background levels for one or more of the Appendix III constituents has been detected at any downgradient well during Detection Monitoring at the waste boundary.

However, one may demonstrate that a source other than the CCR unit caused the SSI over the background levels for a constituent. In this case a written demonstration report, certified by a qualified professional engineer verifying the accuracy of the information, must be submitted within 90-days of the determination of an SSI. Successful demonstration of the alternative source of impact allows the CCR unit to continue with Detection Monitoring.

4.2 ASSESSMENT MONITORING

Pursuant to 40 CFR § 257.95(a), assessment monitoring is conducted whenever a SSI over background levels has been detected for one or more of the constituents listed in Appendix III of the Rule. Within 90 days of triggering assessment monitoring, and annually thereafter, groundwater samples will be analyzed for the constituents listed in Appendix IV of the Rule. Within 90 days of obtaining the results from the initial assessment monitoring samples, semi-annual sampling will begin for all wells installed

pursuant 40 CFR § 257.91; these samples will be analyzed for constituents listed in Appendices III and IV of the Rule. Field methods and procedures detailed in the GWSAP will be followed for the collection of the assessment monitoring groundwater samples.

If within 90 days of finding that any constituents listed in Appendix IV of the Rule have been detected at a SSL over the Groundwater Protection Standard (GWPS), which is defined as the Maximum Concentration Limit (MCL) or background for those constituents that do not have an MCL, SIGECO must initiate an assessment of corrective measures to prevent further releases and define the nature and extent of the release.

4.3 GROUNDWATER ELEVATION MEASUREMENT

The depth to groundwater must be measured in each well immediately prior to purging, each time groundwater samples are collected. Groundwater measurements from monitoring wells surrounding each CCR unit should be recorded within a period short enough to avoid temporal variations in groundwater conditions. The measured groundwater levels are converted to groundwater elevations for subsequent interpretation of groundwater flow direction and rate.

4.3.1 Procedures for Groundwater Elevation Measurement

The water level in each well will be measured using an electric water level indicator. Water level measurements should be made from a surveyed fixed reference point marked on the well. The fixed reference point will usually be located on the top of the well casing or on the top of the water level access point into the well, depending on the completion of the well at the surface. If a surveyed mark is not present, the reference point is typically established and marked on the north side of the well casing. More details for groundwater measurement procedures are in the GWSAP.

4.3.2 Frequency

The depth to groundwater, in wells which monitor the same CCR unit, must be measured within a period short enough to avoid temporal variations in groundwater conditions which could preclude accurate determination of groundwater flow rate and direction.

4.4 GROUNDWATER FLOW DIRECTION AND GRADIENT

The groundwater elevations will be used to construct a water table configuration map to interpret direction of groundwater flow and calculate the hydraulic gradient each time groundwater is sampled.

4.4.1 Procedures for Calculation

Groundwater flow direction and gradient will be calculated using one of several computer programs such as Surfer, AutoCAD, or equivalent. Groundwater flow direction and gradient can also be calculated without the use of a computer program by the following steps:

- Determine the groundwater surface elevation by subtracting the water level measurement (depth to water) from the surveyed measuring point elevation at each well.

- Determine the difference in groundwater surface elevation between each of the wells by subtracting the groundwater elevation of a well with a higher elevation from the groundwater elevation of a well with a lower elevation. The elevation differences are divided up into equal increments. Repeat this step between multiple wells. Groundwater elevation contours can be drawn at corresponding elevation increments between wells.

- Determine groundwater flow direction by drawing a line perpendicular to the groundwater contour lines from higher elevations to lower elevations.

- Determine the hydraulic gradient by dividing the groundwater elevation change in the direction of flow by the horizontal difference between measurement points.

4.4.2 Frequency

The gradient and direction of groundwater flow within each CCR unit must be calculated upon completion of each groundwater sampling event.

5. Reporting

5.1 DATA MANAGEMENT

A project database that incorporates hydrogeologic and groundwater quality data has been established to allow efficient management of chemical and physical data collected in the field and received from the laboratories. Laboratories conducting groundwater analyses for this program have been supplied with specific formats for electronic data deliverables to ensure compatibility with the project database requirements. Qualified personnel will be assigned to conduct quality assurance/quality control (QA/QC) reviews for each dataset generated. The database will be integrated with a geographical information system to allow for presentation of spatial information and data, such as site features, ownership boundaries, and sample locations. Each sample location was surveyed to North American Datum of 1988 (NAD88).

5.2 ANNUAL REPORTING

Per the CCR Rule, SIGECO, or a designated representative, must prepare an annual groundwater monitoring report for each CCR unit. The first annual report must be completed by 31 January 2018 and annually thereafter for existing CCR units. The annual groundwater monitoring report summarizes key actions completed, for the previous year; describes any problems that may have encountered, and the corresponding actions to resolve the problems. At a minimum, the annual groundwater monitoring report should include the following:

- A detailed site map showing the CCR units, including all background and downgradient monitoring wells;
- Identification of any monitoring wells installed or decommissioned during the preceding year;
- A summary of all groundwater monitoring activities, including number of samples collected, specific analysis for each groundwater sample, field procedures followed during sample collection activities, and dates of sampling events;
- Discussion of any transition between monitoring programs, including dates of transition, cause for transition, identification of constituents detected at a SSI over background levels; and
- Any other pertinent information regarding the groundwater monitoring system or groundwater monitoring program.

The annual groundwater monitoring report must comply with recordkeeping requirements specified in §257.105 and Section 6 of this Work Plan.

6. Documentation

6.1 RECORDKEEPING

Per the CCR Rule, SIGECO, or a designated representative, must maintain adequate information in a written operating record at the subject facility, as described in §257.105. The operating record must be retained for at least five years following the date of each occurrence, measurement, sampling event, maintenance activity, corrective action, or report for each CCR unit. One operating record may be kept for multi-unit facilities, provided that each CCR unit is clearly identified. The operating record may be maintained in a variety of methods, such as saved on a computer, computer storage devices, or equivalent system that ensure that adequate information is kept for the required timeframe. Documentation must be submitted to the state director or tribal authority upon request when such documentation is not available on SIGECO's maintained website, as described in Section 6.3, below. The following information pertinent to the groundwater monitoring network and the groundwater monitoring program must be placed in the operating record:

- The annual groundwater monitoring report, as required by §257.90(e);
- Documentation of the design, installation, development, and decommissioning of any monitoring well, piezometer, and other measurement or sampling device as required under §257.91(e)(1);
- The groundwater monitoring system certification, as required under §257.91(f);
- Selection of the statistical method certification (SDAP), as required under §257.93(f)(6);
- Notification of establishing an Assessment Monitoring program (within 30 days of triggering), as required under §257.94(e)(3);
- Results of Appendix III and IV constituent concentrations, as required under §257.95(d)(1);
- Notification of returning to Detection Monitoring (within 30 days), as required under §257.95(e);
- Notification of detection of one or more Appendix IV constituents at statistically significant levels above the groundwater protection standard (within 30 days), as required by §257.95(g). Note - Appendix III constituents are not assessed above the groundwater protection standards but are assessed against the upgradient/background concentrations;
- Notification of initiating the assessment of Corrective Measures (within 30 days), as required under §257.95(g)(5);
- Completed assessment of Corrective Measures, as required under §257.96(d);
- Documents prepared by owner/operator recording the public meeting for Corrective Measures assessment, as required under §257.96(e);
- The semi-annual report documenting the progress in selecting and designing the remedy and the selection of remedy report, as required under §257.97(a); and
- Notification of completing the remedy (within 30 days), as required under §257.98(e).

6.2 NOTIFICATION

Notifications must be provided to the relevant State Director before the close of business on the day the notification is required to be completed, as specified under §257.106. The State must be notified when information is added or placed in the operating recorded and on SIGECO's publicly accessible internet site. Notification must be made to the relevant authority of any design or operating criteria

modifications or actions specified under §257.106(f) and §257.106(g) of the Rule. Notification of the availability of the annual groundwater monitoring report is specified under §257.105(h)(1).

6.3 POSTING INFORMATION TO THE INTERNET

A publicly accessible Internet website (CCR website) must be maintained, titled "CCR Rule Compliance Data and Information," and must contain the information specified under §257.107 of the Rule. One CCR website may be kept for multi-unit facilities provided the name or identification number of each unit is clearly specified. All information must be made available to the public within 30 days of placing the information in the operating record and for at least five years following the date on which the information was first posted to the CCR website. Notification information provided to the relevant State Director must be posted on the CCR website as specified under §257.106.

7. Certification

Pursuant to CFR Title 40 Chapter I Subchapter I Part 257 Subpart D §257.91(f), the owner or operator must obtain a certification from a qualified engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of §257.91. The certification for the Sedimentation Pond is provided on the following page.

HALEY & ALDRICH, INC.
400 Augusta Street
Suite 130
Greenville, SC 29601
864-214-8750

17 October 2017
File No. 129420-006

SUBJECT: A.B. Brown Generating Station Groundwater Monitoring System Certification for the Sedimentation Pond, Southern Indiana Gas and Electric Company (SIGECO)

SIGECO operates the existing coal combustion residuals (CCR) management unit referred to as the Sedimentation Pond at A.B. Brown Generating Station located in Evansville, Indiana. This CCR unit is considered subject to the CCR Rule since it was active as of the effective date of the CCR Rule. This document addresses the requirements of §257.91 *Groundwater Monitoring Systems*, specifically section §257.91(f), of the US Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257 (CCR Rule) effective 19 October 2015. This document serves as certification that the Sedimentation Pond complies with the requirements defined in the CCR Rule and cited below. This certification has been prepared based upon information made accessible by SIGECO pursuant to §257.91(e)(1).

The groundwater monitoring system at the Sedimentation Pond has been designed to include as a minimum one upgradient and three downgradient monitoring wells pursuant to §257.91(c). The actual number of wells used in the groundwater monitoring system is sufficient and appropriate to characterize the quality of groundwater flowing beneath the Sedimentation Pond based on site-specific conditions.

Pursuant to CFR Title 40 Chapter I Subchapter I Part 257 Subpart D §257.91(f), I certify that the groundwater monitoring system for the Sedimentation Pond has been designed and constructed to meet the requirements of §257.91. The certification submitted is, to the best of my knowledge accurate and complete.

Signed: _____
Certifying Engineer

STEVEN F. PUTRICH
REGISTERED
No. PE11200566
STATE OF
INDIANA
PROFESSIONAL ENGINEER

Print Name: Steven F. Putrich, P.E.
Indiana License No.: PE11200566
Title: CCR Program Manager
Company: Haley & Aldrich, Inc.

References

1. Cardno ATC, 2017, May 2017 Groundwater Quality Data Statistics, May 2017.

2. Moore, D.W., Lundstrom, S.C., Counts, R.C., Martin, S.L., Andrews, Jr., W.M., Newell, W.L., Murphy, M.L., Thompson, M.F., Taylor, E.M., Kvale, E.P., and Brandt, T.R., 2009, Surficial geologic map of the Evansville, Indiana, and Henderson, Kentucky, area: U.S. Geological Survey Scientific Investigations Map 3069, scale 1:50,000, 21-p. pamphlet. [Available at URL https://pubs.usgs.gov/sim/3069]

3. United States Environmental Protection Agency (USEPA), 2000. Sampling and Analysis Plan Guidance and Template, R9QA/002.1. April 2000.

4. United States Environmental Protection Agency (USEPA), 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance, EPA 530/R-09-007. March 2009.

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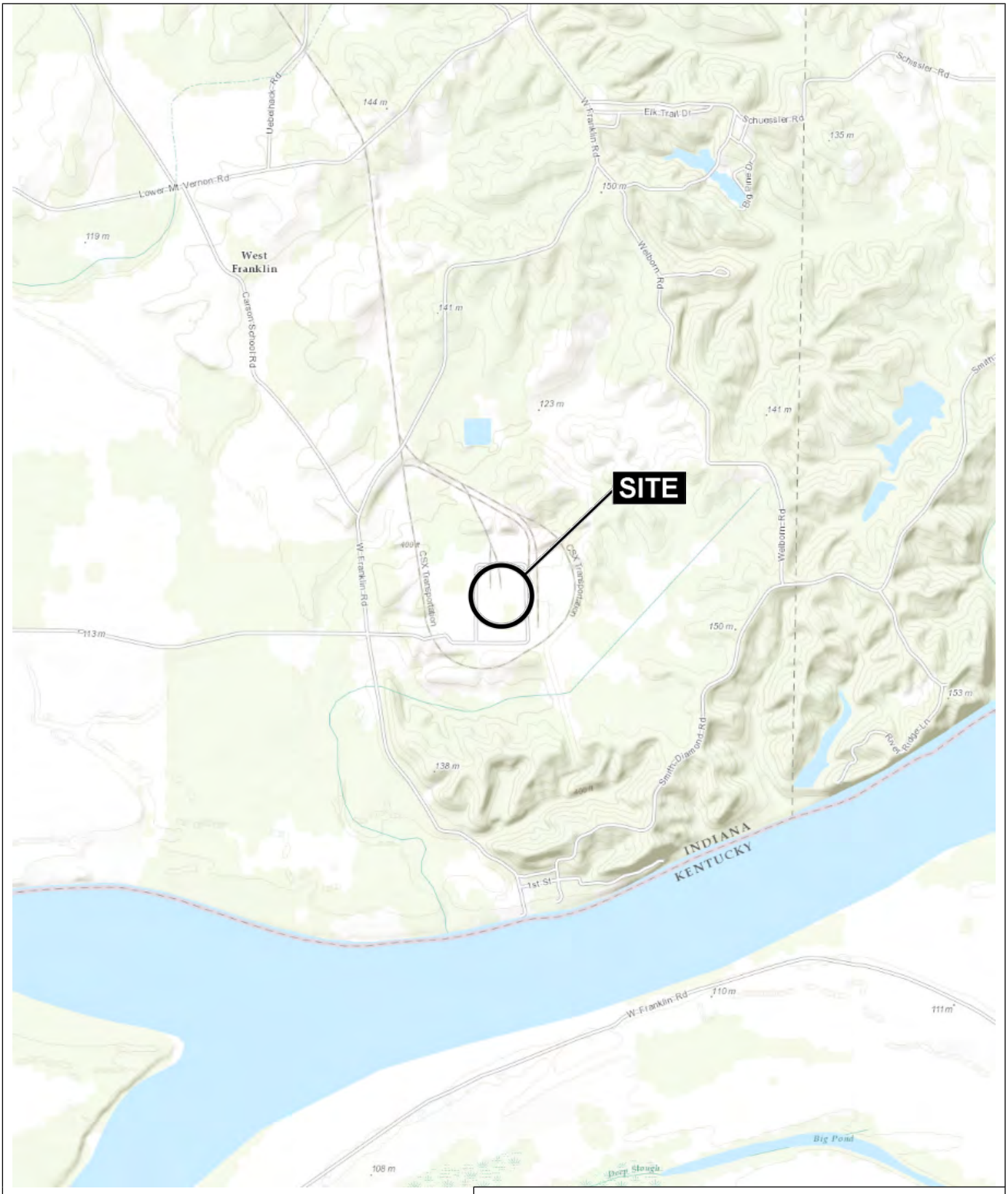
Tables

TABLE 1
GROUNDWATER MONITORING WELL LOCATION AND CONSTRUCTION DETAILS
A.B. BROWN GENERATING STATION
MOUNT VERNON, INDIANA

Well	CCR Unit	Date Installed	Easting	Northing	Top of Pad Elevation (ft msl)	Top of Riser Elevation (ft msl)	Surface Grout (ft bgs)	Bentonite (ft bgs)	Sand Pack (ft bgs)	Screen Zone (ft bgs)	Screen Length (ft)	Well Radius (in)
CCR-AP-1R	Ash Pond	July 2016	2773560.71	968260.82	464.70	467.57	0.0 - 23.0	23.0 - 25.0	25.0 - 37.0	27.0 - 37.0	10	2.00
CCR-AP-2R	Ash Pond	July 2016	2771922.52	969079.16	465.40	468.13	0.0 - 39.0	39.0 - 41.0	41.0 - 53.3	43.3 - 53.3	10	2.00
CCR-AP-3R	Ash Pond	July 2016	2771404.27	966865.12	450.10	449.13	0.0 - 33.0	33.0 - 35.0	35.0 - 47.0	37.0 - 47.0	10	2.00
CCR-AP-4R	Ash Pond	July 2016	2772827.01	966741.47	472.80	475.38	0.0 - 34.0	34.0 - 36.0	36.0 - 48.0	38.0 - 48.0	10	2.00
CCR-AP-5	Ash Pond	March 2016	2771019.70	968166.03	451.00	453.77	0.0 - 31.0	31.0 - 33.0	33.0 - 45.0	35.0 - 45.0	10	2.00
CCR-AP-6	Ash Pond	March 2016	2771626.75	969932.76	458.90	461.57	0.0 - 25.0	25.0 - 27.0	27.0 - 39.0	29.0 - 39.0	10	2.00
CCR-AP-7R	Ash Pond	July 2016	2773501.63	970758.70	486.00	488.57	0.0 - 39.5	39.5 - 41.5	41.5 - 53.5	43.5 - 53.5	10	2.00
CCR-LF-1	Landfill	March 2016	2771247.76	970812.18	432.80	435.63	0.0 - 3.0	3.0 - 7.0	7.0 - 19.0	9.0 - 19.0	10	2.00
CCR-LF-2	Landfill	March 2016	2772205.05	970681.32	470.10	473.00	0.0 - 30.0	30.0 - 32.0	32.0 - 45.0	35.0 - 45.0	10	2.00
CCR-LF-3	Landfill	March 2016	2773138.97	970949.70	482.00	484.75	0.0 - 21.0	21.0 - 23.0	23.0 - 35.0	25.0 - 35.0	10	2.00
CCR-LF-4	Landfill	March 2016	2772876.83	972312.24	476.60	478.85	0.0 - 40.8	40.8 - 43.0	43.0 - 55.0	45.0 - 55.0	10	2.00
CCR-LF-5	Landfill	March 2016	2772003.91	972228.16	427.50	430.41	0.0 - 16.0	16.0 - 18.0	18.0 - 30.0	20.0 - 30.0	10	2.00
CCR-LF-6	Landfill	March 2016	2771046.15	972269.53	409.20	412.05	0.0 - 0.0	0.0 - 2.66	2.66 - 9.66	4.66 - 9.66	10	2.00
CCR-SP-1	Sediment Pond	March 2016	2770030.26	970981.89	403.90	403.51	0.0 - 6.0	6.0 - 8.0	8.0 - 20.0	10.0 - 20.0	10	2.00
CCR-SP-2	Sediment Pond	March 2016	2769939.51	970887.25	403.60	403.23	0.0 - 6.0	6.0 - 8.0	8.0 - 20.0	10.0 - 20.0	10	2.00
CCR-SP-3	Sediment Pond	March 2016	2770027.64	970735.02	403.90	403.57	0.0 - 6.0	6.0 - 8.0	8.0 - 20.0	10.0 - 20.0	10	2.00
CCR-BK-1R	Background	March 2016	2770919.08	974083.40	480.10	483.39	0.0 - 50.0	50.0 - 52.0	52.0 - 64.0	54.0 - 64.0	10	2.00
CCR-BK-2	Background	March 2016	2769728.14	972854.33	427.50	430.60	0.0 - 11.5	11.5 - 13.5	13.5 - 25.5	15.5 - 25.5	10	2.00
SG-2	--	December 2016	2769926.52	967306.25	*378.50	--	--	--	--	--	--	--
SG-3	--	December 2016	2769283.63	971032.24	*386.03	--	--	--	--	--	--	--
SG-4	--	December 2016	2769953.05	965243.95	+369.99	--	--	--	--	--	--	--
PZ-1	--	December 2016	2772095.52	972970.06	415.90	417.37	--	--	--	4.0 - 5.0	1	1
PZ-5	--	December 2016	2772500.01	965928.39	484.10	486.47	4.0-31.5	31.5-35.0	35.0-47.0	37.0-47.0	10	2

Notes:
+ Elevation of Staff Guage is base at top of guardrail over flowline of creek.
*Elevation of Staff Guage is based on the 3.0' mark of the vertical staff guage. Piezometers/staff guages for water level only.
bgs = below ground surface
ft = feet
in = inches
msl = mean sea level
Datum of Elevations in NAVD 88

Figures



MAP SOURCE: ESRI

SITE COORDINATES: 37°54'25"N, 87°42'55"W

HALEY ALDRICH

VECTREN CORPORATION
A.B. BROWN GENERATING STATION
8511 WELBORN ROAD
MT. VERNON, INDIANA 47620

SITE LOCATION MAP

APPROXIMATE SCALE: 1 IN = 2000 FT
MAY 2016

FIGURE 1

42796-000_1_LOCUS.PDF

NOTES

1. AERIAL IMAGERY SOURCE: ESRI
2. LOCATIONS DERIVED FROM THREE I DESIGN DATA.

N

0 500 1,000 1,500 2,000
SCALE IN FEET

HALEY ALDRICH

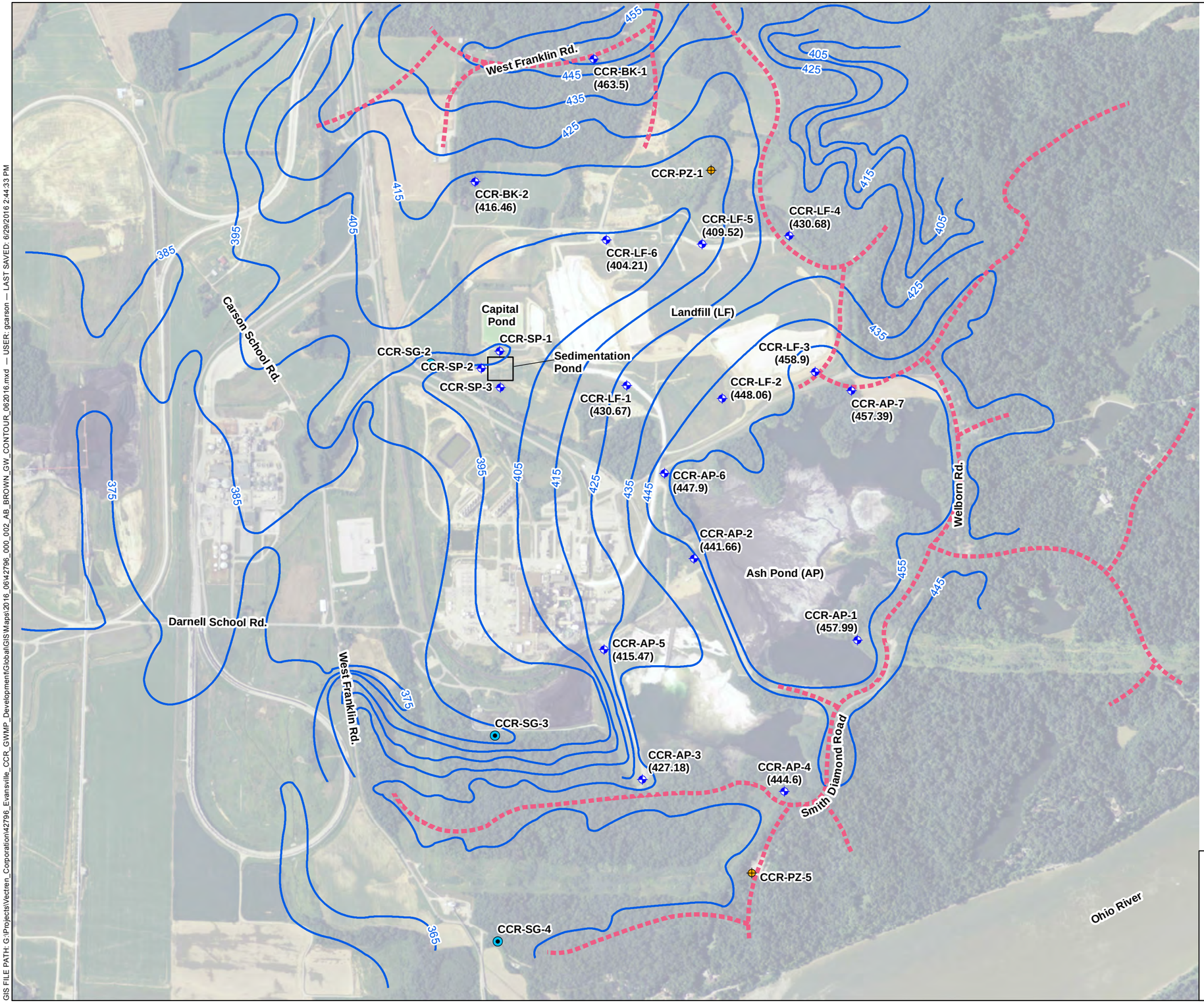
VECTREN CORPORATION
A.B. BROWN GENERATING STATION
8511 WELBORN ROAD
MOUNT VERNON, IN 47620

SITE INDEX MAP

OCTOBER 2016

FIGURE 2

GIS FILE PATH: G:\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2016_10\42796_000_002_AB_BROWN_GW_MONITORING_LOCS_SURV.mxd — USER: gcarson — LAST SAVED: 10/25/2016 2:57:13 PM



LEGEND

- CCR-AP-1 — MONITORING WELL
- CCR-PZ-1 — PIEZOMETER
- CCR-SG-1 — STAFF GAUGE
- GROUNDWATER ELEVATION CONTOURS (10 FT. INTERVALS)
- (430.86) GROUNDWATER ELEVATION (6/6/2016)
- TOPOGRAPHIC DIVIDE

NOTES

1. AERIAL IMAGERY SOURCE: ESRI
2. LOCATIONS DERIVED FROM THREE I DESIGN DATA.
3. ELEVATIONS ARE FEET ABOVE MEAN SEA LEVEL.

0 500 1,000 1,500 2,000
SCALE IN FEET

HALEY ALDRICH

VECTREN CORPORATION
A.B. BROWN GENERATING STATION
8511 WELBORN ROAD
MOUNT VERNON, IN 47620

GROUNDWATER ELEVATION CONTOURS - JUNE 2016

JUNE 2016

FIGURE 3

GIS FILE PATH: G:\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2016_06\42796_000_002_AB_BROWN_GW_CONTOUR_062016.mxd — USER: gcarson — LAST SAVED: 6/29/2016 2:44:33 PM

LEGEND

CCR-AP-1
MONITORING WELL

CCR-PZ-1
PIEZOMETER

CCR-SG-1
STAFF GAUGE

NOTES

1. AERIAL IMAGERY SOURCE: ESRI
2. LOCATIONS DERIVED FROM THREE I DESIGN DATA.

N

0 500 1,000 1,500 2,000
SCALE IN FEET

HALEY ALDRICH

VECTREN CORPORATION
A.B. BROWN GENERATING STATION
8511 WELBORN ROAD
MOUNT VERNON, IN 47620

MONITORING WELL LOCATIONS FOR COMPLIANCE WITH FEDERAL CCR RULE

OCTOBER 2016

FIGURE 4

GIS FILE PATH: G:\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2016_10\42796_000_002_AB_BROWN_GW_MONITORING_LOCS_SURV.mxd — USER: gcarson — LAST SAVED: 10/25/2016 2:57:13 PM

APPENDIX A

40 CFR §257.90 through §257.98 and Appendices III and IV

following the date of initial receipt of CCR in the CCR unit.

(4) *Frequency of inspections.* (i) Except as provided for in paragraph (b)(4)(ii) of this section, the owner or operator of the CCR unit must conduct the inspection required by paragraphs (b)(1) and (2) of this section on an annual basis. The date of completing the initial inspection report is the basis for establishing the deadline to complete the first subsequent inspection. Any required inspection may be conducted prior to the required deadline provided the owner or operator places the completed inspection report into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing subsequent inspection reports is based on the date of completing the previous inspection report. For purposes of this section, the owner or operator has completed an inspection when the inspection report has been placed in the facility's operating record as required by § 257.105(g)(6).

(ii) In any calendar year in which both the periodic inspection by a qualified professional engineer and the quinquennial (occurring every five years) structural stability assessment by a qualified professional engineer required by §§ 257.73(d) and 257.74(d) are required to be completed, the annual inspection is not required, provided the structural stability assessment is completed during the calendar year. If the annual inspection is not conducted in a year as provided by this paragraph (b)(4)(ii), the deadline for completing the next annual inspection is one year from the date of completing the quinquennial structural stability assessment.

(5) If a deficiency or release is identified during an inspection, the owner or operator must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

(c) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

§ 257.84 Inspection requirements for CCR landfills.

(a) *Inspections by a qualified person.* (1) All CCR landfills and any lateral expansion of a CCR landfill must be examined by a qualified person as follows:

(i) At intervals not exceeding seven days, inspect for any appearances of actual or potential structural weakness and other conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR unit; and

(ii) The results of the inspection by a qualified person must be recorded in the facility's operating record as required by § 257.105(g)(8).

(2) *Timeframes for inspections by a qualified person*—(i) *Existing CCR landfills.* The owner or operator of the CCR unit must initiate the inspections required under paragraph (a) of this section no later than October 19, 2015.

(ii) *New CCR landfills and any lateral expansion of a CCR landfill.* The owner or operator of the CCR unit must initiate the inspections required under paragraph (a) of this section upon initial receipt of CCR by the CCR unit.

(b) *Annual inspections by a qualified professional engineer.* (1) Existing and new CCR landfills and any lateral expansion of a CCR landfill must be inspected on a periodic basis by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards. The inspection must, at a minimum, include:

(i) A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record (*e.g.,* the results of inspections by a qualified person, and results of previous annual inspections); and

(ii) A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit.

(2) *Inspection report.* The qualified professional engineer must prepare a report following each inspection that addresses the following:

(i) Any changes in geometry of the structure since the previous annual inspection;

(ii) The approximate volume of CCR contained in the unit at the time of the inspection;

(iii) Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit; and

(iv) Any other change(s) which may have affected the stability or operation of the CCR unit since the previous annual inspection.

(3) *Timeframes for conducting the initial inspection*—(i) *Existing CCR landfills.* The owner or operator of the CCR unit must complete the initial inspection required by paragraphs (b)(1) and (2) of this section no later than January 18, 2016.

(ii) *New CCR landfills and any lateral expansion of a CCR landfill.* The owner or operator of the CCR unit must complete the initial annual inspection required by paragraphs (b)(1) and (2) of this section no later than 14 months following the date of initial receipt of CCR in the CCR unit.

(4) *Frequency of inspections.* The owner or operator of the CCR unit must conduct the inspection required by paragraphs (b)(1) and (2) of this section on an annual basis. The date of completing the initial inspection report is the basis for establishing the deadline to complete the first subsequent inspection. Any required inspection may be conducted prior to the required deadline provided the owner or operator places the completed inspection report into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing subsequent inspection reports is based on the date of completing the previous inspection report. For purposes of this section, the owner or operator has completed an inspection when the inspection report has been placed in the facility's operating record as required by § 257.105(g)(9).

(5) If a deficiency or release is identified during an inspection, the owner or operator must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.

(c) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(g), the notification requirements specified in § 257.106(g), and the internet requirements specified in § 257.107(g).

Groundwater Monitoring and Corrective Action

§ 257.90 Applicability.

(a) Except as provided for in § 257.100 for inactive CCR surface impoundments, all CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under §§ 257.90 through 257.98.

(b) *Initial timeframes*—(1) *Existing CCR landfills and existing CCR surface impoundments.* No later than October 17, 2017, the owner or operator of the CCR unit must be in compliance with the following groundwater monitoring requirements:

(i) Install the groundwater monitoring system as required by § 257.91;

(ii) Develop the groundwater sampling and analysis program to include selection of the statistical

procedures to be used for evaluating groundwater monitoring data as required by § 257.93;

(iii) Initiate the detection monitoring program to include obtaining a minimum of eight independent samples for each background and downgradient well as required by § 257.94(b); and

(iv) Begin evaluating the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in appendix III of this part as required by § 257.94.

(2) *New CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units.* Prior to initial receipt of CCR by the CCR unit, the owner or operator must be in compliance with the groundwater monitoring requirements specified in paragraph (b)(1)(i) and (ii) of this section. In addition, the owner or operator of the CCR unit must initiate the detection monitoring program to include obtaining a minimum of eight independent samples for each background well as required by § 257.94(b).

(c) Once a groundwater monitoring system and groundwater monitoring program has been established at the CCR unit as required by this subpart, the owner or operator must conduct groundwater monitoring and, if necessary, corrective action throughout the active life and post-closure care period of the CCR unit.

(d) In the event of a release from a CCR unit, the owner or operator must immediately take all necessary measures to control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of contaminants into the environment. The owner or operator of the CCR unit must comply with all applicable requirements in §§ 257.96, 257.97, and 257.98.

(e) *Annual groundwater monitoring and corrective action report.* For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1). At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (*e.g.*, the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

(5) Other information required to be included in the annual report as specified in §§ 257.90 through 257.98.

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the internet requirements specified in § 257.107(h).

§ 257.91 Groundwater monitoring systems.

(a) *Performance standard.* The owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that:

(1) Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the CCR management area where:

(i) Hydrogeologic conditions do not allow the owner or operator of the CCR unit to determine what wells are hydraulically upgradient; or

(ii) Sampling at other wells will provide an indication of background groundwater quality that is as representative or more representative than that provided by the upgradient wells; and

(2) Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contaminant pathways must be monitored.

(b) The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that must include thorough characterization of:

(1) Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and

(2) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities.

(c) The groundwater monitoring system must include the minimum number of monitoring wells necessary to meet the performance standards specified in paragraph (a) of this section, based on the site-specific information specified in paragraph (b) of this section. The groundwater monitoring system must contain:

(1) A minimum of one upgradient and three downgradient monitoring wells; and

(2) Additional monitoring wells as necessary to accurately represent the quality of background groundwater that has not been affected by leakage from the CCR unit and the quality of groundwater passing the waste boundary of the CCR unit.

(d) The owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit.

(1) The multiunit groundwater monitoring system must be equally as capable of detecting monitored constituents at the waste boundary of

the CCR unit as the individual groundwater monitoring system specified in paragraphs (a) through (c) of this section for each CCR unit based on the following factors:

(i) Number, spacing, and orientation of each CCR unit;

(ii) Hydrogeologic setting;

(iii) Site history; and

(iv) Engineering design of the CCR unit.

(2) If the owner or operator elects to install a multiunit groundwater monitoring system, and if the multiunit system includes at least one existing unlined CCR surface impoundment as determined by § 257.71(a), and if at any time after October 19, 2015 the owner or operator determines in any sampling event that the concentrations of one or more constituents listed in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under § 257.95(h) for the multiunit system, then all unlined CCR surface impoundments comprising the multiunit groundwater monitoring system are subject to the closure requirements under § 257.101(a) to retrofit or close.

(e) Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of groundwater samples. The annular space (*i.e.,* the space between the borehole and well casing) above the sampling depth must be sealed to prevent contamination of samples and the groundwater.

(1) The owner or operator of the CCR unit must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers and other measurement, sampling, and analytical devices. The qualified professional engineer must be given access to this documentation when completing the groundwater monitoring system certification required under paragraph (f) of this section.

(2) The monitoring wells, piezometers, and other measurement, sampling, and analytical devices must be operated and maintained so that they perform to the design specifications throughout the life of the monitoring program.

(f) The owner or operator must obtain a certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of this section. If the groundwater monitoring system includes the minimum number of monitoring wells specified in paragraph (c)(1) of this section, the certification must document the basis supporting this determination.

(g) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the internet requirements specified in § 257.107(h).

§ 257.92 [Reserved]

§ 257.93 Groundwater sampling and analysis requirements.

(a) The groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of groundwater quality at the background and downgradient wells required by § 257.91. The owner or operator of the CCR unit must develop a sampling and analysis program that includes procedures and techniques for:

(1) Sample collection;

(2) Sample preservation and shipment;

(3) Analytical procedures;

(4) Chain of custody control; and

(5) Quality assurance and quality control.

(b) The groundwater monitoring program must include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents and other monitoring parameters in groundwater samples. For purposes of §§ 257.90 through 257.98, the term *constituent* refers to both hazardous constituents and other monitoring parameters listed in either appendix III or IV of this part.

(c) Groundwater elevations must be measured in each well immediately prior to purging, each time groundwater is sampled. The owner or operator of the CCR unit must determine the rate and direction of groundwater flow each time groundwater is sampled. Groundwater elevations in wells which monitor the same CCR management area must be measured within a period of time short enough to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater flow rate and direction.

(d) The owner or operator of the CCR unit must establish background groundwater quality in a hydraulically upgradient or background well(s) for each of the constituents required in the particular groundwater monitoring program that applies to the CCR unit as determined under § 257.94(a) or § 257.95(a). Background groundwater quality may be established at wells that are not located hydraulically upgradient from the CCR unit if it meets the requirements of § 257.91(a)(1).

(e) The number of samples collected when conducting detection monitoring and assessment monitoring (for both downgradient and background wells) must be consistent with the statistical procedures chosen under paragraph (f) of this section and the performance standards under paragraph (g) of this section. The sampling procedures shall be those specified under § 257.94(b) through (d) for detection monitoring, § 257.95(b) through (d) for assessment monitoring, and § 257.96(b) for corrective action.

(f) The owner or operator of the CCR unit must select one of the statistical methods specified in paragraphs (f)(1) through (5) of this section to be used in evaluating groundwater monitoring data for each specified constituent. The statistical test chosen shall be conducted separately for each constituent in each monitoring well.

(1) A parametric analysis of variance followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.

(2) An analysis of variance based on ranks followed by multiple comparison procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.

(3) A tolerance or prediction interval procedure, in which an interval for each constituent is established from the distribution of the background data and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.

(4) A control chart approach that gives control limits for each constituent.

(5) Another statistical test method that meets the performance standards of paragraph (g) of this section.

(6) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area. The certification must include a narrative description of the statistical method selected to evaluate the groundwater monitoring data.

(g) Any statistical method chosen under paragraph (f) of this section shall comply with the following performance standards, as appropriate, based on the statistical test method used:

(1) The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of constituents. Normal distributions of data values shall use parametric methods. Non-normal distributions shall use non-parametric methods. If the distribution of the constituents is shown by the owner or operator of the CCR unit to be inappropriate for a normal theory test, then the data must be transformed or a distribution-free (non-parametric) theory test must be used. If the distributions for the constituents differ, more than one statistical method may be needed.

(2) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a groundwater protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparison procedure is used, the Type I experiment wise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts.

(3) If a control chart approach is used to evaluate groundwater monitoring data, the specific type of control chart and its associated parameter values shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. The parameter values shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

(4) If a tolerance interval or a predictional interval is used to evaluate groundwater monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be such that this approach is at least as effective as any other approach in this section for evaluating groundwater data. These parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

(5) The statistical method must account for data below the limit of detection with one or more statistical procedures that shall at least as effective as any other approach in this section for evaluating groundwater data. Any practical quantitation limit that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.

(6) If necessary, the statistical method must include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

(h) The owner or operator of the CCR unit must determine whether or not there is a statistically significant increase over background values for each constituent required in the particular groundwater monitoring program that applies to the CCR unit, as determined under § 257.94(a) or § 257.95(a).

(1) In determining whether a statistically significant increase has occurred, the owner or operator must compare the groundwater quality of each constituent at each monitoring well designated pursuant to § 257.91(a)(2) or (d)(1) to the background value of that constituent, according to the statistical procedures and performance standards specified under paragraphs (f) and (g) of this section.

(2) Within 90 days after completing sampling and analysis, the owner or operator must determine whether there has been a statistically significant increase over background for any constituent at each monitoring well.

(i) The owner or operator must measure "total recoverable metals" concentrations in measuring groundwater quality. Measurement of total recoverable metals captures both the particulate fraction and dissolved fraction of metals in natural waters. Groundwater samples shall not be field-filtered prior to analysis.

(j) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.94 Detection monitoring program.

(a) The owner or operator of a CCR unit must conduct detection monitoring at all groundwater monitoring wells consistent with this section. At a minimum, a detection monitoring program must include groundwater monitoring for all constituents listed in appendix III to this part.

(b) Except as provided in paragraph (d) of this section, the monitoring frequency for the constituents listed in appendix III to this part shall be at least semiannual during the active life of the CCR unit and the post-closure period. For existing CCR landfills and existing CCR surface impoundments, a minimum of eight independent samples from each background and downgradient well must be collected and analyzed for the constituents listed in appendix III and IV to this part no later than October 17, 2017. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, a minimum of eight independent samples for each background well must be collected and analyzed for the constituents listed in appendices III and IV to this part during the first six months of sampling.

(c) The number of samples collected and analyzed for each background well and downgradient well during subsequent semiannual sampling events must be consistent with § 257.93(e), and must account for any unique characteristics of the site, but must be at least one sample from each background and downgradient well.

(d) The owner or operator of a CCR unit may demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for constituents listed in appendix III to this part during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semiannually, the alternative frequency shall be no less than annual. The need to vary monitoring frequency must be evaluated on a site-specific basis. The demonstration must be supported by, at a minimum, the information specified in paragraphs (d)(1) and (2) of this section.

(1) Information documenting that the need for less frequent sampling. The alternative frequency must be based on consideration of the following factors:

(i) Lithology of the aquifer and unsaturated zone;

(ii) Hydraulic conductivity of the aquifer and unsaturated zone; and

(iii) Groundwater flow rates.

(2) Information documenting that the alternative frequency will be no less effective in ensuring that any leakage from the CCR unit will be discovered within a timeframe that will not materially delay establishment of an assessment monitoring program.

(3) The owner or operator must obtain a certification from a qualified

professional engineer stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

(e) If the owner or operator of the CCR unit determines, pursuant to § 257.93(h) that there is a statistically significant increase over background levels for one or more of the constituents listed in appendix III to this part at any monitoring well at the waste boundary specified under § 257.91(a)(2), the owner or operator must:

(1) Except as provided for in paragraph (e)(2) of this section, within 90 days of detecting a statistically significant increase over background levels for any constituent, establish an assessment monitoring program meeting the requirements of § 257.95.

(2) The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with a detection monitoring program under this section. If a successful demonstration is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under § 257.95. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

(3) The owner or operator of a CCR unit must prepare a notification stating that an assessment monitoring program has been established. The owner or operator has completed the notification when the notification is placed in the facility's operating record as required by § 257.105(h)(5).

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.95 Assessment monitoring program.

(a) Assessment monitoring is required whenever a statistically significant increase over background levels has been detected for one or more of the constituents listed in appendix III to this part.

(b) Within 90 days of triggering an assessment monitoring program, and annually thereafter, the owner or operator of the CCR unit must sample and analyze the groundwater for all constituents listed in appendix IV to this part. The number of samples collected and analyzed for each well during each sampling event must be consistent with § 257.93(e), and must account for any unique characteristics of the site, but must be at least one sample from each well.

(c) The owner or operator of a CCR unit may demonstrate the need for an alternative monitoring frequency for repeated sampling and analysis for constituents listed in appendix IV to this part during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semiannually, the alternative frequency shall be no less than annual. The need to vary monitoring frequency must be evaluated on a site-specific basis. The demonstration must be supported by, at a minimum, the information specified in paragraphs (c)(1) and (2) of this section.

(1) Information documenting that the need for less frequent sampling. The alternative frequency must be based on consideration of the following factors:

(i) Lithology of the aquifer and unsaturated zone;

(ii) Hydraulic conductivity of the aquifer and unsaturated zone; and

(iii) Groundwater flow rates.

(2) Information documenting that the alternative frequency will be no less effective in ensuring that any leakage from the CCR unit will be discovered within a timeframe that will not materially delay the initiation of any necessary remediation measures.

(3) The owner or operator must obtain a certification from a qualified professional engineer stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer in the annual groundwater monitoring and corrective action report required by § 257.90(e).

(d) After obtaining the results from the initial and subsequent sampling events required in paragraph (b) of this section, the owner or operator must:

(1) Within 90 days of obtaining the results, and on at least a semiannual basis thereafter, resample all wells that were installed pursuant to the requirements of § 257.91, conduct analyses for all parameters in appendix III to this part and for those constituents in appendix IV to this part that are detected in response to paragraph (b) of this section, and record their concentrations in the facility operating record. The number of samples collected and analyzed for each background well and downgradient well during subsequent semiannual sampling events must be consistent with § 257.93(e), and must account for any unique characteristics of the site, but must be at least one sample from each background and downgradient well;

(2) Establish groundwater protection standards for all constituents detected pursuant to paragraph (b) or (d) of this section. The groundwater protection standards must be established in accordance with paragraph (h) of this section; and

(3) Include the recorded concentrations required by paragraph (d)(1) of this section, identify the background concentrations established under § 257.94(b), and identify the groundwater protection standards established under paragraph (d)(2) of this section in the annual groundwater monitoring and corrective action report required by § 257.90(e).

(e) If the concentrations of all constituents listed in appendices III and IV to this part are shown to be at or below background values, using the statistical procedures in § 257.93(g), for two consecutive sampling events, the owner or operator may return to detection monitoring of the CCR unit. The owner or operator must prepare a notification stating that detection monitoring is resuming for the CCR unit. The owner or operator has completed the notification when the notification is placed in the facility's operating record as required by § 257.105(h)(7).

(f) If the concentrations of any constituent in appendices III and IV to this part are above background values, but all concentrations are below the groundwater protection standard

established under paragraph (h) of this section, using the statistical procedures in § 257.93(g), the owner or operator must continue assessment monitoring in accordance with this section.

(g) If one or more constituents in appendix IV to this part are detected at statistically significant levels above the groundwater protection standard established under paragraph (h) of this section in any sampling event, the owner or operator must prepare a notification identifying the constituents in appendix IV to this part that have exceeded the groundwater protection standard. The owner or operator has completed the notification when the notification is placed in the facility's operating record as required by § 257.105(h)(8). The owner or operator of the CCR unit also must:

(1) Characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected. The characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the CCR unit pursuant to § 257.96. Characterization of the release includes the following minimum measures:

(i) Install additional monitoring wells necessary to define the contaminant plume(s);

(ii) Collect data on the nature and estimated quantity of material released including specific information on the constituents listed in appendix IV of this part and the levels at which they are present in the material released;

(iii) Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well in accordance with paragraph (d)(1) of this section; and

(iv) Sample all wells in accordance with paragraph (d)(1) of this section to characterize the nature and extent of the release.

(2) Notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site if indicated by sampling of wells in accordance with paragraph (g)(1) of this section. The owner or operator has completed the notifications when they are placed in the facility's operating record as required by § 257.105(h)(8).

(3) Within 90 days of finding that any of the constituents listed in appendix IV to this part have been detected at a statistically significant level exceeding the groundwater protection standards the owner or operator must either:

(i) Initiate an assessment of corrective measures as required by § 257.96; or

(ii) Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such demonstration must be supported by a report that includes the factual or evidentiary basis for any conclusions and must be certified to be accurate by a qualified professional engineer. If a successful demonstration is made, the owner or operator must continue monitoring in accordance with the assessment monitoring program pursuant to this section, and may return to detection monitoring if the constituents in appendices III and IV to this part are at or below background as specified in paragraph (e) of this section. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

(4) If a successful demonstration has not been made at the end of the 90 day period provided by paragraph (g)(3)(ii) of this section, the owner or operator of the CCR unit must initiate the assessment of corrective measures requirements under § 257.96.

(5) If an assessment of corrective measures is required under § 257.96 by either paragraph (g)(3)(i) or (g)(4) of this section, and if the CCR unit is an existing unlined CCR surface impoundment as determined by § 257.71(a), then the CCR unit is subject to the closure requirements under § 257.101(a) to retrofit or close. In addition, the owner or operator must prepare a notification stating that an assessment of corrective measures has been initiated.

(h) The owner or operator of the CCR unit must establish a groundwater protection standard for each constituent in appendix IV to this part detected in the groundwater. The groundwater protection standard shall be:

(1) For constituents for which a maximum contaminant level (MCL) has been established under §§ 141.62 and 141.66 of this title, the MCL for that constituent;

(2) For constituents for which an MCL has not been established, the background concentration for the constituent established from wells in accordance with § 257.91; or

(3) For constituents for which the background level is higher than the MCL identified under paragraph (h)(1) of this section, the background concentration.

(i) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.96 Assessment of corrective measures.

(a) Within 90 days of finding that any constituent listed in appendix IV to this part has been detected at a statistically significant level exceeding the groundwater protection standard defined under § 257.95(h), or immediately upon detection of a release from a CCR unit, the owner or operator must initiate an assessment of corrective measures to prevent further releases, to remediate any releases and to restore affected area to original conditions. The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measures due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for no longer than 60 days. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer.

(b) The owner or operator of the CCR unit must continue to monitor groundwater in accordance with the assessment monitoring program as specified in § 257.95.

(c) The assessment under paragraph (a) of this section must include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under § 257.97 addressing at least the following:

(1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;

(2) The time required to begin and complete the remedy;

(3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

(d) The owner or operator must place the completed assessment of corrective measures in the facility's operating record. The assessment has been completed when it is placed in the facility's operating record as required by § 257.105(h)(10).

(e) The owner or operator must discuss the results of the corrective measures assessment at least 30 days prior to the selection of remedy, in a public meeting with interested and affected parties.

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.97 Selection of remedy.

(a) Based on the results of the corrective measures assessment conducted under § 257.96, the owner or operator must, as soon as feasible, select a remedy that, at a minimum, meets the standards listed in paragraph (b) of this section. This requirement applies to, not in place of, any applicable standards under the Occupational Safety and Health Act. The owner or operator must prepare a semiannual report describing the progress in selecting and designing the remedy. Upon selection of a remedy, the owner or operator must prepare a final report describing the selected remedy and how it meets the standards specified in paragraph (b) of this section. The owner or operator must obtain a certification from a qualified professional engineer that the remedy selected meets the requirements of this section. The report has been completed when it is placed in the operating record as required by § 257.105(h)(12).

(b) Remedies must:

(1) Be protective of human health and the environment;

(2) Attain the groundwater protection standard as specified pursuant to § 257.95(h);

(3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment;

(4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;

(5) Comply with standards for management of wastes as specified in § 257.98(d).

(c) In selecting a remedy that meets the standards of paragraph (b) of this section, the owner or operator of the CCR unit shall consider the following evaluation factors:

(1) The long- and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on consideration of the following:

(i) Magnitude of reduction of existing risks;

(ii) Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy;

(iii) The type and degree of long-term management required, including monitoring, operation, and maintenance;

(iv) Short-term risks that might be posed to the community or the environment during implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminant;

(v) Time until full protection is achieved;

(vi) Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment;

(vii) Long-term reliability of the engineering and institutional controls; and

(viii) Potential need for replacement of the remedy.

(2) The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors:

(i) The extent to which containment practices will reduce further releases; and

(ii) The extent to which treatment technologies may be used.

(3) The ease or difficulty of implementing a potential remedy(s) based on consideration of the following types of factors:

(i) Degree of difficulty associated with constructing the technology;

(ii) Expected operational reliability of the technologies;

(iii) Need to coordinate with and obtain necessary approvals and permits from other agencies;

(iv) Availability of necessary equipment and specialists; and

(v) Available capacity and location of needed treatment, storage, and disposal services.

(4) The degree to which community concerns are addressed by a potential remedy(s).

(d) The owner or operator must specify as part of the selected remedy a schedule(s) for implementing and completing remedial activities. Such a schedule must require the completion of remedial activities within a reasonable period of time taking into consideration the factors set forth in paragraphs (d)(1) through (6) of this section. The owner or operator of the CCR unit must consider the following factors in determining the schedule of remedial activities:

(1) Extent and nature of contamination, as determined by the characterization required under § 257.95(g);

(2) Reasonable probabilities of remedial technologies in achieving compliance with the groundwater protection standards established under § 257.95(h) and other objectives of the remedy;

(3) Availability of treatment or disposal capacity for CCR managed during implementation of the remedy;

(4) Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy;

(5) Resource value of the aquifer including:

(i) Current and future uses;

(ii) Proximity and withdrawal rate of users;

(iii) Groundwater quantity and quality;

(iv) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to CCR constituents;

(v) The hydrogeologic characteristic of the facility and surrounding land; and

(vi) The availability of alternative water supplies; and

(6) Other relevant factors.

(e) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the Internet requirements specified in § 257.107(h).

§ 257.98 Implementation of the corrective action program.

(a) Within 90 days of selecting a remedy under § 257.97, the owner or operator must initiate remedial activities. Based on the schedule established under § 257.97(d) for implementation and completion of remedial activities the owner or operator must:

(1) Establish and implement a corrective action groundwater monitoring program that:

(i) At a minimum, meets the requirements of an assessment monitoring program under § 257.95;

(ii) Documents the effectiveness of the corrective action remedy; and

(iii) Demonstrates compliance with the groundwater protection standard pursuant to paragraph (c) of this section.

(2) Implement the corrective action remedy selected under § 257.97; and

(3) Take any interim measures necessary to reduce the contaminants leaching from the CCR unit, and/or potential exposures to human or ecological receptors. Interim measures must, to the greatest extent feasible, be consistent with the objectives of and contribute to the performance of any remedy that may be required pursuant to § 257.97. The following factors must be considered by an owner or operator in determining whether interim measures are necessary:

(i) Time required to develop and implement a final remedy;

(ii) Actual or potential exposure of nearby populations or environmental receptors to any of the constituents listed in appendix IV of this part;

(iii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;

(iv) Further degradation of the groundwater that may occur if remedial action is not initiated expeditiously;

(v) Weather conditions that may cause any of the constituents listed in appendix IV to this part to migrate or be released;

(vi) Potential for exposure to any of the constituents listed in appendix IV to this part as a result of an accident or failure of a container or handling system; and

(vii) Other situations that may pose threats to human health and the environment.

(b) If an owner or operator of the CCR unit, determines, at any time, that compliance with the requirements of § 257.97(b) is not being achieved through the remedy selected, the owner or operator must implement other methods or techniques that could feasibly achieve compliance with the requirements.

(c) Remedies selected pursuant to § 257.97 shall be considered complete when:

(1) The owner or operator of the CCR unit demonstrates compliance with the groundwater protection standards established under § 257.95(h) has been achieved at all points within the plume of contamination that lie beyond the groundwater monitoring well system established under § 257.91.

(2) Compliance with the groundwater protection standards established under § 257.95(h) has been achieved by demonstrating that concentrations of constituents listed in appendix IV to this part have not exceeded the groundwater protection standard(s) for a period of three consecutive years using the statistical procedures and performance standards in § 257.93(f) and (g).

(3) All actions required to complete the remedy have been satisfied.

(d) All CCR that are managed pursuant to a remedy required under § 257.97, or an interim measure required under paragraph (a)(3) of this section, shall be managed in a manner that complies with all applicable RCRA requirements.

(e) Upon completion of the remedy, the owner or operator must prepare a notification stating that the remedy has been completed. The owner or operator must obtain a certification from a qualified professional engineer attesting that the remedy has been completed in compliance with the requirements of paragraph (c) of this section. The report has been completed when it is placed in the operating record as required by § 257.105(h)(13).

(f) The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in § 257.105(h), the notification requirements specified in § 257.106(h), and the internet requirements specified in § 257.107(h).

Closure and Post-Closure Care

§ 257.100 Inactive CCR surface impoundments.

(a) Except as provided by paragraph (b) of this section, inactive CCR surface impoundments are subject to all of the requirements of this subpart applicable to existing CCR surface impoundments.

(b) An owner or operator of an inactive CCR surface impoundment that completes closure of such CCR unit, and meets all of the requirements of either paragraphs (b)(1) through (4) of this section or paragraph (b)(5) of this section no later than April 17, 2018, is exempt from all other requirements of this subpart.

(1) *Closure by leaving CCR in place.* If the owner or operator of the inactive CCR surface impoundment elects to close the CCR surface impoundment by leaving CCR in place, the owner or operator must ensure that, at a minimum, the CCR unit is closed in a manner that will:

(i) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;

(ii) Preclude the probability of future impoundment of water, sediment, or slurry;

(iii) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system; and

(iv) Minimize the need for further maintenance of the CCR unit.

(2) The owner or operator of the inactive CCR surface impoundment must meet the requirements of paragraphs (b)(2)(i) and (ii) of this section prior to installing the final cover system required under paragraph (b)(3) of this section.

(i) Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.

(ii) Remaining wastes must be stabilized sufficient to support the final cover system.

(3) The owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and at a minimum, meets the requirements of paragraph (b)(3)(i) of this section, or the requirements of an alternative final cover system specified in paragraph (b)(3)(ii) of this section.

(i) The final cover system must be designed and constructed to meet the criteria specified in paragraphs (b)(3)(i)(A) through (D) of this section.

(A) The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1×10^{-5} centimeters/second, whichever is less.

(B) The infiltration of liquids through the CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material.

(C) The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.

(D) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

(ii) The owner or operator may select an alternative final cover system design, provided the alternative final cover system is designed and constructed to meet the criteria in paragraphs (b)(3)(ii)(A) through (C) of this section.

(A) The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in paragraphs (b)(3)(i)(A) and (B) of this section.

(B) The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in paragraph (b)(3)(i)(C) of this section.

deficiency or release specified under § 257.105(f)(11).

(11) The initial and periodic safety factor assessments specified under § 257.105(f)(12).

(12) The design and construction plans, and any revisions of them, specified under § 257.105(f)(13).

(g) *Operating criteria.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) The CCR fugitive dust control plan, or any subsequent amendment of the plan, specified under § 257.105(g)(1) except that only the most recent plan must be maintained on the CCR Web site irrespective of the time requirement specified in paragraph (c) of this section.

(2) The annual CCR fugitive dust control report specified under § 257.105(g)(2).

(3) The initial and periodic run-on and run-off control system plans specified under § 257.105(g)(3).

(4) The initial and periodic inflow design flood control system plans specified under § 257.105(g)(4).

(5) The periodic inspection reports specified under § 257.105(g)(6).

(6) The documentation detailing the corrective measures taken to remedy the deficiency or release specified under § 257.105(g)(7).

(7) The periodic inspection reports specified under § 257.105(g)(9).

(h) *Groundwater monitoring and corrective action.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) The annual groundwater monitoring and corrective action report specified under § 257.105(h)(1).

(2) The groundwater monitoring system certification specified under § 257.105(h)(3).

(3) The selection of a statistical method certification specified under § 257.105(h)(4).

(4) The notification that an assessment monitoring programs has been established specified under § 257.105(h)(5).

(5) The notification that the CCR unit is returning to a detection monitoring program specified under § 257.105(h)(7).

(6) The notification that one or more constituents in appendix IV to this part have been detected at statistically significant levels above the groundwater protection standard and the notifications to land owners specified under § 257.105(h)(8).

(7) The notification that an assessment of corrective measures has been initiated specified under § 257.105(h)(9).

(8) The assessment of corrective measures specified under § 257.105(h)(10).

(9) The semiannual reports describing the progress in selecting and designing remedy and the selection of remedy report specified under § 257.105(h)(12), except that the selection of the remedy report must be maintained until the remedy has been completed.

(10) The notification that the remedy has been completed specified under § 257.105(h)(13).

(i) *Closure and post-closure care.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) The notification of intent to initiate closure of the CCR unit specified under § 257.105(i)(1).

(2) The annual progress reports of closure implementation specified under § 257.105(i)(2).

(3) The notification of closure completion specified under § 257.105(i)(3).

(4) The written closure plan, and any amendment of the plan, specified under § 257.105(i)(4).

(5) The demonstration(s) for a time extension for initiating closure specified under § 257.105(i)(5).

(6) The demonstration(s) for a time extension for completing closure specified under § 257.105(i)(6).

(7) The notification of intent to close a CCR unit specified under § 257.105(i)(7).

(8) The notification of completion of closure of a CCR unit specified under § 257.105(i)(8).

(9) The notification recording a notation on the deed as required by § 257.105(i)(9).

(10) The notification of intent to comply with the alternative closure requirements as required by § 257.105(i)(10).

(11) The annual progress reports under the alternative closure requirements as required by § 257.105(i)(11).

(12) The written post-closure plan, and any amendment of the plan, specified under § 257.105(i)(12).

(13) The notification of completion of post-closure care specified under § 257.105(i)(13).

(j) *Retrofit criteria.* The owner or operator of a CCR unit subject to this subpart must place the following information on the owner or operator's CCR Web site:

(1) The written retrofit plan, and any amendment of the plan, specified under § 257.105(j)(1).

(2) The notification of intent to comply with the alternative retrofit requirements as required by § 257.105(j)(2).

(3) The annual progress reports under the alternative retrofit requirements as required by § 257.105(j)(3).

(4) The demonstration(s) for a time extension for completing retrofit activities specified under § 257.105(j)(4).

(5) The notification of intent to retrofit a CCR unit specified under § 257.105(j)(5).

(6) The notification of completion of retrofit activities specified under § 257.105(j)(6).

■ 5. Amend part 257 by adding "Appendix III to Part 257" and "Appendix IV to Part 257" to read as follows:

Appendix III to Part 257—Constituents for Detection Monitoring

Common name [1]
Boron
Calcium
Chloride
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)

[1] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

Appendix IV to Part 257—Constituents for Assessment Monitoring

Common name [1]
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined

[1] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

PART 261—IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

■ 6. The authority citation for part 261 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921, 6922, 6924(y) and 6938.

■ 7. Section 261.4 is amended by revising paragraph (b)(4) to read as follows:

APPENDIX B

Boring Logs and Construction Diagrams

TEST BORING REPORT

Boring No. CCR-AP-1

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 1
Start 18 December 2015
Finish 18 December 2015
Driller B. Marshall
H&A Rep. T. Vanage
Elevation 465.7 (est.)
Datum
Location See Plan
N 968260.82
E 2773560.71

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	6	-	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	-	-	Drill Mud: None
Hammer Fall (in.)		-	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 38	0.0 5.0	CL			Soft brown lean CLAY (CL), mps 20 mm, no odor, moist, roots throughout	-	5	-	-	5	90				
							-OVERBURDEN-										
5		U2 58	5.0 10.0	ML		460.0 5.8	Soft brown SILT (ML), no odor, wet	-	-	-	-	5	95				
							-OVERBURDEN-										
10		U3 108	10.0 20.0														
15																	
						447.7 18.0	Moderately weathered red-brown medium-grained SANDSTONE										
							-BEDROCK-										
20						445.7 20.0	BOTTOM OF EXPLORATION 20.0 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/20/15	-	-	-	-	4.87

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 18.0
Rock Cored (ft) 2.0
Samples 3U

Boring No. CCR-AP-1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-AP-1R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 26 July 2016
Finish 26 July 2016
Driller J. Gryska
H&A Rep. C. Toscano
Elevation Datum
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-1, see test boring report for soils logged from 0-20 ft.										
							-OVERBURDEN-										
18.0							Top of weathered bedrock										
							-BEDROCK										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/27/16	7:15	-	-	-	5.60

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	18.0
Rock Cored (ft)	19.0
Samples	1S

Boring No. CCR-AP-1R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-AP-1R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
	4 5 5 16	S1 24	28.0 30.0				Loose reddish-brown sandy SILT (ML) with occasional layers of highly weathered rock with distinct rock fabric (sandstone/siltstone)	-	5	10	15	10	60				
30																	
							Drill action, occasional rig chatter and soil cuttings indicated highly weathered Siltstone/Sandstone										
35																	
						37.0	BOTTOM OF EXPLORATION 37.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-1R

TEST BORING REPORT

Boring No. CCR-AP-2

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 17 December 2015
Finish 17 December 2015
Driller B. Marshall
H&A Rep. T. Vanage
Elevation 465.2 (est.)
Datum
Location See Plan
N 969079.16
E 2771922.52

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	-	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	-	-	Drill Mud: None
Hammer Fall (in.)		-	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 47	0.0 5.0	CL			Medium stiff brown lean CLAY (CL), no odor, moist, red mottling at 3 feet, organics present	-	-	-	-	-	100				
							-FILL-										
5		U2 58	5.0 10.0	CL			Medium stiff yellow-brown lean CLAY (CL), no door, moist	-	-	-	-	-	100				
10		U3 57	10.0 15.0														
				MH		452.7 12.5	Soft to medium stiff yellow-brown elastic SILT (MH), no odor, dry	-	-	-	-	-	100				
							-OVERBURDEN-										
15		U4 60	15.0 20.0	MH			Driller indicated collapse at 15.5 feet Soft yellow-brown elastic SILT (MH), no odor, wet	-	-	-	-	5	95				
20		U5 60	20.0 25.0														

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/20/15	-	-	-	-	18.46

Sample ID
- O - Open End Rod
- T - Thin Wall Tube
- U - Undisturbed Sample
- S - Split Spoon Sample

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (ft)	25.5
Rock Cored (ft)	-
Samples	5U

Boring No. CCR-AP-2

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-AP-2
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
				MH			Similar as above, except wet										
25						439.7 25.5	BOTTOM OF EXPLORATION 25.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-2

TEST BORING REPORT

Boring No. CCR-AP-2R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 28 July 2016
Finish 28 July 2016
Driller J. Gryska
H&A Rep. C. Toscano
Elevation Datum
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-2, see test boring report for soils logged from 0-25 ft.										
							-OVERBURDEN-										
5																	
10																	
15																	
20																	
25																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/29/15	7:30	-	-	-	28.80

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	30.0
Rock Cored (ft)	23.3
Samples	3S

Boring No. CCR-AP-2R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-AP-2R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	1 1 1 1	S1 8	25.0 27.0	ML			Very soft yellowish-brown sandy SILT (ML), mps 1 mm, no odor, wet	-	-	-	-	25	75				
							Top of decomposed bedrock at 30.0 ft										
30	7 9 13 12	S2 24	30.0 32.0			30.0	Stiff yellowish-brown to tan sandy SILT (ML) with frequent alternating layers and seems of silt and fine sand. Trace coal and decomposed rock fragments, wet	-	-	-	-	25	75				
						32.0	-BEDROCK-										
35	50/6	S3 6	35.0 37.0				Hard yellowish-brown to gray-brown SILT with sand (ML) with frequent alternating layers and seams of sandy silt and silty fine sand, well stratified, entire sample exhibits distinct rock fabric, wet	-	-	-	-	15	85				
40																	
45																	
50						53.3	Drill action and rig chatter indicated harder rock at 53.0 ft, soil cuttings on auger flights indicated limestone bedrock										
							BOTTOM OF EXPLORATION 53.3 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-2R

TEST BORING REPORT

Boring No. CCR-AP-3

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 19 December 2015
Finish 20 December 2015
Driller B. Marshall
H&A Rep. T. Vanage
Elevation 450.0 (est.)
Datum
Location See Plan
N 966865.12
E 2771404.27

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	-	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	-	-	Drill Mud: None
Hammer Fall (in.)		-	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 42	0.0 3.5	CL			Medium stiff brown lean CLAY (CL), interbedded gravel, very fine sand partings, no odor, dry -FILL-	-	5	-	-	10	85				
5						444.5 5.5											
		U2 48	5.5 9.0	ML			Very soft brown SILT (ML), no odor, dry -OVERBURDEN-	-	-	-	-	-	100				
10		U3 120	9.0 19.0														
							Grades to very moist at 14 feet										
15							Grades to wet at 15 feet										
20		U4 120	19.0 29.0														

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/20/15	-	-	-	-	21.97

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 32.5
Rock Cored (ft) 2.5
Samples 5U

Boring No. CCR-AP-3

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-AP-3
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
				CL		429.0 21.0	Medium stiff red-brown lean CLAY (CL), no odor, moist -OVERBURDEN-	-	-	-	-	-	100				
25																	
30						417.5 32.5	Highly weathered brown SANDSTONE, fine-grained, trace silt and clay present -BEDROCK-										
35						415.0 35.0	BOTTOM OF EXPLORATION 35.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-3

TEST BORING REPORT

Boring No. CCR-AP-3R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 27 July 2016
Finish 28 July 2016
Driller J. Gryska
H&A Rep. S.Lewis
Elevation Datum
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-3, see test boring report for soils logged from 0-25 ft -OVERBURDEN-										
5																	
10																	
15																	
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/27/16	8:00	-	-	-	37.90

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	32.5
Rock Cored (ft)	14.5
Samples	1S

Boring No. CCR-AP-3R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-AP-3R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
30																	
35	12 21 18 25	S1 24	35.0 37.0			32.5	Top of decomposed bedrock at 32.5 ft -BEDROCK- Dense tan to yellow-brown silty SAND (SM) with frequent interbedded seams layers of sandy silt and silt, well stratified, entire sample exhibits distinct rock fabric, dry	-	-	5	15	45	35				
40																	
45						47.0	BOTTOM OF EXPLORATION 47.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-3R

TEST BORING REPORT

Boring No. CCR-AP-4

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 14 March 2016
Finish 14 March 2016
Driller J. Gryska
H&A Rep. J. Yonts
Elevation 472.9 (est.)
Datum
Location See Plan
N 966741.47
E 2772827.01

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				ML			Hand clear to 5.0 ft bgs, mostly brown SILT (ML), no odor, moist										
							-OVERBURDEN-										
5	WOH 1 WOH 1	S1 22	5.0 7.0	ML			Very soft brown SILT (ML), no structure, moist, trace clay, trace woody debris Wet at 6.0 ft	-	-	-	-	5	95				
						464.4 8.5											
10	1 1 2 3	S2 16	8.5 10.5	ML			Soft brown SILT (ML), no odor, dry, faint laminae from light brown to brown (1-2 mm thick)	-	-	-	-	10	90				
15	2 5 4 5	S3 17	13.5 15.5	ML			Similar as above										
							Water between 15.6 ft to 18.5 ft										
20	2 2 2 3	S4 20	18.5 20.5	ML			Similar as above except no structure and wet										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	17:05	-	-	-	31.69

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 28.5
Rock Cored (ft) 7.0
Samples 7S

Boring No. CCR-AP-4

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-AP-4
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						449.4											
	2 3 4 5	S5 24	23.5 25.5	CL		23.5	Medium stiff dark red brown red-brown CLAY (CL), no structure										
25						444.4											
	2 2 3 5	S6 24	28.5 30.5	SC		28.5	Brown red-brown black clayey SAND (SC), no odor, moist, mostly medium to fine poorly graded sands, weathered sandstone -BEDROCK-										
30																	
	3 6 11 14	S7 24	33.5 35.5	SC			Red-brown orange black yellow mottled clayey SAND (SC), weathered sandstone										
35						437.4 35.5	BOTTOM OF EXPLORATION 35.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-4

TEST BORING REPORT

Boring No. CCR-AP-4R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 27 July 2016
Finish 27 July 2016
Driller J. Gryska
H&A Rep. C. Toscano
Elevation Datum
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-4, see test boring report for soils logged from 0-35.5 ft.										
							-OVERBURDEN-										
5																	
10																	
15																	
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/27/16	12:30	-	-	-	31.60

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	28.5
Rock Cored (ft)	19.5
Samples	1S

Boring No. CCR-AP-4R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-AP-4R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
30						28.0	-BEDROCK-										
35	2 12 18 22	S1 24	35.5 37.5	SM		35.5	Medium dense tan to yellow-brown silty SAND (SM) with occasional layers of completely weathered bedrock exhibiting distinct rock fabric	-	-	10	15	40	35				
40						38.0	Drill action, occasional rig chatter and soil cuttings indicated completely weathered bedrock at 38.0 ft.										
45						48.0	BOTTOM OF EXPLORATION 48.0 ft										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-4R

TEST BORING REPORT

Boring No. CCR-AP-5

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 13 March 2016
Finish 14 March 2016
Driller J. Gryska
H&A Rep. S. Lewis
Elevation 451.0 (est.)
Datum
Location See Plan
N 968166.03
E 3771019.7

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				ML			Hand auger to 0.0 ft to 5.0 ft, brown SILT (ML), dry										
							-FILL-										
5	4 2 5 7	S1 18	5.0 7.0	ML			Medium stiff grayish brown SILT (ML), no odor, moist	-	5	-	-	5	90				
	WOH 2 3 2	S2 9	8.0 10.0	ML			Medium stiff grayish brown SILT (ML), no odor, moist	-	-	-	-	5	95				
10																	
	4 7 6 12	S3 15	13.0 15.0	ML			Stiff grayish brown SILT (ML), no odor, dry, mottled with red color	-	-	-	-	10	90				
15																	
	2 5 10 18	S4 12	18.0 20.0	ML			Stiff grayish brown sandy SILT (ML), no odor, dry, trace clay, mottled with red color	-	10	-	-	30	60				
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	09:12	-	-	-	37.46

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 45.0
Rock Cored (ft) -
Samples 9S

Boring No. CCR-AP-5

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-AP-5
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
	4 11 15 18	S5 18	23.0 25.0	ML			Very stiff brown SILT with sand (ML), no odor, dry, trace clay, mottled with red color	-	5	-	-	15	80				
25						423.0											
	1 2 1 3	S6 24	28.0 30.0	ML		28.0	Soft brown and gray SILT (ML), no odor, wet -OVERBURDEN-	-	-	-	-	5	95				
30																	
	1 3 3 4	S7 24	33.0 35.0	ML			Medium stiff gray SILT (ML), no odor, wet	-	-	-	-	-	100				
35						413.0											
	WOH WOH 3 4	S8 24	38.0 40.0	CL		38.0	Soft brown lean CLAY (CL), no odor, wet	-	-	-	-	-	100				
40						408.0											
	WOH WOH 2 3	S9 24	43.0 45.0	ML		43.0	Very soft brown SILT (ML), no odor, wet, trace clay	-	-	-	-	-	100				
45						406.0 45.0	BOTTOM OF EXPLORATION 45.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-5

TEST BORING REPORT

Boring No. CCR-AP-6

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

File No. 42796-001
Sheet No. 1 of 2
Start 10 March 2016
Finish 11 March 2016
Driller J. Gryska
H&A Rep. S. Lewis
Elevation 458.9 (est.)
Datum
Location See Plan
N 969932.76
E 2771626.75

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							-FILL-										
	1 2 2 4	S1 24	4.0 6.0	CL		454.9 4.0	Soft brown lean CLAY (CL), no odor, moist -OVERBURDEN-	-	-	-	-	10	90				
5																	
	8 15 30 50/2	S2 24	9.0 11.0	SM		449.9 9.0	Dense grayish brown silty SAND (SM), no odor, moist	-	-	-	10	60	30				
10																	
	20 50/6	S3 6	14.0 16.0			444.9 14.0	Tan mottled with red brown and dark gray weathered SANDSTONE, moist, thinly laminated -BEDROCK-										
15																	
	50/6	S4 2	19.0 21.0				Brownish tan weathered SANDSTONE, moist, thinly laminated										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	15:33	-	-	-	12.15

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 14.0
Rock Cored (ft) 25.0
Samples 8S

Boring No. CCR-AP-6

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-AP-6
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
							Brownish tan weathered SANDSTONE, moist, thinly laminated										
25	6 9 15 16	S5 24	24.0 26.0														
						429.9 29.0	Dark gray weathered SHALE, wet, fissile										
30	50/5	S6 4	29.0 31.0														
	50/6	S7 7	34.0 36.0				Dark gray weathered SHALE, organic matter at 34.5 ft (1.0 in. thick)										
35						419.9 39.0	Dark gray weathered SHALE										
	50/1	S8 1	39.0 39.0				BOTTOM OF EXPLORATION 39.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-6

TEST BORING REPORT

Boring No. CCR-AP-7

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 13 March 2016
Finish 14 March 2016
Driller B. Marshall
H&A Rep. J. Yonts
Elevation Datum 486.0 (est.)
Location See Plan
N 970758.7
E 2773501.63

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	-	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	-	-	Drill Mud: None
Hammer Fall (in.)		-	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 60	0.0 5.0	ML			Brown SILT with trace clay (ML), no structure, no odor, moist, root material	-	-	-	-	5	95				
							-OVERBURDEN-										
				ML			Brown SILT (ML), no odor, moist, no wood material	-	-	-	-	10	90				
5		U2 60	5.0 10.0	ML			Similar as above										
				ML			Brown SILT with trace clay (ML), no structure, no odor, moist	-	-	-	-	10	90				
10		U3 96	10.0 18.0	ML			Similar as above										
						471.0											
15						15.0	Orange red red-brown weathered SANDSTONE, moist, mostly medium to fine sands										
							-BEDROCK-										
		U4 24	18.0 20.0				Similar as above except more competent, bedrock										
20		U5 120	20.0 30.0				Similar as above										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	14:18	-	-	-	31.95

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft) 15.0
Rock Cored (ft) 20.0
Samples 6U

Boring No. CCR-AP-7

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-AP-7
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						464.0											
						22.0	Brown orange gray SHALE, moist, fissile, trace fine sand										
25						460.0											
						26.0	Gray SILTSTONE, soft, wet										
						458.0											
						28.0	Red brown orange brown SANDSTONE, moist, moistly fine sands										
30		U6 60	30.0 35.0				Brown tan black gray orange SANDSTONE, moist to wet, fine to medium sands										
						451.0											
35						35.0	BOTTOM OF EXPLORATION 35.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-7

TEST BORING REPORT

Boring No. CCR-AP-7R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 3
Start 30 July 2016
Finish 30 July 2016
Driller J. Gryska
H&A Rep. C. Toscano
Elevation Datum
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-AP-7, see test boring report for soils logged from 0-35.0 ft. -OVERBURDEN-										
15						15.0	Drill action, rig chatter and soil cuttings indicated highly to slightly weathered Sandstone/Shale -BEDROCK-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/30/16	-	-	-	-	28.30

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 15.0
Rock Cored (ft) 38.5
Samples -
Boring No. CCR-AP-7R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-AP-7R
File No. 42796-001
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25																	
30																	
35						35.0											
40																	
45																	
50																	

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-7R

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-AP-7R
File No. 42796-001
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						53.5	BOTTOM OF EXPLORATION 53.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-AP-7R

TEST BORING REPORT

Boring No. CCR-BK-1

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	-	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	-	-	Drill Mud: None
Hammer Fall (in.)		-	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

File No. 42796-001
Sheet No. 1 of 1
Start 10 March 2016
Finish 10 March 2016
Driller B. Marshall
H&A Rep. J. Yonts
Elevation Datum 480.4 (est.)
Location See Plan
N 974083.4
E 2770919.08

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 60	0.0 5.0	ML			Brown and tan SILT (ML), moist, trace clay, trace roots and wood debris	-	-	-	-	10	90				
							-TOPSOIL-										
5		U2 48	5.0 9.0	ML			Similar as above										
							-OVERBURDEN-										
10		U3 120	9.0 19.0	ML			Similar as above except wet in top 6.0 in. of sample										
15						464.4											
				CL		16.0	Dense red brown lean CLAY (CL), moist	-	-	-	-	5	95				
						461.4											
20		U4 43	19.0 22.5	SC		19.0	Similar as above except more sand content, gradual increase in sand, weathered sandstone	-	-	10	20	30	40				
						459.9											
						20.5	-BEDROCK-										
							Red brown SANDSTONE										
						457.9											
						22.5	BOTTOM OF EXPLORATION 22.5 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	13:50	-	-	-	19.51

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	19.0
Rock Cored (ft)	3.5
Samples	4U

Boring No. CCR-BK-1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-BK-1R

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 29 July 2016
Finish 29 July 2016
Driller J. Gryska
H&A Rep. C. Toscano
Elevation Datum
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	9.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Drilled through existing observation well CCR-BK-1, see test boring report for soils logged from 0-22.5 ft.										
							-OVERBURDEN-										
19.0							-BEDROCK-										
25	1 12 50/1	S1 10	23.0 25.0	SM			Medium dense red-brown to gray-brown silty SAND (SM), trace decomposed bedrock fragments. Note: Bottom 3-inches at tip of spoon consist of pulverized bedrock fragments. Drill action and increase in rig chatter indicated harder rock at 24.0 ft.										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
7/29/16	-	-	-	-	54.00

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 19.0
Rock Cored (ft) 45.0
Samples 1S

Boring No. CCR-BK-1R

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-BK-1R
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
30																	
35																	
40																	
45							Drill action indicated harder bedrock at 45.0 ft.										
50																	
55																	
60																	
						64.0	BOTTOM OF EXPLORATION 64.0 ft.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-BK-1R

TEST BORING REPORT

Boring No. CCR-BK-2

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

File No. 42796-001
Sheet No. 1 of 2
Start 11 March 2016
Finish 11 March 2016
Driller J. Gryska
H&A Rep. S. Lewis
Elevation Datum 427.5 (est.)
Location See Plan
N 972854.33
E 2769728.14

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				ML			-TOPSOIL-										
						424.0											
	1 2 3 4	S1 16	3.5 5.5	ML		3.5	Medium stiff brown SILT (ML), no odor, moist	-	-	-	-	10	90				
5							-OVERBURDEN-										
	1 1 1 1	S2 24	8.5 10.5	ML			Very soft brown SILT (ML), no odor, wet, mottled with gray colors	-	-	-	-	10	90				
10						414.0											
	1 1 1 2	S3 24	13.5 15.5	CL		13.5	Very soft brownish gray lean CLAY (CL), no door, wet, wood fragments present	-	-	-	-	5	95				
15																	
	1 1 2 2	S4 24	18.5 20.5	CL			Soft brownish gray silty lean CLAY (CL), no odor, wet	-	-	-	-	5	95				
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	10:38	-	-	-	13.40

Sample ID
- O - Open End Rod
- T - Thin Wall Tube
- U - Undisturbed Sample
- S - Split Spoon Sample

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (ft)	25.5
Rock Cored (ft)	-
Samples	5S

Boring No. CCR-BK-2

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-BK-2
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						404.0											
	2 2 2 4	S5 24	23.5 25.5	ML		23.5	Medium stiff brown clayey SILT (ML), no odor, wet	-	-	-	-	5	95				
25						402.0 25.5	BOTTOM OF EXPLORATION 25.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-BK-2

TEST BORING REPORT

Boring No. CCR-LF-1

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 10 March 2016
Finish 10 March 2016
Driller B. Marshall
H&A Rep. J. Yonts
Elevation 432.8 (est.)
Datum
Location See Plan
N 970812.18
E 2771247.76

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	-	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	-	-	Drill Mud: None
Hammer Fall (in.)		-	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 12	0.0 5.0	CH			Red brown sandy CLAY (CH), no structure, mps 1.0 in., moist -FILL-	5	5	5	10	15	60				
				SC		430.3 2.5	Black orange yellow red-brown clayey SAND (SC), mps 1.1 in., no structure, moist	-	-	10	40	30	20				
						428.8 4.0	-BEDROCK-										
5		U2 48	5.0 9.0				Black orange yellow SANDSTONE, wet Similar as above except white tan orange Similar as above except no clay, uniform sand (medium > fine)										
		U3 60	9.0 14.0			423.8 9.0	Black coal, organic rich, no structure, wet										
10						423.3 9.5	Gray SHALE, weathered, no structure, moist, thinly laminated										
						420.8 12.0	Black coal, organic rich layer, moist										
						419.8 13.0	White gray orange SILTSTONE, weathered, moist, soft Orange and tan SILTSTONE, soft to hard, weathered, dry										
		U4 36	14.0 17.0			418.8 14.0	Similar as above										
15		U5 24	17.0 19.0				Similar as above										
						413.8 19.0	BOTTOM OF EXPLORATION 19.0 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	14:35	-	-	-	4.04

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft) 4.0
Rock Cored (ft) 15.0
Samples 5U

Boring No. CCR-LF-1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-LF-2

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 3
Start 12 March 2016
Finish 12 March 2016
Driller B. Marshall
H&A Rep. J. Yonts
Elevation 470.1 (est.)
Datum
Location See Plan
N 970681.32
E 2772205.05

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	-	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	-	-	Drill Mud: None
Hammer Fall (in.)		-	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 30	0.0 5.0	ML		469.9 0.2	-TOPSOIL-	-	-	-	-	10	90				
				ML			Brown SILT (ML), no structure, wet, root material, gradual increase in sand content with depth -FILL- Brown sandy SILT (ML), no structure, moist	-	-	-	5	25	70				
				CL		467.1 3.0	Brown red-brown CLAY (CL), no structure, moist mostly fine material, trace fine sand	-	-	-	-	5	95				
5		U2 20	5.0 10.0	CL			Similar as above										
				ML		462.6 7.5	Brown SILT (ML), moist, breaks into 1-2 mm layers -OVERBURDEN-	-	-	-	-	5	95				
10		U3 96	10.0 13.0	ML			Gray brown SILT (ML), moist, few woody materials (black)	-	-	-	5	10	85				
				ML			Similar as above except increased clay content										
15						454.1											
				CL		16.0	Dense red brown yellow CLAY (CL), moist, trace coarse material, few sandstone rock fragments < 1.0 in. bottom of sample	-	-	-	-	5	95				
		U4 24	18.0 20.0			451.4 18.7	Drilling action indicates bedrock at 18.5 ft Yellow to yellow brown orange SANDSTONE, weathered, dry, mostly medium sands -BEDROCK-										
20		U5 72	20.0 26.0														

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	14:45	-	-	-	24.75

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	18.7
Rock Cored (ft)	26.3
Samples	8U

Boring No. CCR-LF-2

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-LF-2
File No. 42796-001
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						446.1											
						24.0	Gray white black and orange laminated (1-2 mm) SILTSTONE, dry										
25						444.1											
		U6 48	26.0 30.0			26.0	Brown tan SANDSTONE, dry, mostly fine and medium sands										
30		U7 120	30.0 40.0				Notes: Drilling action changed at ~33.0 ft to 35.0 ft Similar as above except tan brown and orange, wet										
35																	
40		U8 60	40.0 45.0				Similar as above except poorly graded										
45						425.1 45.0	BOTTOM OF EXPLORATION 45.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-LF-2

TEST BORING REPORT

Boring No. CCR-LF-3

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 14 March 2016
Finish 14 March 2016
Driller J. Gryska
H&A Rep. J. Yonts
Elevation 482.0 (est.)
Datum
Location See Plan
N 970949.7
E 2773138.97

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 CR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Hand cleared to 5.0 ft bgs, no sample, brown SILT (ML), no odor, moist	-	-	-	-	5	95				
5	1 1 1 1	S1 23	5.0 7.0	ML			Brown SILT (ML), no structure, no odor, wet, trace roots -OVERBURDEN-	-	-	-	-	5	95				
10	4 14 12 14	S2 20	10.0 12.0	ML			Similar as above except moist, no roots										
				SP		471.2 10.8	Brown black and orange poorly graded SAND (SP), weathered sandstone	-	-	5	50	40	5				
15	50/4	S3 41	15.0 17.0			467.0 15.0	Brown tan SANDSTONE medium to fine sands, uniform, moist, trace clay										
20	50/5	S4 5	20.0 22.0				Tan light brown to brown SANDSTONE, medium to fine sands, moist										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	16:30	-	-	-	25.80

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	15.3
Rock Cored (ft)	20.0
Samples	7S

Boring No. CCR-LF-3

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-LF-3
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	50/4	S5 4	25.0 27.0				Similar as above except wet										
30	50/5	S6 5	30.0 32.0				Similar as above except red brown/maroon, wet Note: Driller noted drilling action indicated fractures between 30.0 and 35.0 ft bgs										
35	50/3	S7 3	35.0 37.0			446.7 35.3	BOTTOM OF EXPLORATION 35.3 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-LF-3

TEST BORING REPORT

Boring No. CCR-LF-4

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 3
Start 11 March 2016
Finish 11 March 2016
Driller B. Marshall
H&A Rep. J. Yonts
Elevation Datum 476.6 (est.)
Location See Plan
N 972312.24
E 2772876.83

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	-	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	-	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	-	-	Drill Mud: None
Hammer Fall (in.)		-	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 60	0.0 5.0	ML			Brown SILT (ML), no structure, no odor, moist, trace clay, less clay with depth to 5.0 ft, trace root material	-	-	-	-	5	95				
5		U2 60	5.0 10.0	ML			Similar as above										
10		U3 120	10.0 20.0	ML			Similar as above Wet at 12.0 ft, possible perched										
				CL		463.6 13.0	Dense red brown CLAY (CL), no odor, moist, trace coarse material -OVERBURDEN-	-	-	-	-	5	95				
15																	
20		U4 120	20.0 30.0	CL			Similar as above except more fine sand, increasing sand content with depth, moist	-	-	-	-	30	70				

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	14:00	-	-	-	48.36

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 28.5
Rock Cored (ft) 31.5
Samples 8U

Boring No. CCR-LF-4

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-LF-4
File No. 42796-001
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
						453.6											
				SC		23.0	Red-brown yellow-brown clayey SAND (SC), moist, weathered bedrock	-	-	-	10	50	40				
25							-BEDROCK-										
						448.1											
						28.5	Yellow brown white red-brown SANDSTONE, mostly medium to fine sands, dry										
30		U5 120	30.0 40.0				Similar as above except yellow, tan, yellow-brown, white, and red										
35																	
40		U6 120	40.0 50.0				Similar as above except color variations Light brown SANDSTONE, dry Yellow to yellow-brown SANDSTONE, dry Brown light brown SANDSTONE, dry Dark brown SANDSTONE, dry										
45							Red brown, SANDSTONE, moist, trace clay										
						429.6											
						47.0	Gray to dark gray SHALE, fissile, no fossil or other identifiers										
50		U7 36	50.0 53.0				Black organic rich SHALE, no fossils or layering Similar as above Gray SHALE, fissile, no other identifiers observed, dry										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-LF-4

TEST BORING REPORT

Boring No. CCR-LF-4
File No. 42796-001
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
		U8 84	53.0 60.0														
55						421.6 55.0	Gray SILTSTONE										
60						416.6 60.0	BOTTOM OF EXPLORATION 60.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-LF-4

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-LF-5

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 12 March 2016
Finish 12 March 2016
Driller J. Gryska
H&A Rep. S. Lewis
Elevation Datum 427.5 (est.)
Location See Plan
N 972228.16
E 2772003.91

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				ML			Hand auger from 0.0 ft to 5.0 ft, brown SILT (ML), dry										
							-FILL-										
				ML			Gray and black SILT (ML), petroleum-like odor, moist										
5	4 9 7 6	S1 19	5.0 7.0	ML			Very stiff gray and black SILT (ML), petroleum-like odor, moist	-	-	-	-	5	95				
				ML			Very stiff brown SILT (ML), no odor, moist	-	-	-	-	5	95				
						418.5											
	2 2 3 5	S2 24	9.0 11.0	CL		9.0	Medium stiff brown lean CLAY (CL), no odor, moist	-	-	-	-	5	95				
10							-OVERBURDEN-										
						413.5											
	2 6 7 10	S3 24	14.0 16.0	ML		14.0	Stiff grayish brown SILT with gravel (ML), no odor, moist, organic matter present	-	15	5	5	5	70				
15				ML			Stiff orange black SILT with gravel (ML), no odor, moist, organic matter present	-	15	5	5	5	70				
						408.5											
	4 12 19 36	S4 24	19.0 21.0			19.0	Gray brown black SILTSTONE, dry, layers of organic matter and laminated less than a mm										
20							-BEDROCK-										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	11:01	-	-	-	20.50

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 19.0
Rock Cored (ft) 11.0
Samples 6S
Boring No. CCR-LF-5

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-LF-5
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	9 16 22 27	S5 24	24.0 26.0				Similar as above										
						398.5											
	5 5 50/0	S6 no recovery	29.0 31.0			29.0 397.5	Similar as above, refusal at 30.0 ft, wet, dark gray limestone										
30						30.0	BOTTOM OF EXPLORATION 30.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-LF-5

TEST BORING REPORT

Boring No. CCR-LF-6

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 1
Start 11 March 2016
Finish 12 March 2016
Driller J. Gryska
H&A Rep. S. Lewis
Elevation Datum 409.2 (est.)
Location See Plan
N 972269.53
E 2771046.15

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Hand clear to 5.0 ft bgs, brown and gray SILT (ML), rock fragments -FILL-										
5	8 14 19 19	S1 17	5.0 7.0	ML		404.2 5.0	Hard brownish gray SILT (ML), no odor, moist	-	-	-	-	-	100				
						400.7 8.5	Dark gray LIMESTONE, no odor, wet -BEDROCK-										
10						399.2 10.0	BOTTOM OF EXPLORATION 10.0 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	10:00	-	-	-	12.15

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 10.0
Rock Cored (ft) -
Samples 1S

Boring No. CCR-LF-6

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-PZ-5

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 3
Start 18 December 2015
Finish 18 December 2015
Driller B. Marshall
H&A Rep. T. Vanage
Elevation 484.1 (est.)
Datum
Location See Plan
N 965928.39
E 2772500.01

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Sonic	S	Steel	Rig Make & Model: Track Geoprobe 8140LS
Inside Diameter (in.)	4.5	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0		U1 30	0.0 5.0				Missing recovery - gravel										
				CL			Brown lean CLAY, no odor, moist -FILL-	-	-	-	-	-	100				
5		U2 32	5.0 10.0														
				ML		475.4 8.8	Brown SILT, no odor, dry, laminae bedding observed -OVERBURDEN-	-	-	-	-	-	100				
10		U3 55	10.0 15.0														
15																	
20		U4 58	20.0 25.0														

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
12/20/15	-	-	-	-	Dry

Sample ID
- O - Open End Rod
- T - Thin Wall Tube
- U - Undisturbed Sample
- S - Split Spoon Sample

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (ft)	40.3
Rock Cored (ft)	8.8
Samples	8U

Boring No. CCR-PZ-5

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-PZ-5
File No. 42796-001
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
							Moist at 21.0 ft										
						459.6											
				CL		24.5	Medium stiff brown lean CLAY with silt, no odor, dry to moist	-	-	-	-	-	100				
25		U5 60	25.0 30.0														
30		U6 36	30.0 35.0	CL			Similar as above										
35		U7 60	35.0 40.0	CL			Similar as above										
40		U8 120	40.0 50.0			443.9 40.3	Tan moderately weathered fine-grained SANDSTONE -BEDROCK-										
45																	
50						434.1 50.0	BOTTOM OF EXPLORATION 50.0 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-PZ-5

TEST BORING REPORT

Boring No. CCR-SP-1

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 1
Start 13 March 2016
Finish 13 March 2016
Driller J. Gryska
H&A Rep. S. Lewis
Elevation Datum
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				ML			Hand clear to 5.0 ft bgs, brown SILT (ML), dry -FILL-										
5	4 5 8 8	S1 15	5.0 7.0	ML		5.0	Stiff brown SILT (ML), no odor, moist	-	-	-	-	-	100				
10	3 5 7 5	S2 17	8.5 10.5	ML			Stiff dark gray SILT (ML), no odor, moist, trace wood fragments	-	-	-	-	-	100				
15	WOH WOH WOH 3	S3 24	13.5 15.5	ML			Very soft grayish brown SILT ML), no odor, wet	-	-	-	-	-	100				
20	WOH 2 1 2	S4 20	18.5 20.5	ML			Soft grayish brown SILT (ML), no odor, wet, mottled with orange/black colors	-	-	-	-	-	100				
						20.5	BOTTOM OF EXPLORATION 20.5 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	09:41	-	-	-	9.00

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 20.0
Rock Cored (ft) -
Samples 4S

Boring No. CCR-SP-1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. CCR-SP-2

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No. 42796-001
Sheet No. 1 of 2
Start 13 March 2016
Finish 13 March 2016
Driller J. Gryska
H&A Rep. S. Lewis
Elevation Datum
Location See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer: -
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Hand auger from 0.0 ft to 5.0 ft 1.0 ft to 1.5 ft, crushed limestone and clay										
				CL		1.5	-FILL- Brown CLAY (CL), dry										
5	4 7 12 12	S1 18	5.0 7.0	ML		5.0	Very stiff grayish brown SILT (ML), no odor, moist	-	-	-	-	-	100				
	3 4 6 6	S2 14	8.5 10.5	ML			Stiff gray SILT with sand (ML), no odor, moist -OVERBURDEN-	-	-	-	-	15	85				
15	1 2 2 2	S3 17	13.5 15.5	ML			Soft grayish brown SILT (ML), no odor, wet, trace clay present	-	-	-	-	5	95				
20	1 1 1 1	S4 18	18.5 20.5	ML			Very soft grayish brown SILT (ML), no odor, wet, trace clay present	-	-	-	-	5	95				

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	09:35	-	-	-	8.60

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 25.5
Rock Cored (ft) -
Samples 5S

Boring No. CCR-SP-2

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST BORING REPORT

Boring No. CCR-SP-2
File No. 42796-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
25	2 1 2 3	S5 24	23.5 25.5	ML			Soft gray SILT (ML), no odor, wet, trace wood fragments, trace clay present	-	-	-	-	5	95				
						25.5	BOTTOM OF EXPLORATION 25.5 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. CCR-SP-2

TEST BORING REPORT

Boring No. CCR-SP-3

Project	Vectren, A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling

File No.	42796-001
Sheet No.	1 of 1
Start	13 March 2016
Finish	13 March 2016
Driller	J. Gryska
H&A Rep.	S. Lewis
Elevation Datum	
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	Steel	Rig Make & Model: Track CME 850 XR
Inside Diameter (in.)	4.25	1 3/8	6.0	Bit Type: Cutting Head
Hammer Weight (lb)	-	140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: Spun
				Hoist/Hammer:
				PID Make & Model: -

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				ML			Hand auger from 0.0 ft to 5.0 ft, brown SILT (ML), dry -FILL-										
5	1 1 2 3	S1 22	5.0 7.0	ML		5.0	Soft brownish gray mottled SILT (ML), no odor, wet -OVERBURDEN-	-	-	-	-	5	95				
10	1 1 2 2	S2 21	8.5 10.5	ML			Soft grayish brown mottled SILT (ML), no odor, wet	-	-	-	-	-	100				
15	WOH WOH WOH WOH	S3 24	13.5 15.5	CL		13.5	Very soft gray lean CLAY (CL), no odor, wet	-	-	-	-	-	100				
20	2 5 8 9	S4 24	18.5 20.5	ML		18.5	Stiff gray-brown lean CLAY (CL), no odor, moist, red mottling	-	-	-	-	-	100				
						20.5	BOTTOM OF EXPLORATION 20.5 FT										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/15/16	09:28	-	-	-	3.44

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	20.5
Rock Cored (ft)	-
Samples	4S

Boring No. CCR-SP-3

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-AP-1

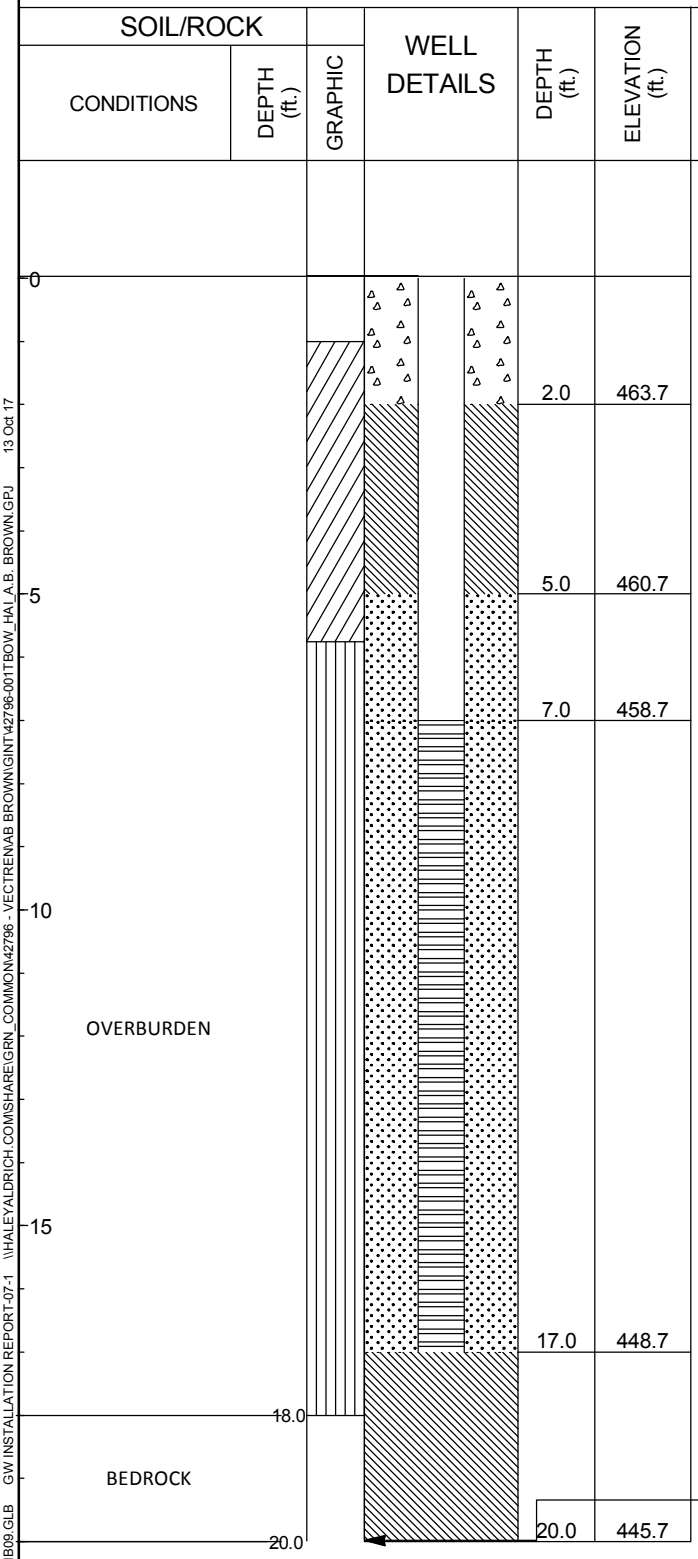
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 18 Dec 2015
H&A Rep. T. Vanage
Location N 968260.82
E 2773560.71

Ground El. 465.7 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.0 ft
Height of top of riser above ground surface	2.8 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.0 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	7.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Bentonite	2.0	3.0
Sand	5.0	12.5
Bentonite	17.5	2.5
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	7.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	17.0 ft
Bottom of silt trap	-
Depth of bottom of borehole	20.0 ft

COMMENTS:

HA-LIB09.GLB GW INSTALLATION REPORT-07-1 \\HALEYALDRICH.COM\SHARE\GRN_COMMON\42796 - VECTREN\AB BROWN\GINT\42796-001TBOW_HAI_A.B. BROWN.GPJ 13 Oct 17

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-AP-1R

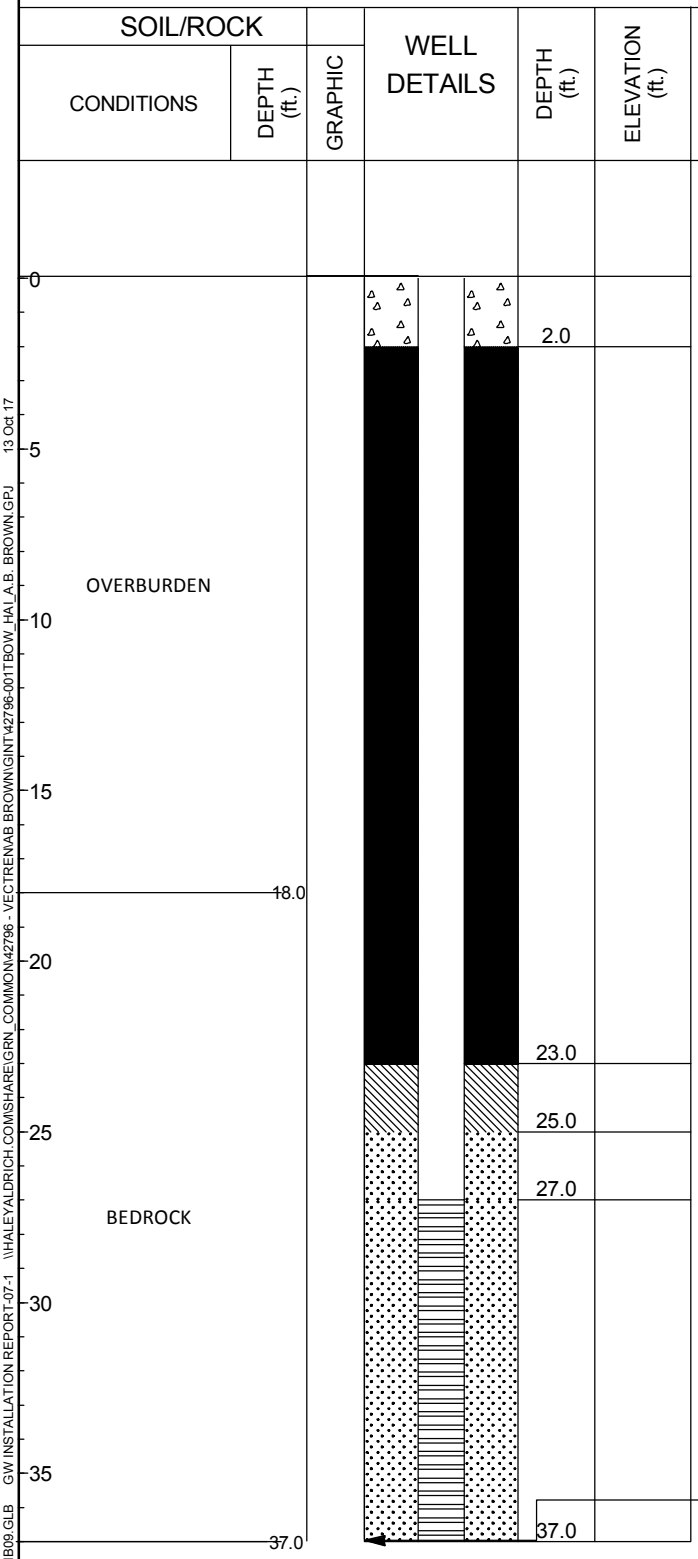
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 26 Jul 2016
H&A Rep. C. Toscano
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.0 ft
Height of top of riser above ground surface	2.8 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.0 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	26.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0	23.0
Bentonite	23.0	2.0
Sand	25.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	26.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	36.7 ft
Bottom of silt trap	37.0 ft
Depth of bottom of borehole	37.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

HALEY ALDRICH

Well No.
Boring No. CCR-AP-2

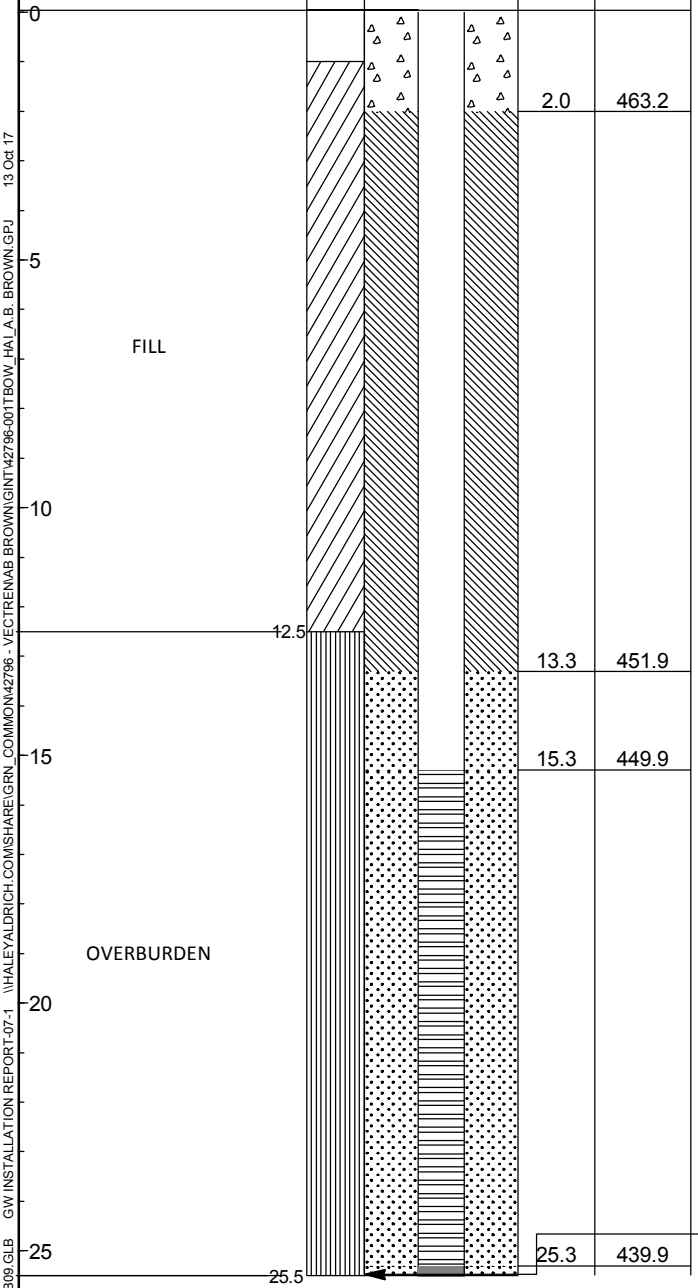
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 17 Dec 2015
H&A Rep. T. Vanage
Location N 969079.16
E 2771922.52

Ground El. 465.2 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.2 ft
Height of top of riser above ground surface	2.8 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	2.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	15.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	2.0
Bentonite	2.0	10.5
Sand	12.5	13.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	15.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	25.5 ft
Bottom of silt trap	25.3 ft
Depth of bottom of borehole	25.5 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-AP-2R

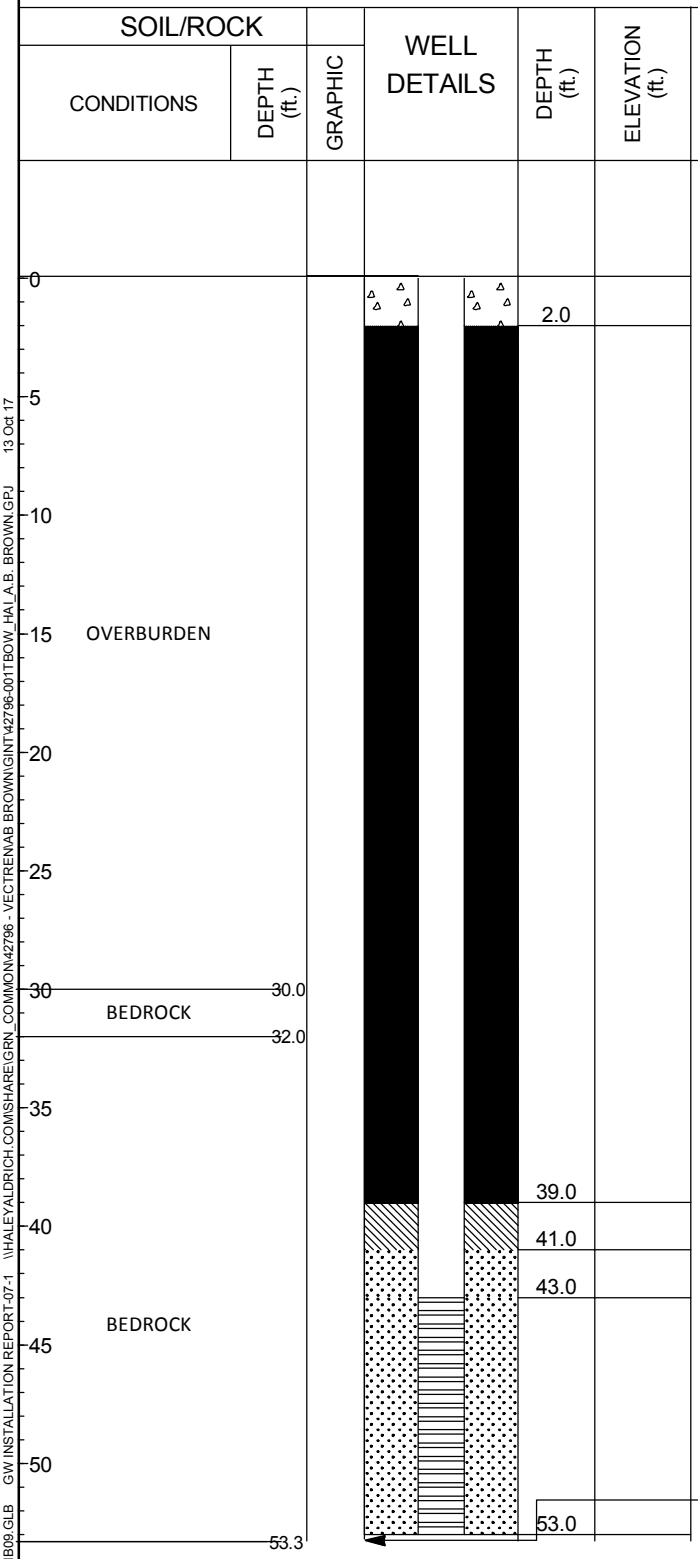
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 28 Jul 2016
H&A Rep. C. Toscano
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.0 ft
Height of top of riser above ground surface	2.8 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.0 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	43.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0	39.0
Bentonite	39.0	2.0
Sand	41.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	43.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	53.0 ft
Bottom of silt trap	53.3 ft
Depth of bottom of borehole	53.3 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

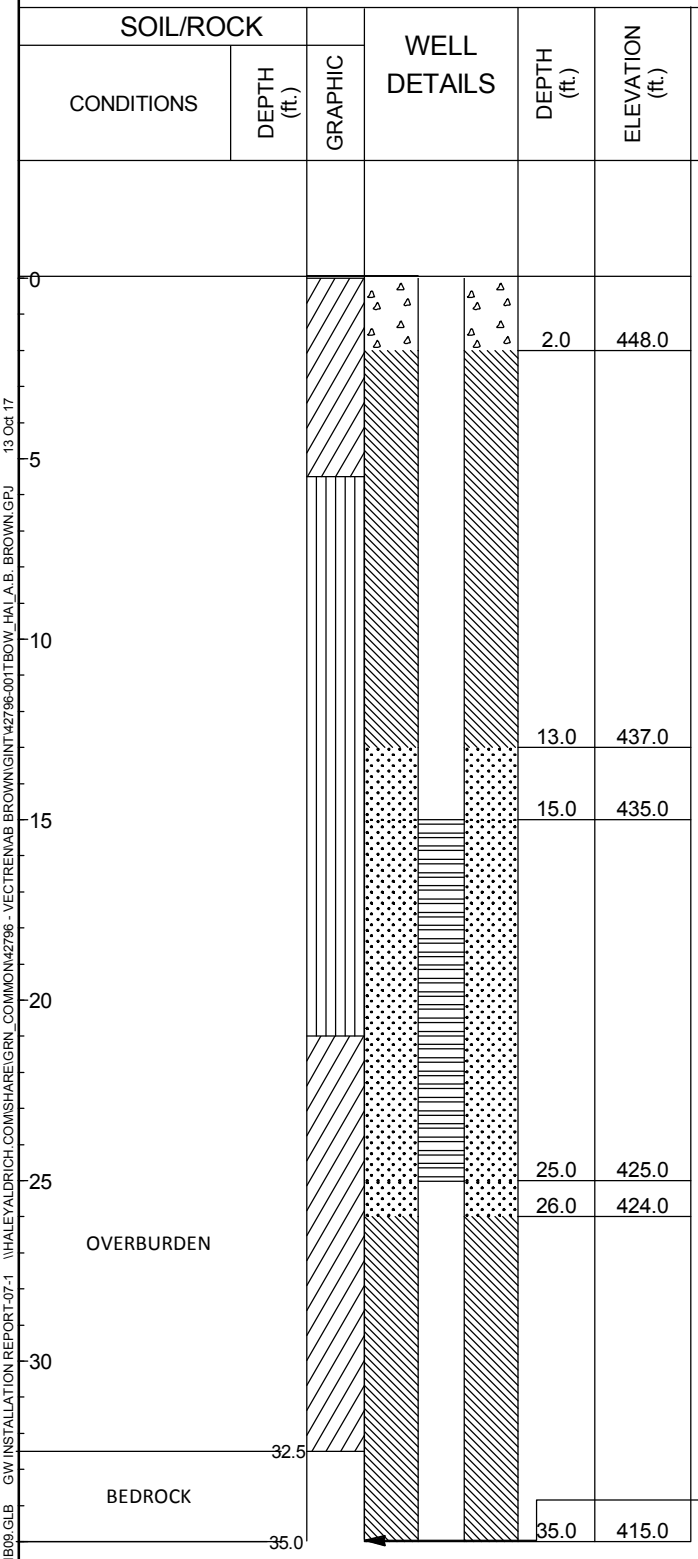
Well No.
Boring No. CCR-AP-3

Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 20 Dec 2015
H&A Rep. T. Vanage
Location N 966865.12, E 2771404.27
Ground El. 450.0 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Flush Mount
Depth of Morrison Flush Mount below ground surface	0.0 ft
Height of top of riser above ground surface	0.3 ft
Type of protective casing	Morrison Flush Mount
Length	0.8 ft
Inside diameter	0.8 in.
Depth of bottom of Morrison Flush Mount	0.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	15.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Bentonite	2.0	11.0
Sand	13.0	13.0
Bentonite	26.0	9.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	15.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	25.0 ft
Bottom of silt trap	25.5 ft
Depth of bottom of borehole	35.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

HALEY ALDRICH

Well No.
Boring No. CCR-AP-3R

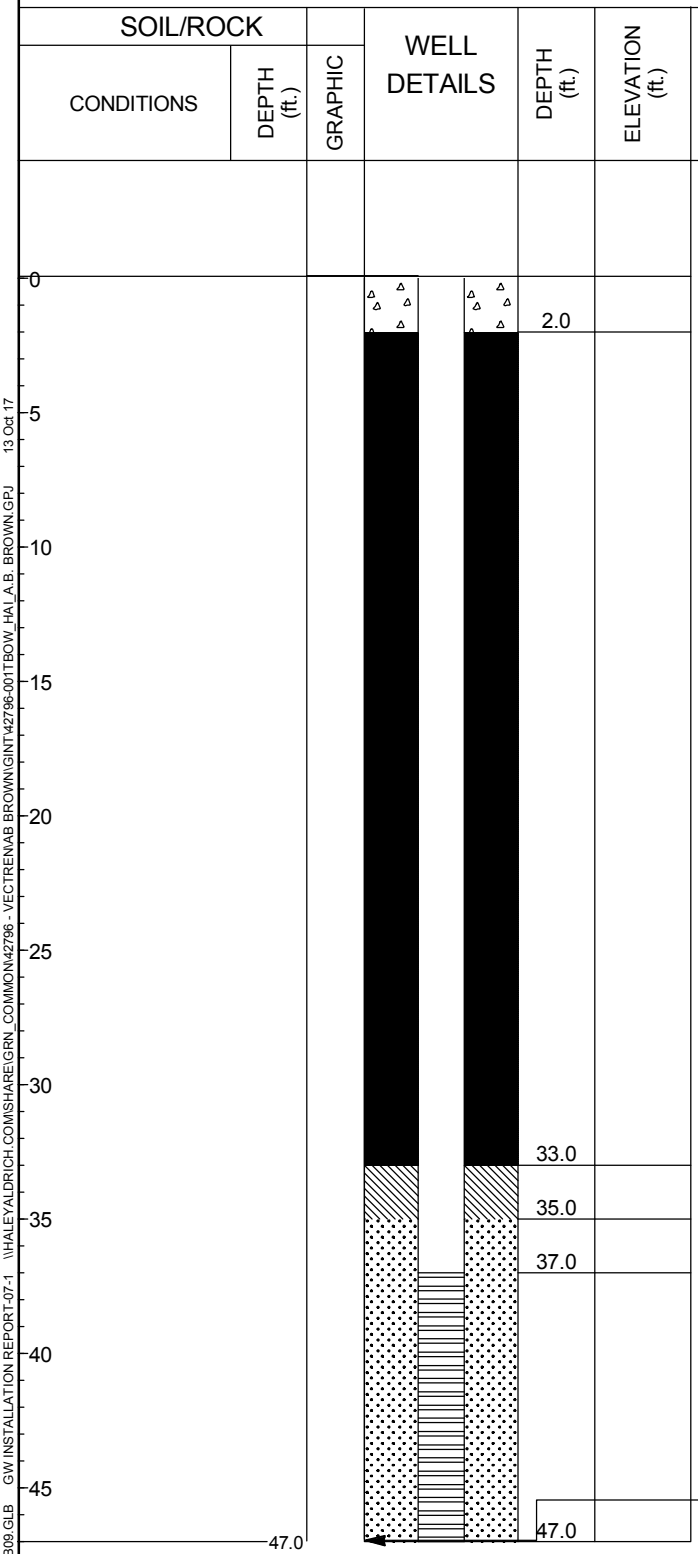
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 28 Jul 2016
H&A Rep. S.Lewis
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Flush Mount
Depth of Morrison Flush Mount below ground surface	0.0 ft
Height of top of riser above ground surface	0.2 ft
Type of protective casing	Morrison Flush Mount
Length	0.8 ft
Inside diameter	3.0 in.
Depth of bottom of Morrison Flush Mount	0.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	36.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	33.0
Bentonite	33.0	2.0
Sand	35.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	36.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	46.7 ft
Bottom of silt trap	47.0 ft
Depth of bottom of borehole	47.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

HALEY ALDRICH

Well No.
Boring No. CCR-AP-4

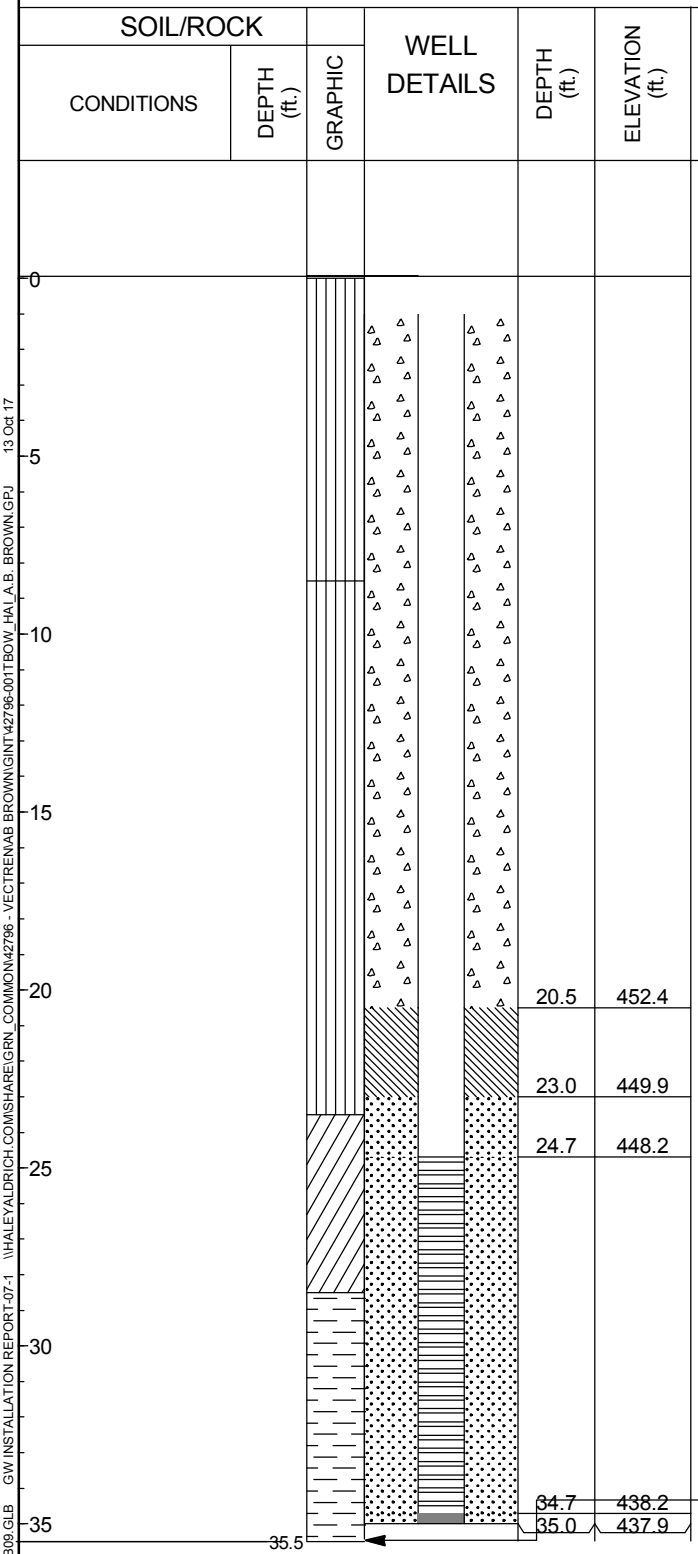
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 14 Mar 2016
H&A Rep. J. Yonts
Location N 966741.47
E 2772827.01

Ground El. 472.9 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	2.8 ft
Height of top of riser above ground surface	2.5 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.3 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	24.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	19.5
Bentonite	20.5	2.5
Sand	23.0	12.0
	-	-

Diameter of borehole	8.0 in.
Depth to top of well screen	24.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	34.7 ft
Bottom of silt trap	35.0 ft
Depth of bottom of borehole	35.5 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

HALEY ALDRICH

Well No.
Boring No. CCR-AP-4R

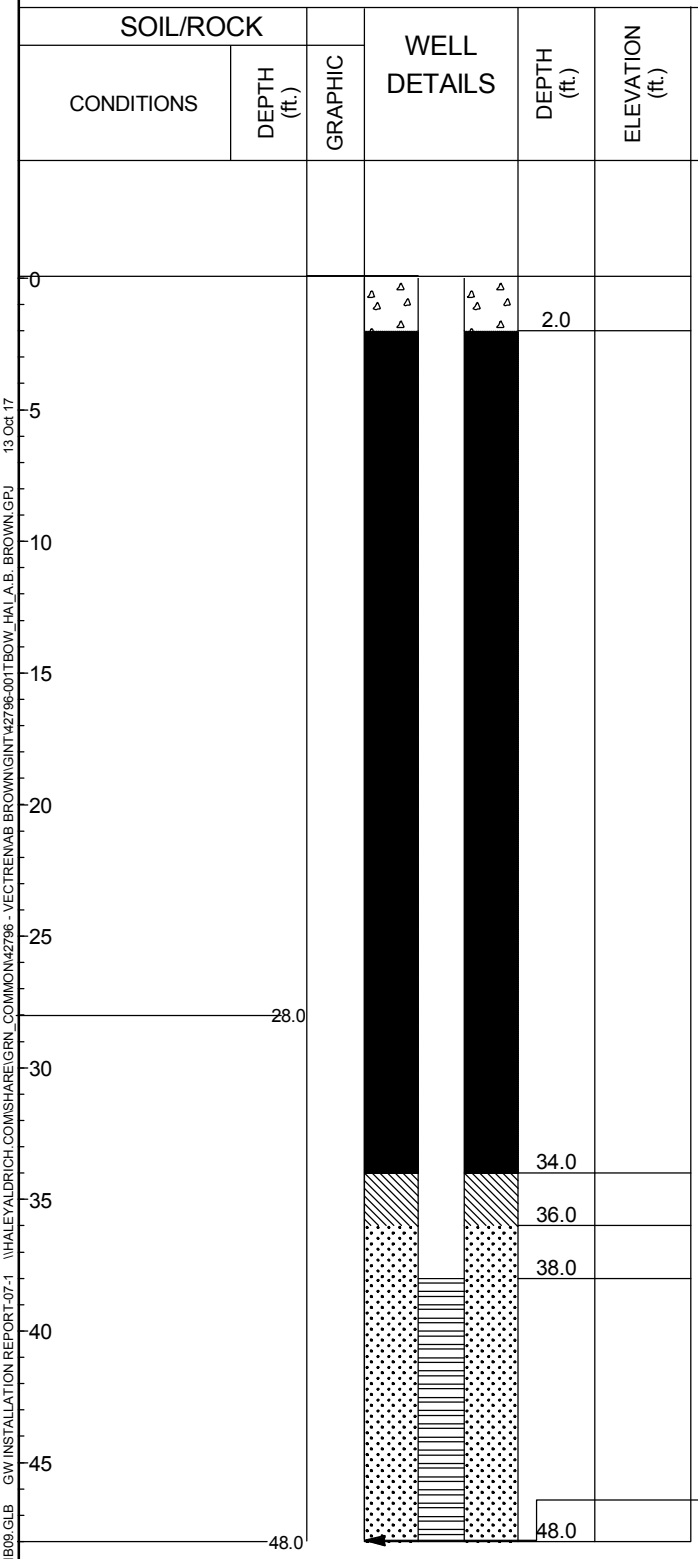
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 27 Jul 2016
H&A Rep. C. Toscano
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.0 ft
Height of top of riser above ground surface	2.7 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.0 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	37.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	36.0
Bentonite	36.0	2.0
Sand	38.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	37.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	47.7 ft
Bottom of silt trap	48.0 ft
Depth of bottom of borehole	48.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-AP-5

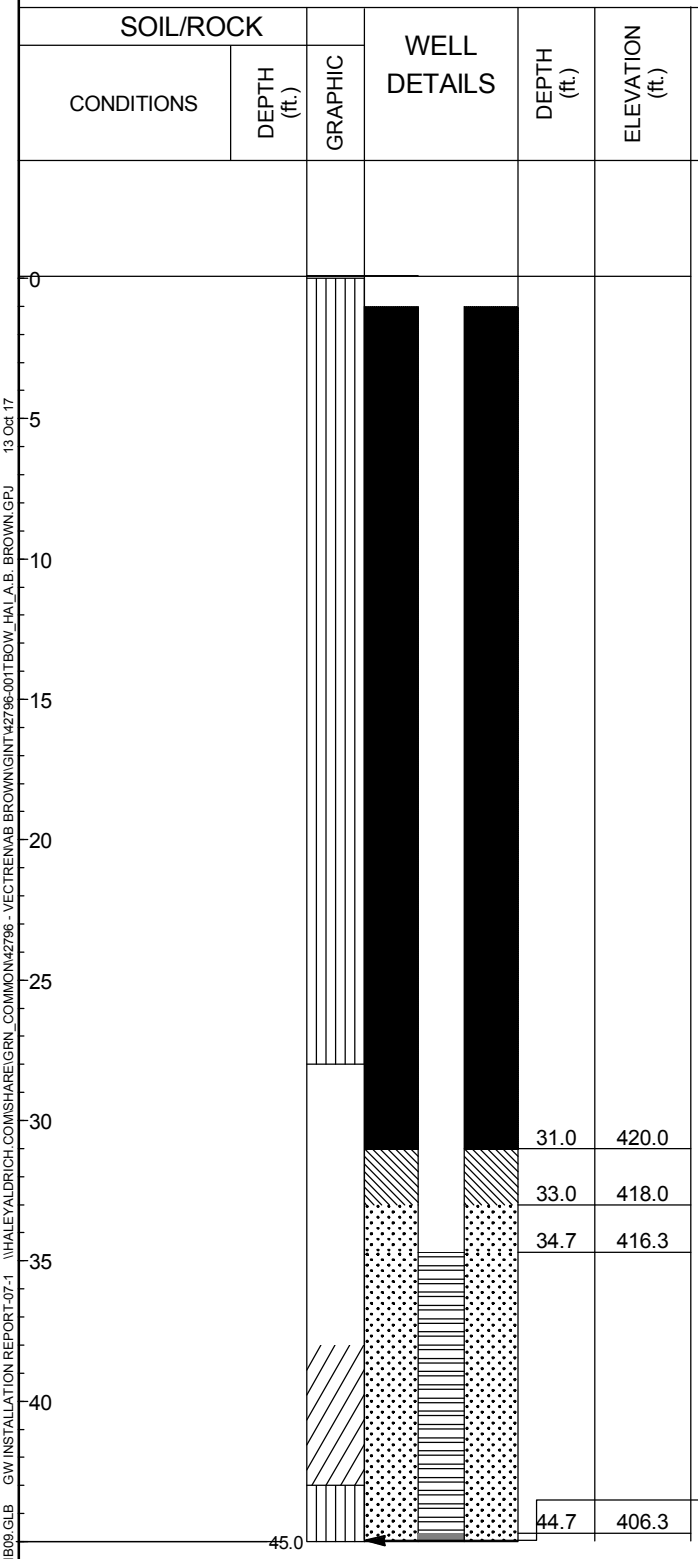
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 14 Mar 2016
H&A Rep. S. Lewis
Location N 968166.03
E 3771019.7

Ground El. 451.0 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.0 ft
Height of top of riser above ground surface	2.7 ft
Type of protective casing	Steel
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	2.0 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	34.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	1.0	30.0
Bentonite	31.0	2.0
Sand	33.0	12.0
	-	-

Diameter of borehole	8.0 in.
Depth to top of well screen	34.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	44.7 ft
Bottom of silt trap	45.0 ft
Depth of bottom of borehole	45.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-AP-6

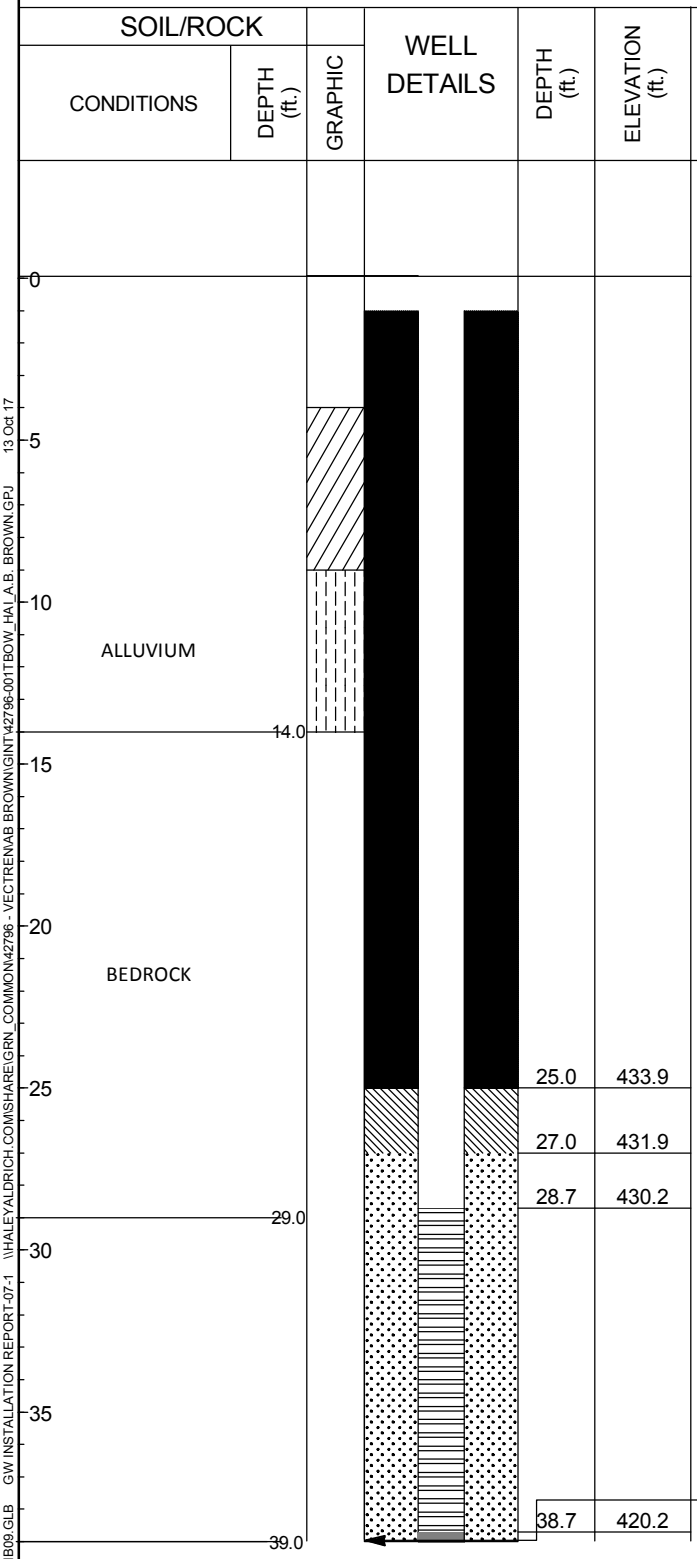
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 11 Mar 2016
H&A Rep. S. Lewis
Location N 969932.76
E 2771626.75

Ground El. 458.9 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.2 ft
Height of top of riser above ground surface	2.9 ft
Type of protective casing	Steel
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	1.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	28.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	1.0	24.0
Bentonite	25.0	2.0
Sand	27.0	12.0
	-	-

Diameter of borehole	8.0 in.
Depth to top of well screen	28.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	39.0 ft
Bottom of silt trap	28.7 ft
Depth of bottom of borehole	39.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-AP-7

Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 14 Mar 2016
H&A Rep. J. Yonts
Location N 970758.7
E 2773501.63

Ground El. 486.0 (est.)
Datum

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
	0				
	15.0			20.3	465.7
	22.0			23.0	463.0
				24.7	461.3
	26.0				
	28.0				
	35.0			34.7	451.3

WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.0 ft
Height of top of riser above ground surface	2.7 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.1 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	24.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	19.3
Bentonite	20.3	2.7
Sand	23.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	24.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	34.7 ft
Bottom of silt trap	35.0 ft
Depth of bottom of borehole	35.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-AP-7R

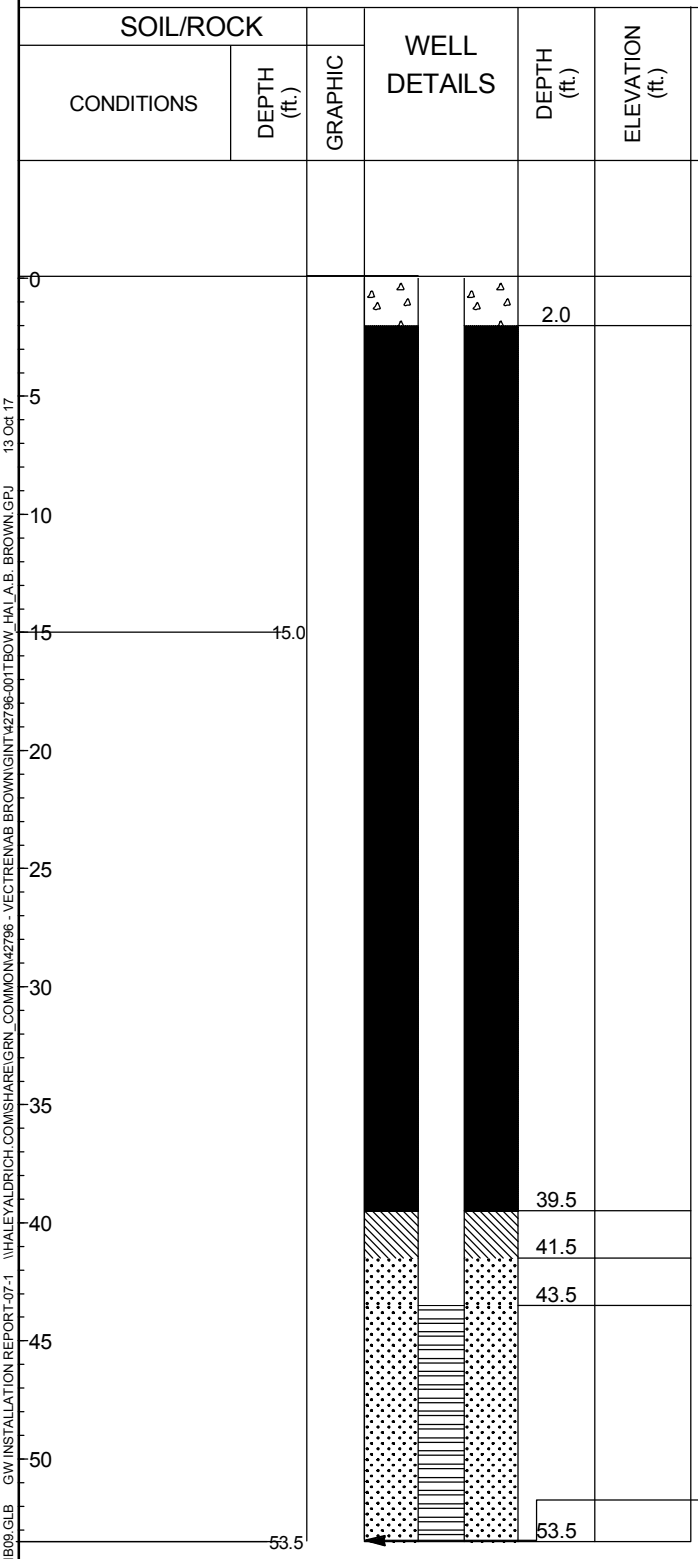
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 30 Jul 2016
H&A Rep. C. Toscano
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.0 ft
Height of top of riser above ground surface	2.7 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.0 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	53.2 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	41.5
Bentonite	41.5	2.0
Sand	43.5	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	53.2 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	53.2 ft
Bottom of silt trap	53.5 ft
Depth of bottom of borehole	53.5 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-BK-1

Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 10 Mar 2016
H&A Rep. J. Yonts
Location N 974083.4
E 2770919.08

Ground El. 480.4 (est.)
Datum

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
	0				
				2.0	478.4
TOPSOIL				8.0	472.4
				9.7	470.7
	16.0			19.7	460.7
				20.0	460.4
	22.5				

WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.3 ft
Height of top of riser above ground surface	3.0 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	2.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	9.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	2.0
Bentonite	2.0	6.0
Sand	8.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	9.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	19.7 ft
Bottom of silt trap	20.0 ft
Depth of bottom of borehole	22.5 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-BK-1R

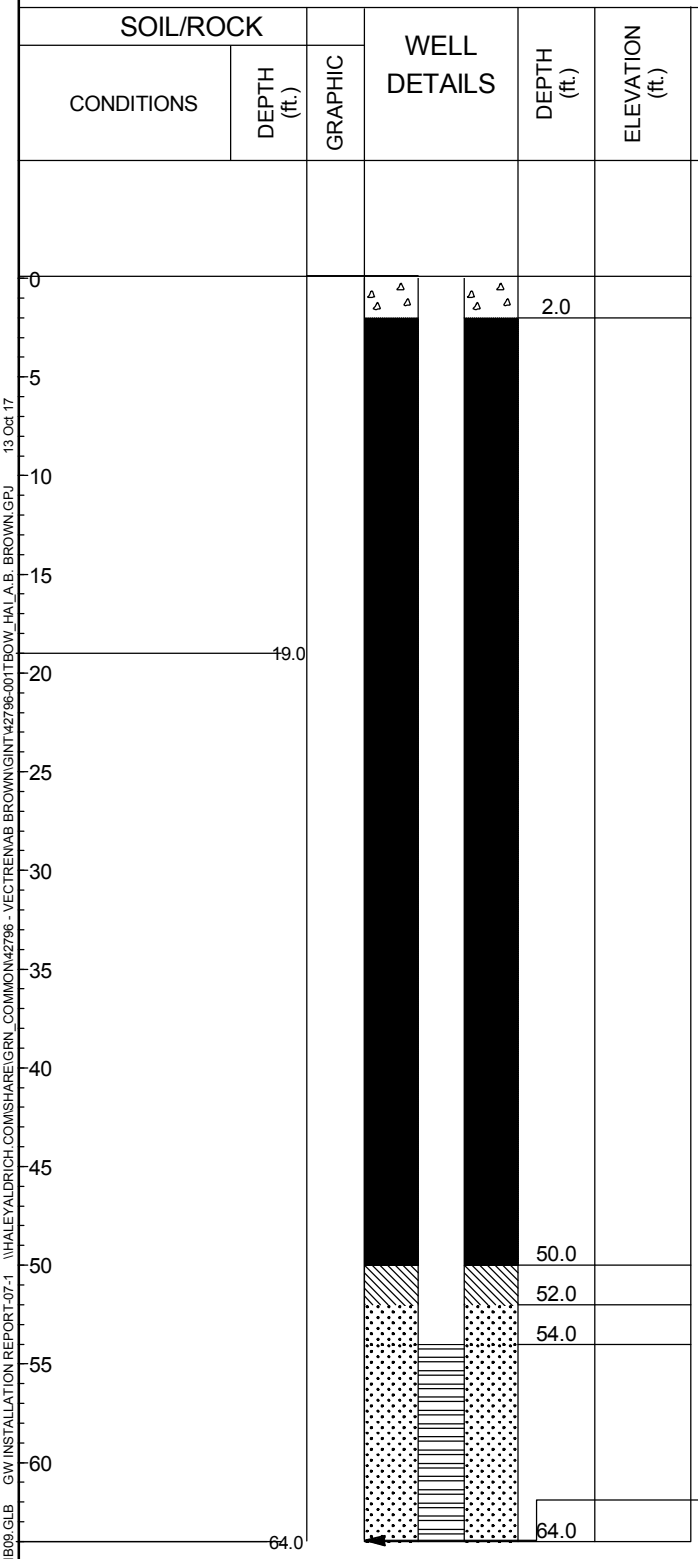
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 29 Jul 2016
H&A Rep. C. Toscano
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.0 ft
Height of top of riser above ground surface	2.7 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.0 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	53.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	50.0
Bentonite	50.0	2.0
Sand	52.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	53.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	63.7 ft
Bottom of silt trap	64.0 ft
Depth of bottom of borehole	64.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

HALEY ALDRICH

Well No.
Boring No. CCR-BK-2

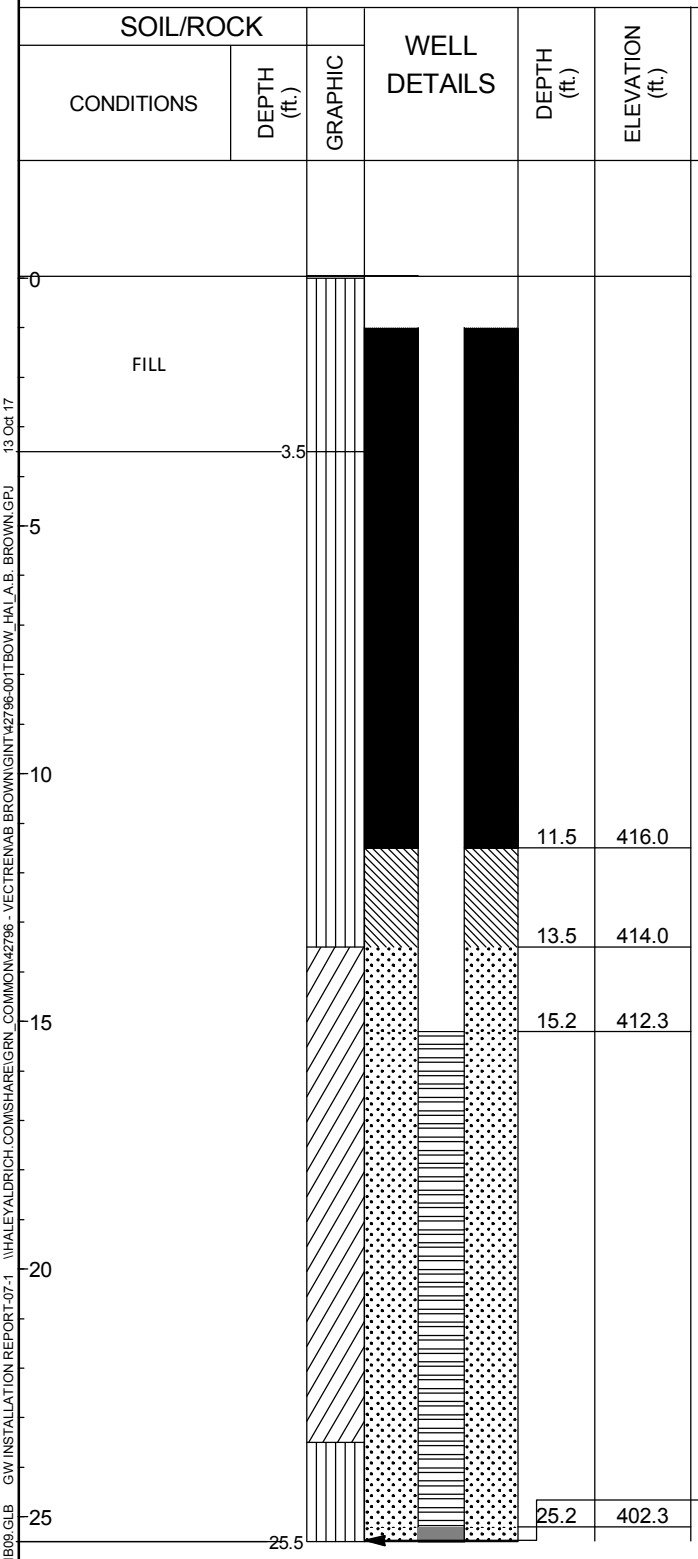
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 11 Mar 2016
H&A Rep. S. Lewis
Location N 972854.33
E 2769728.14

Ground El. 427.5 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.4 ft
Height of top of riser above ground surface	3.1 ft
Type of protective casing	Steel
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	1.6 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	15.2 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	1.0	10.5
Bentonite	11.5	2.0
Sand	13.5	12.0
	-	-

Diameter of borehole	8.0 in.
Depth to top of well screen	15.2 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	25.5 ft
Bottom of silt trap	25.2 ft
Depth of bottom of borehole	25.5 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-LF-1

Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 10 Mar 2016
H&A Rep. J. Yonts
Location N 970812.18
E 2771247.76

Ground El. 432.8 (est.)
Datum

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
	0				
FILL				3.0	429.8
	4.0				
BEDROCK	5			7.0	425.8
				8.7	424.1
	9.0				
	9.5				
	10				
	12.0				
	13.0				
	15				
	19.0			18.7	414.1
				19.0	413.8

WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.2 ft
Height of top of riser above ground surface	2.9 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	2.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	8.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	2.0
Bentonite	3.0	4.0
Sand	7.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	8.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	18.7 ft
Bottom of silt trap	19.0 ft
Depth of bottom of borehole	19.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-LF-2

Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 12 Mar 2016
H&A Rep. J. Yonts
Location N 970681.32
E 2772205.05

Ground El. 470.1 (est.)
Datum

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
0 TOPSOIL	0.2				
FILL	3.0				
FILL	7.5				
	18.7				
	24.0				
				30.0	440.1
				32.0	438.1
				34.7	435.4
	45.0			44.7	425.4

WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.2 ft
Height of top of riser above ground surface	2.9 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	2.9 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	34.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	29.0
Bentonite	30.0	2.0
Sand	32.0	13.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	34.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	44.7 ft
Bottom of silt trap	45.0 ft
Depth of bottom of borehole	45.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-LF-3

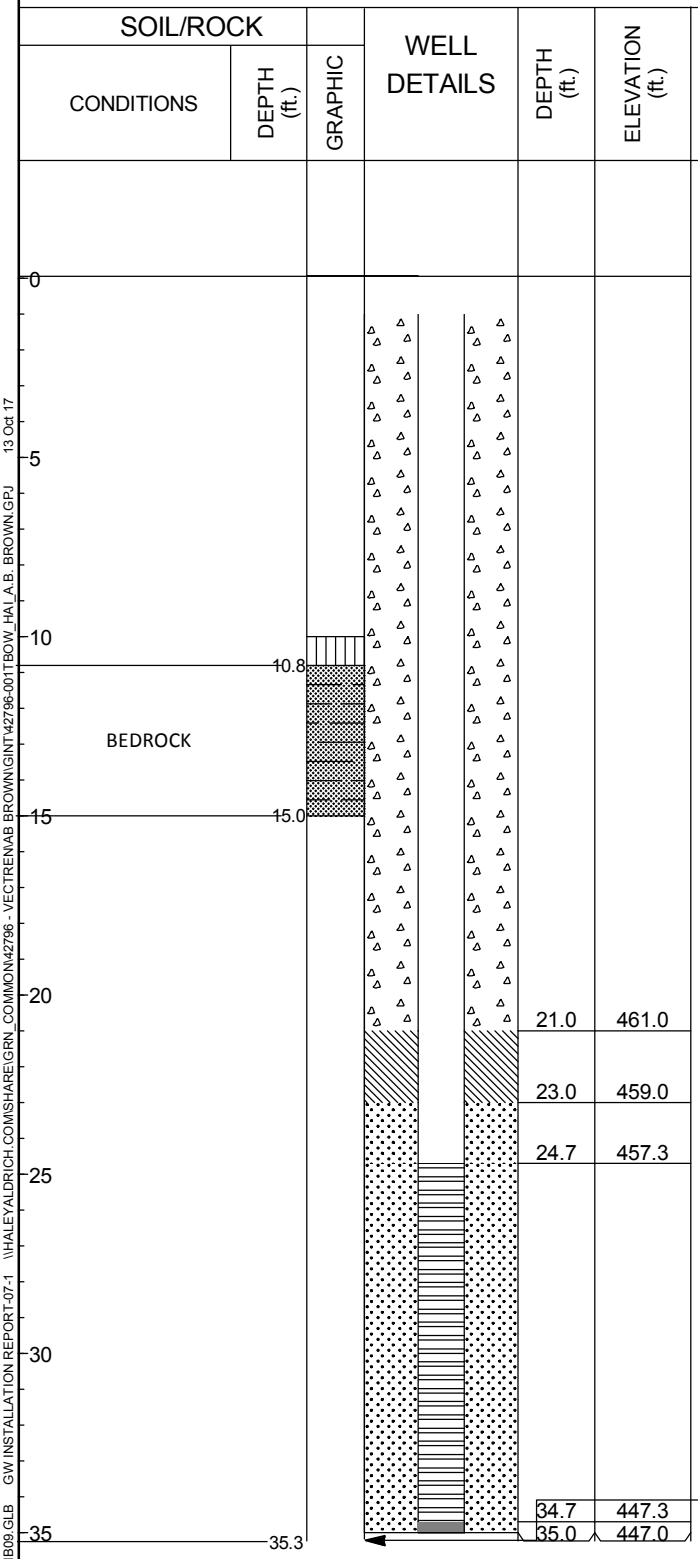
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 14 Mar 2016
H&A Rep. J. Yonts
Location N 970949.7
E 2773138.97

Ground El. 482.0 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.2 ft
Height of top of riser above ground surface	2.8 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	2.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	24.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	20.0
Bentonite	21.0	2.0
Sand	23.0	12.0
	-	-

Diameter of borehole	8.0 in.
Depth to top of well screen	24.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	34.7 ft
Bottom of silt trap	35.0 ft
Depth of bottom of borehole	35.3 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-LF-4

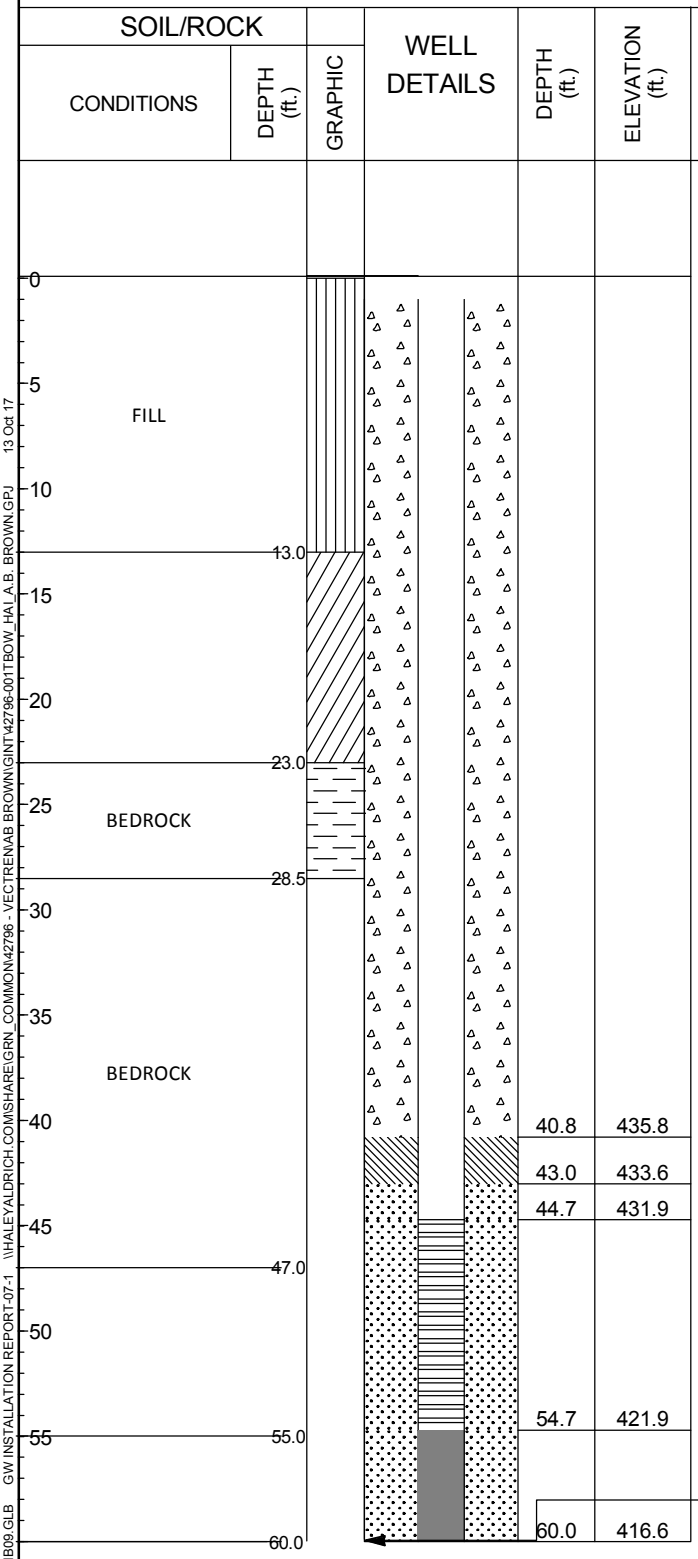
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 11 Mar 2016
H&A Rep. J. Yonts
Location N 972312.24
E 2772876.83

Ground El. 476.6 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	2.7 ft
Height of top of riser above ground surface	2.4 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.3 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	44.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	1.0	39.8
Bentonite	40.8	2.2
Sand	43.0	12.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	44.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	54.7 ft
Bottom of silt trap	55.0 ft
Depth of bottom of borehole	60.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-LF-5

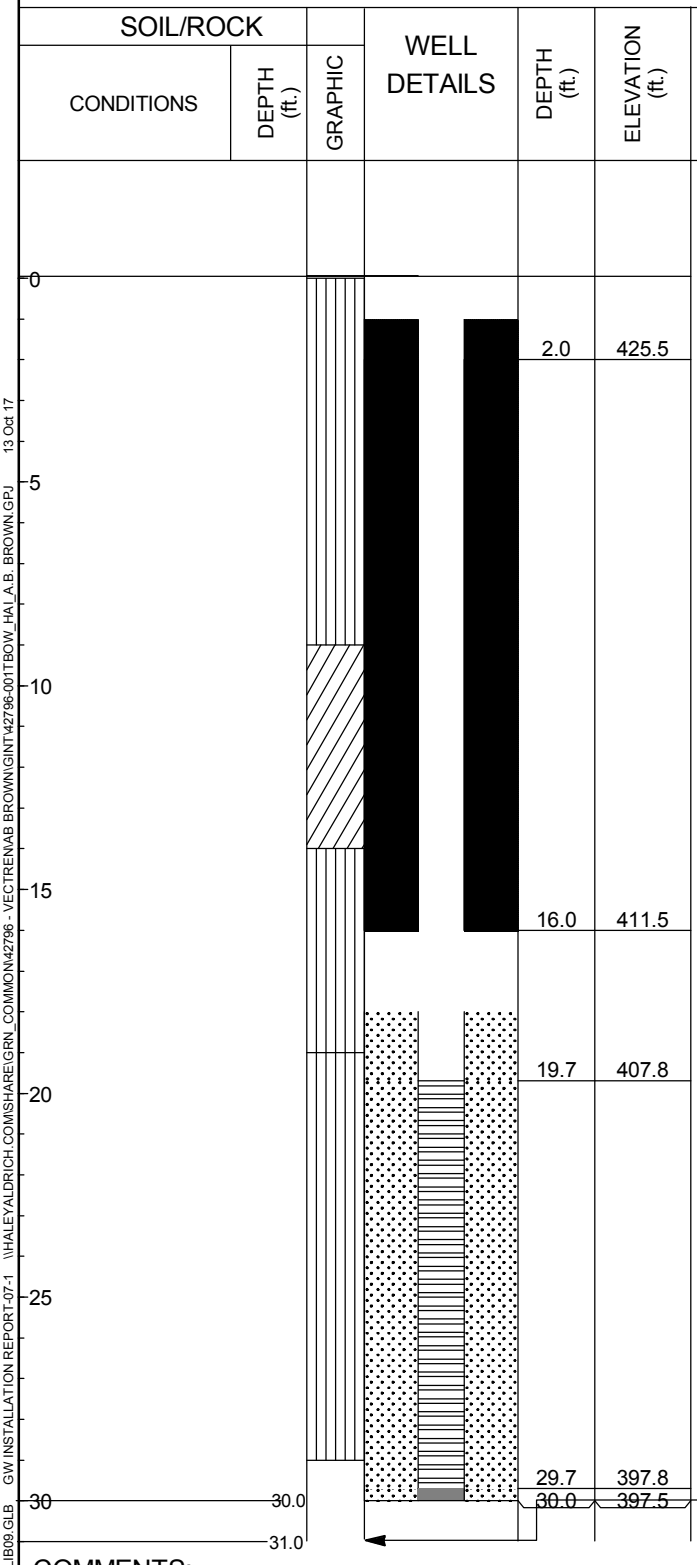
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

File No. 42796-001
Date Installed 12 Mar 2016
H&A Rep. S. Lewis
Location N 972228.16
E 2772003.91

Ground El. 427.5 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.1 ft
Height of top of riser above ground surface	2.8 ft
Type of protective casing	Steel
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	1.9 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	19.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	1.0	15.0
Bentonite	16.0	2.0
Sand	18.0	12.0
	-	-

Diameter of borehole	8.0 in.
Depth to top of well screen	19.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	30.0 ft
Bottom of silt trap	29.7 ft
Depth of bottom of borehole	31.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

HALEY ALDRICH

Well No.
Boring No. CCR-LF-6

Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 12 Mar 2016
H&A Rep. S. Lewis
Location N 972269.53, E 2771046.15
Ground El. 409.2 (est.)
Datum

SOIL/ROCK CONDITIONS	DEPTH (ft.)	GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)
	0				
				2.7	406.5
				4.4	404.8
	5.0				
	8.5				
				9.4	399.8
				9.7	399.5
	10.0				

WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	3.3 ft
Height of top of riser above ground surface	2.8 ft
Type of protective casing	Steel
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	1.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	4.4 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Bentonite	1.0	1.7
Sand	2.7	7.0
	-	-
	-	-

Diameter of borehole	8.0 in.
Depth to top of well screen	4.4 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	9.66 ft
Bottom of silt trap	9.7 ft
Depth of bottom of borehole	10.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-PZ-5

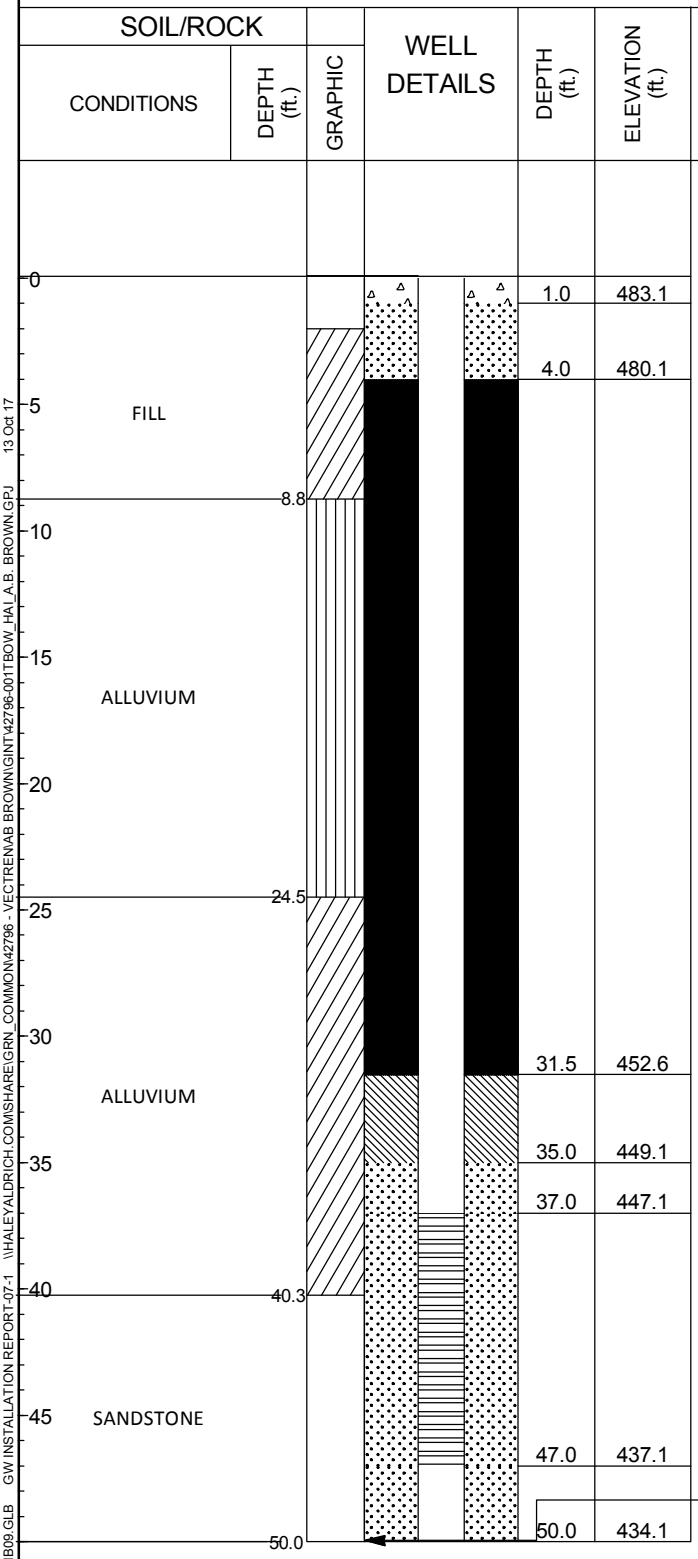
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	B. Marshall
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 18 Dec 2015
H&A Rep. T. Vanage
Location N 965928.39
E 2772500.01

Ground El. 484.1 (est.)
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Stickup Guard Box
Height of Steel above ground surface	2.8 ft
Height of top of riser above ground surface	2.7 ft
Type of protective casing	Steel
Length	6.0 ft
Inside diameter	4.0 in.
Depth of bottom of Steel	3.2 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	37.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	4.0	27.5
Bentonite	31.5	3.5
Sand	35.0	15.0
	-	-

Diameter of borehole	6.0 in.
Depth to top of well screen	37.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	47.0 ft
Bottom of silt trap	47.2 ft
Depth of bottom of borehole	50.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-SP-1

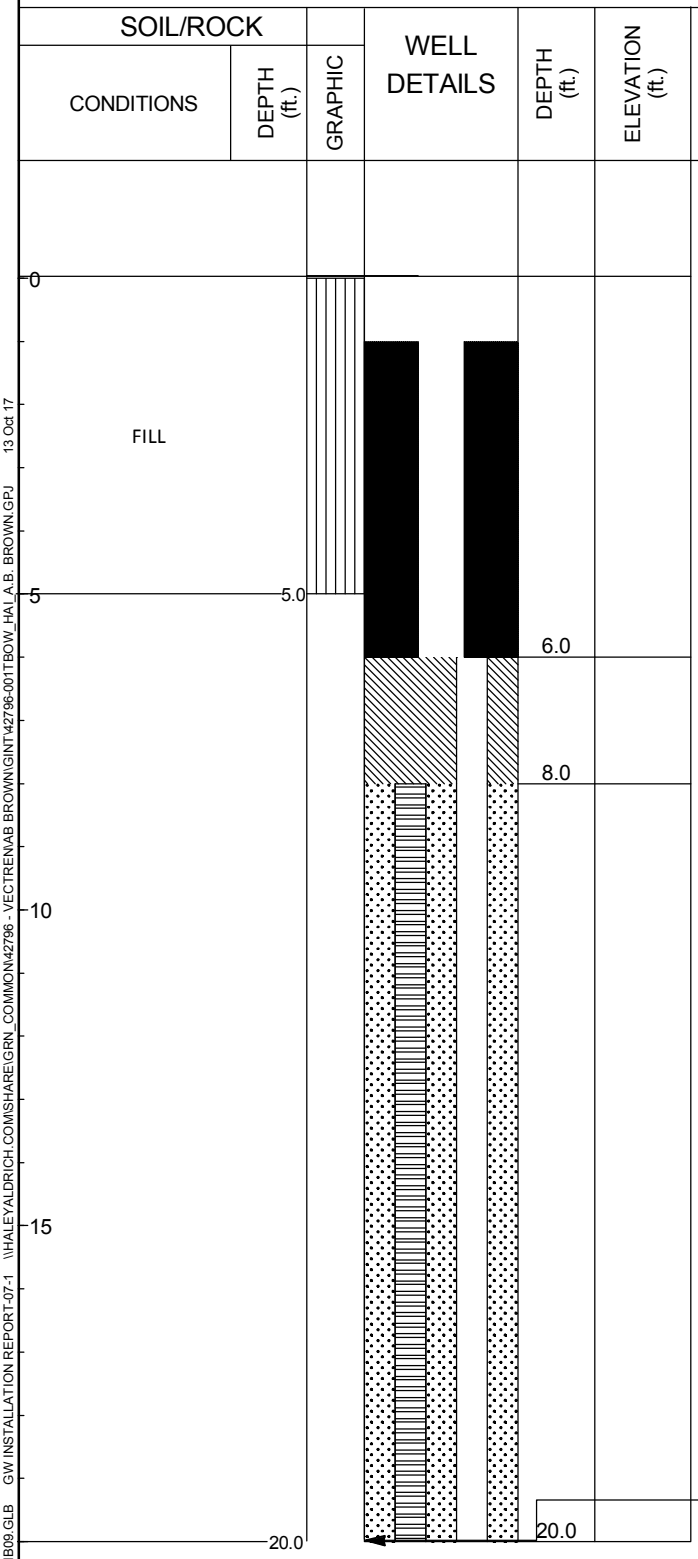
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 13 Mar 2016
H&A Rep. S. Lewis
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover: Flush Mount

Depth of Morrison Flush Mount below ground surface: 0.0 ft

Height of top of riser above ground surface: 0.5 ft

Type of protective casing: Morrison Flush Mount

Length: 0.8 ft

Inside diameter: 9.0 in.

Depth of bottom of Morrison Flush Mount: 0.8 ft

Type of riser pipe: Schedule 40 PVC

Inside diameter of riser pipe: 2.0 in.

Depth of bottom of riser pipe: 9.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	1.0	5.0
Bentonite	6.0	2.0
Sand	8.0	12.0
	-	-

Diameter of borehole: 8.0 in.

Depth to top of well screen: 9.7 ft

Type of screen: Machine slotted Sch 40 PVC

Screen gauge or size of openings: 0.010 in.

Diameter of screen: 2.0 in.

Type of Backfill around Screen: Quartz Sand

Depth to bottom of well screen:

Bottom of silt trap: 20.0 ft

Depth of bottom of borehole: 20.0 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-SP-2

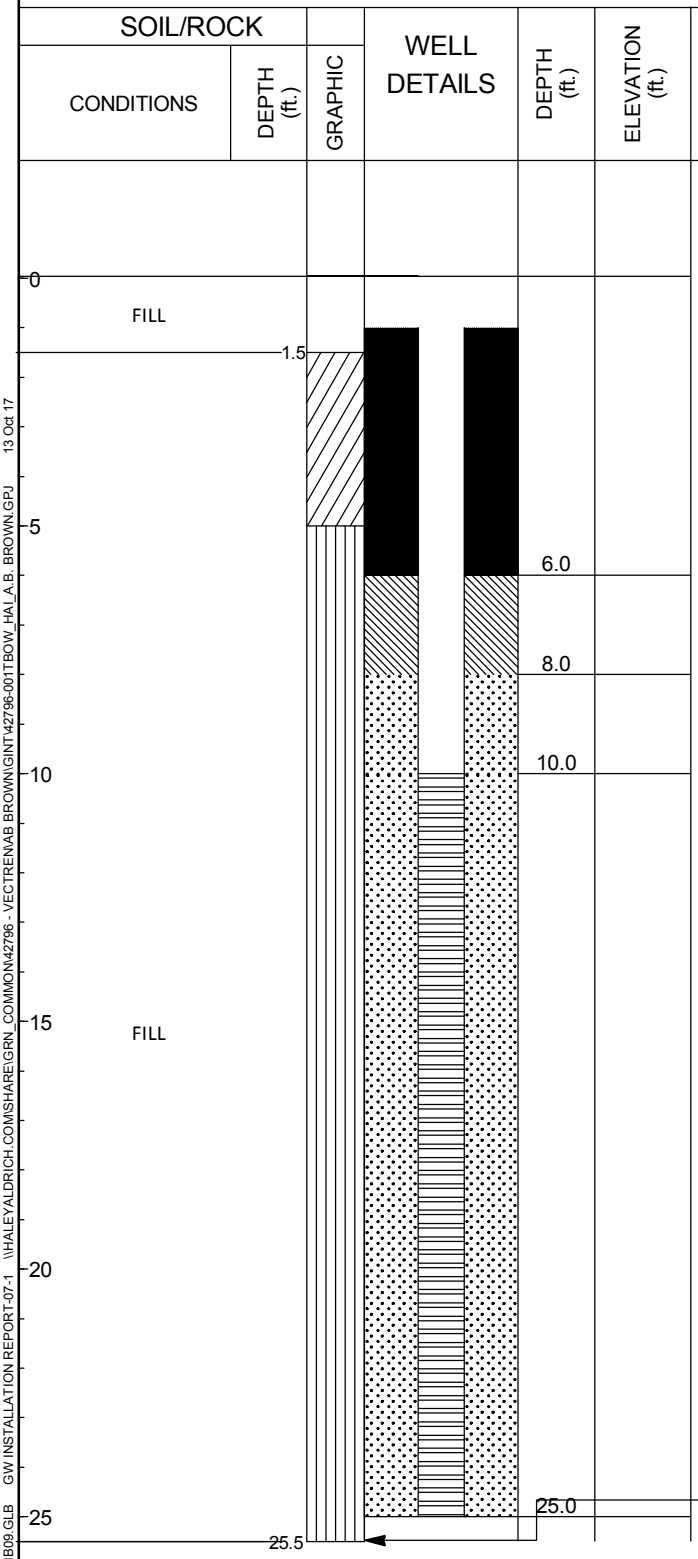
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 13 Mar 2016
H&A Rep. S. Lewis
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover: Flush Mount

Depth of Morrison Flush Mount below ground surface: 0.0 ft

Height of top of riser above ground surface: 0.4 ft

Type of protective casing: Morrison Flush Mount

Length: 0.8 ft

Inside diameter: 9.0 in.

Depth of bottom of Morrison Flush Mount: 0.8 ft

Type of riser pipe: Schedule 40 PVC

Inside diameter of riser pipe: 2.0 in.

Depth of bottom of riser pipe: 9.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	1.0	5.0
Bentonite	6.0	2.0
Sand	8.0	12.0
	-	-

Diameter of borehole: 8.0 in.

Depth to top of well screen: 9.7 ft

Type of screen: Machine slotted Sch 40 PVC

Screen gauge or size of openings: 0.010 in.

Diameter of screen: 2.0 in.

Type of Backfill around Screen: Quartz Sand

Depth to bottom of well screen: 20.0 ft

Bottom of silt trap: 19.7 ft

Depth of bottom of borehole: 25.5 ft

COMMENTS:

GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Well No.
Boring No. CCR-SP-3

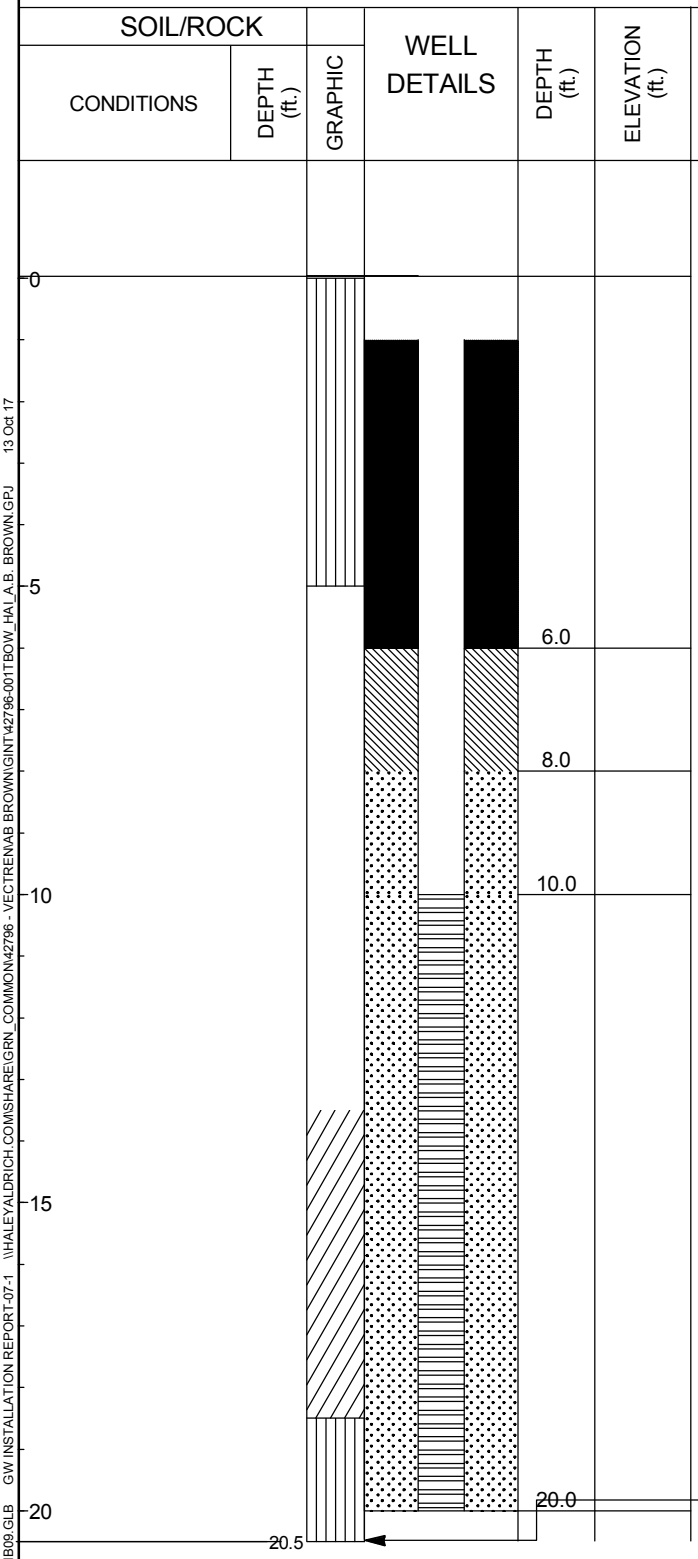
Project	Vectren
Location	A. B. Brown Generating Station
Client	Southern Indiana Gas & Electric Company
Contractor	Stearns Drilling
Driller	J. Gryska
Initial Water Level (depth bgs)	ft

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 42796-001
Date Installed 13 Mar 2016
H&A Rep. S. Lewis
Location See Plan

Ground El.
Datum



WELL CONSTRUCTION DETAILS

Type of protective cover	Flush Mount
Depth of Morrison Flush Mount below ground surface	0.0 ft
Height of top of riser above ground surface	0.4 ft
Type of protective casing	Morrison Flush Mount
Length	0.8 ft
Inside diameter	9.0 in.
Depth of bottom of Morrison Flush Mount	0.8 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	9.7 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	1.0	5.0
Bentonite	6.0	2.0
Sand	8.0	12.0
	-	-

Diameter of borehole	8.0 in.
Depth to top of well screen	9.7 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	Quartz Sand
Depth to bottom of well screen	20.0 ft
Bottom of silt trap	19.7 ft
Depth of bottom of borehole	20.5 ft

COMMENTS: