REPORT ON
2017 ANNUAL GROUNDWATER MONITORING AND
CORRECTIVE ACTION REPORT
F.B. CULLEY GENERATING STATION
WARRICK COUNTY, INDIANA

by Haley & Aldrich, Inc.
Greenville, South Carolina

for Southern Indiana Gas and Electric Company (SIGECO)
Evansville, Indiana

File No. 129420-003
January 2018
Annual Groundwater Monitoring Report Summary

Haley & Aldrich, Inc. (Haley & Aldrich) has prepared this 2017 Annual Groundwater Monitoring Corrective Action Report for the F.B. Culley Generating Station (FBC). This 2017 Annual Report was developed to comply with the United States Environmental Protection Agency (USEPA) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities, 40 CFR Part 257, Subpart D dated 17 April 2015 (Rule), specifically subsection §257.90(e)(1) through (5). Southern Indiana Gas and Electric Company operates the existing coal combustion residuals (CCR) management unit referred to as the East Ash pond at FBC located in Warrick County, Indiana. This CCR unit is subject to the CCR Rule since it was active as of the effective date of the CCR Rule.

This annual report addresses the single CCR management unit at FBC, as described in the Groundwater Monitoring Program report, which was certified and placed in the facility’s operating record on October 17, 2017 as required by §257.105(h)(2) and posted on the facility’s website on November 16, 2017 as required by §257.107(h)(2).

To report on the activities conducted during the prior calendar year and document compliance with the Rule, the specific requirements listed in §257.90(e)(1) through (5) are provided below in bold/italic type followed by a short narrative addressing how that specific requirement was met.

§257.90 APPLICABILITY

§257.90(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).

As required, this annual report documents the status of the groundwater monitoring program for the CCR management unit at FBC and summarizes key actions completed during the prior calendar year.

At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:
§257.90(e)(1) AERIAL IMAGE OF GROUNDWATER MONITORING PROGRAM

§257.90(e)(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;

As required by §257.90(e)(1), maps showing the location of the East Ash pond and associated upgradient and downgradient monitoring wells are included in this report as Figure 1. In addition, this information is presented in the Groundwater Monitoring Program report prepared for FBC, which was placed in the facility’s operating record on October 17, 2017 as required by §257.105(h)(2).

§257.90(e)(2) ADJUSTMENTS TO GROUNDWATER MONITORING PROGRAM

§257.90(e)(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;

To comply with the requirements of §257.91, a groundwater monitoring network of 9 wells was installed for the East Ash pond at FBC. Details of the design, and construction of the monitoring wells are summarized in Table 1. Construction of the groundwater monitoring network was accomplished in three phases. The first phase of drilling, which included CCR-AP-1 through CCR-AP-5, was completed in December 2015. This initial round of well installation was conducted to evaluate the hydrostratigraphy and groundwater flow characteristics downgradient and upgradient of the East Ash pond. To supplement the groundwater monitoring array, two additional rounds of drilling and well installation were completed in March 2016 and February 2017. In March 2016 CCR-AP-1 was deepened and replaced with CCR-AP-1R to provide a sufficient amount of groundwater for sampling. Also in March 2016, monitoring well CCR-AP-6 was installed to supplement the monitoring array downgradient and CCR-AP-7 was installed to provide an additional upgradient monitoring point. In February 2017, CCR-AP-8 was installed downgradient of the East Ash pond to establish a network of six downgradient wells and CCR-AP-9 was installed upgradient of the East Ash pond resulting in network of three upgradient wells. Additional description of the monitoring network is presented in the Groundwater Monitoring Program report which was placed in the facility’s operating record on October 17, 2017, as required by §257.105(h)(2). None of the wells installed to monitor groundwater quality upgradient and downgradient of the East Ash pond were decommissioned in 2017.

§257.90(e)(3) SUMMARY OF GROUNDWATER ANALYSIS

§257.90(e)(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 [upgradient] and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

In accordance with §257.94(b), a minimum of eight independent samples from each upgradient and downgradient monitoring well were collected prior to October 17, 2017. A summary of the
groundwater monitoring program for the East Ash pond, including the analytical results for the Appendix III and Appendix IV list of constituents, is presented in Table 2 of this report. All the samples obtained were required by the detection monitoring program.

§257.90(e)(4) CURRENT GROUNDWATER MONITORING PROGRAM

§257.90(e)(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);

Consistent with §257.90(e), the 2017 annual report documents groundwater related activities conducted during the prior calendar year at the East Ash pond. The statistical analysis of the initial minimum eight rounds of groundwater sampling was completed by January 15, 2018 as required. This statistical analysis relied on the use of tolerance intervals as originally certified on October 17, 2017. The results of this statistical analysis identified statistically significant increases (SSI) of Appendix III constituents in one or more wells monitoring the uppermost aquifer downgradient of the East Ash pond. Consistent with §257.94(e)(2), SIGECO is evaluating options to demonstrate that a source other than the CCR unit caused the SSI and will provide 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), as appropriate, in subsequent annual reports.

§257.90(e)(5) OTHER REQUIRED INFORMATION

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

This initial Annual Report documents activities conducted to comply with Sections §257.90 through §257.94 of the Rule. There are no applicable requirements from Sections §257.95 through §257.98.

Attachments
Table 1. Groundwater Monitoring Well Location and Construction Details
Table 2. Summary of Analytical Results
Figure 1. Monitoring Well Network

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# Table 1

**Groundwater Monitoring Well Location and Construction Details**

**F.B. Culley Generating Station - East Ash Pond**

**Newburgh, Indiana**

<table>
<thead>
<tr>
<th>Well</th>
<th>CCR Unit</th>
<th>Date Installed</th>
<th>Easting</th>
<th>Northing</th>
<th>Top of Pad Elevation (ft msl)</th>
<th>Top of Riser Elevation (ft msl)</th>
<th>Surface Grout (ft bgs)</th>
<th>Bentonite (ft bgs)</th>
<th>Sand Pack (ft bgs)</th>
<th>Screen Zone (ft bgs)</th>
<th>Screen Length (ft)</th>
<th>Well Radius (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCR-AP-1R</td>
<td>East Ash Pond</td>
<td>March 2016</td>
<td>2883429.69</td>
<td>969939.69</td>
<td>438.50</td>
<td>441.64</td>
<td>1.0-51.0</td>
<td>51.0-53.0</td>
<td>53.0-65.0</td>
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<td>10</td>
<td>2</td>
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<tr>
<td>CCR-AP-2</td>
<td>East Ash Pond</td>
<td>December 2015</td>
<td>2884168.67</td>
<td>969117.52</td>
<td>394.40</td>
<td>393.97</td>
<td>1.0-30.5</td>
<td>30.5-32.5</td>
<td>32.5-45.0</td>
<td>36.0-46.0</td>
<td>10</td>
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<td>CCR-AP-3</td>
<td>East Ash Pond</td>
<td>December 2015</td>
<td>2883542.09</td>
<td>969007.98</td>
<td>395.10</td>
<td>394.54</td>
<td>1.0-31.0</td>
<td>31.0-32.8</td>
<td>32.8-45.0</td>
<td>35.0-45.0</td>
<td>10</td>
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<tr>
<td>CCR-AP-4</td>
<td>East Ash Pond</td>
<td>December 2015</td>
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<td>969641.70</td>
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<td>394.91</td>
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<td>19.7-22.5</td>
<td>23.0-35.5</td>
<td>25.5-35.5</td>
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<tr>
<td>CCR-AP-5</td>
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<td>394.32</td>
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<td>28.6-30.6</td>
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<td>CCR-AP-6</td>
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<td>396.71</td>
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<td>CCR-AP-8</td>
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<td>CCR-AP-9</td>
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**Notes:**

bgs = below ground surface  
ft = feet  
in = inches  
msl = mean sea level  
Datum of Elevations in NAVD 88
## TABLE II
### SUMMARY OF ANALYTICAL RESULTS
F.B. CULLEY GENERATING STATION
NEWBURGH, INDIANA

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<thead>
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<th>Location Group</th>
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### Field Parameters

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<tr>
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<td>ORP (mV)</td>
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### Monitoring Program

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<td></td>
<td>Conductivity (μS/cm)</td>
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<tr>
<td></td>
<td>Turbidity (mFNU)</td>
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<td>Dissolved Oxygen (mg/L)</td>
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<td>Fluoride (mg/L)</td>
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<td>Detection Limits</td>
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### Detection Monitoring - EPA Appendix III Constituents (mg/L)

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<tr>
<td>Beryllium</td>
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<td>Cadmium</td>
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<td>Chromium</td>
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<tr>
<td>Cobalt</td>
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<tr>
<td>Lead</td>
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<tr>
<td>Lithium</td>
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<td>Molybdenum</td>
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<td>Selenium</td>
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<td>Thallium</td>
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<td>Mercury</td>
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### Assesment Monitoring - EPA Appendix IV Constituents (mg/L)

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<th>Location</th>
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</thead>
<tbody>
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<td>Arsenic</td>
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</tr>
<tr>
<td>Barium</td>
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<tr>
<td>Beryllium</td>
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<tr>
<td>Cadmium</td>
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<tr>
<td>Chromium</td>
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<tr>
<td>Cobalt</td>
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<tr>
<td>Lead</td>
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<td>Lithium</td>
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<td>Molybdenum</td>
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<td>Selenium</td>
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<tr>
<td>Thallium</td>
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<tr>
<td>Mercury</td>
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### Radiological (Bq/L)

<table>
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<th>Element</th>
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<td>Radon-222</td>
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<tr>
<td>Radon-226 &amp; 228</td>
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### Abbreviations and Notes

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CCR</td>
<td>Coal Combustion Residues</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>Rf</td>
<td>Reference Dose</td>
</tr>
<tr>
<td>MCL</td>
<td>Maximum Contaminant Level</td>
</tr>
<tr>
<td>mg/L</td>
<td>milligrams per liter</td>
</tr>
<tr>
<td>mS/cm</td>
<td>millivolt per centimeter</td>
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<tr>
<td>mg/L</td>
<td>milligrams per liter</td>
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<tr>
<td>NTU</td>
<td>Neopleroetric Turbidity Units</td>
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<tr>
<td>pCi/L</td>
<td>picocurie per liter</td>
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<td>NA</td>
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<td>Method Detection</td>
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<td>UsEPA</td>
<td>United States Environmental Protection Agency</td>
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**Qualifiers:**

- J+: value is estimated
- J: value is estimated with a potentially high bias
- J: value is estimated with a potentially low bias
- U: Not detected value is the laboratory reporting limit

Haley & Aldrich, Inc.
\haleyaldrich.com\share\grn_common\129420 Vectren\FB Culley\East Ash Pond\Annual Report\Tables\2018-0112_HAI FB Culley GW Table-F.xlsx

January 2018
<table>
<thead>
<tr>
<th>Location Group</th>
<th>Location Name</th>
<th>Downgradient</th>
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**Field Parameters**

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<thead>
<tr>
<th>Temperature (Deg C)</th>
<th>Turbidity, Field (FNU)</th>
<th>Dissolved Oxygen, Field (mg/L)</th>
<th>Conductivity, Field (mS/cm)</th>
<th>ORP, Field (mv)</th>
<th>Turbidity, Field (NTU)</th>
<th>pH, Field (su)</th>
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**Detection Monitoring - EPA Appendix III Constituents (mg/L)**

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<th>Beron, Total</th>
<th>Calcium, Total</th>
<th>Chloride (mg/L)</th>
<th>Sulfate (mg/L)</th>
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<tr>
<td>0.18</td>
<td>160</td>
<td>26</td>
<td>0.7</td>
</tr>
<tr>
<td>0.15 ± 0.01</td>
<td>170</td>
<td>26 ± 1.5</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>0.16 ± 0.01</td>
<td>190 ± 2.5</td>
<td>32 ± 2.8</td>
<td>0.9 ± 0.1</td>
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<tr>
<td>0.17 ± 0.01</td>
<td>190 ± 2.5</td>
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<td>190 ± 2.5</td>
<td>25 ± 2.8</td>
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<td>0.18 ± 0.01</td>
<td>200 ± 2.5</td>
<td>25 ± 2.8</td>
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**Assessment Monitoring - EPA Appendix IV Constituents (mg/L)**

<table>
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<tr>
<th>Antimony, Total</th>
<th>Arsenic, Total</th>
<th>Barium, Total</th>
<th>Beryllium, Total</th>
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<tbody>
<tr>
<td>0.0002 ± 0.0001</td>
<td>0.005 ± 0.0002</td>
<td>0.41 ± 0.01</td>
<td>0.001 ± 0.005</td>
</tr>
<tr>
<td>0.0001 ± 0.0001</td>
<td>0.001 ± 0.001</td>
<td>0.4 ± 0.01</td>
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<td>0.01 ± 0.01</td>
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<td>0.02 ± 0.01</td>
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**Radiological (pCi/L)**

<table>
<thead>
<tr>
<th>Radon-222</th>
<th>Radon-222 &amp; 228</th>
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<tbody>
<tr>
<td>0.657 ± 0.201</td>
<td>1.75 ± 0.615</td>
<td>1.10 ± 0.581</td>
</tr>
<tr>
<td>0.865 ± 0.232</td>
<td>1.65 ± 0.627</td>
<td>0.784 ± 0.347</td>
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<tr>
<td>1.15 ± 0.477</td>
<td>1.97 ± 0.569</td>
<td>0.784 ± 0.480</td>
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<tr>
<td>0.789 ± 0.398</td>
<td>1.72 ± 0.623</td>
<td>0.489 ± 0.164</td>
</tr>
<tr>
<td>0.373 ± 0.293</td>
<td>0.862 ± 0.680</td>
<td>0.644 ± 0.344</td>
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<tr>
<td>0.450 ± 0.144</td>
<td>1.09 ± 0.573</td>
<td>2.25 ± 0.427</td>
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<tr>
<td>0.582 ± 0.158</td>
<td>1.83 ± 0.456</td>
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<tr>
<td>0.41 ± 0.136</td>
<td>R</td>
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**ABBREVIATIONS AND NOTES:**

- CFR: Code of Federal Regulations
- ppm: parts per million
- mg/L: milligrams per liter
- µCi/L: microcuries per liter
- NTU: Nephelometric Turbidity Units
- pCi/L: picocuries per liter
- µCi: microminiere per centimeter
- mv: milk
- na: non-applicable

**QUALIFIERS:**

- J: value is estimated
- J*: value is estimated with a potentially high bias
- J**: value is estimated with a potentially low bias
- R: value is rejected
- U: Not detected value in the laboratory reporting limit

- USEPA: United States Environmental Protection Agency
- QCP: Quality Control Program
- H: high
- L: low
- ±: plus or minus
- CF: Combustion Fluid
- R: Radium
- 40: 40 CFR Part 246
- 129: 40 CFR Part 129
- Nephelometric Turbidity Units
- 0.0001: picocurie per liter
- 0.0001: picocurie per liter

**Notes:**

- Haley & Aldrich, Inc.

January 2018
<table>
<thead>
<tr>
<th>Field Parameters</th>
<th>Temperature (°C)</th>
<th>Turbidity, Field (NTU)</th>
<th>Conductivity, Field (mS/cm)</th>
<th>ORP, Field (mV)</th>
<th>Turbidity, Field (NTU)</th>
<th>pH, Field (su)</th>
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<th>Units</th>
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<tr>
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<td>24.12</td>
<td>15.92</td>
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<td>13.92</td>
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<td>Sample Date</td>
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<thead>
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<th>Field</th>
<th>Baseline</th>
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<tbody>
<tr>
<td>Turbidity</td>
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<td>0.16+</td>
<td>0.18</td>
<td>0.16+</td>
<td>0.14</td>
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<td>0.18</td>
<td>0.085</td>
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<tr>
<td>Calcium</td>
<td>160</td>
<td>190</td>
<td>170</td>
<td>160</td>
<td>180</td>
<td>180+</td>
<td>190</td>
<td>170</td>
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<td>Chloride</td>
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<td>24</td>
<td>85+</td>
<td>70</td>
<td>49</td>
<td>48</td>
<td>41</td>
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<tr>
<td>Fluoride</td>
<td>0.29+</td>
<td>0.43</td>
<td>0.3</td>
<td>0.49</td>
<td>0.32+</td>
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<tr>
<td>Sulfate</td>
<td>20+</td>
<td>R</td>
<td>15+</td>
<td>3.9+</td>
<td>1</td>
<td>U</td>
<td>1</td>
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<tr>
<td>pH (lab)</td>
<td>6.95</td>
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<td>7</td>
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<td>Total Dissolved Solids (TDS) (mg/L)</td>
<td>1000</td>
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<td>880</td>
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### Assessment Monitoring - EPA Appendix IV Constituents (mg/L)

<table>
<thead>
<tr>
<th>Parameter</th>
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<tbody>
<tr>
<td>Antimony</td>
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<td>Arsenic</td>
<td>0.036</td>
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<tr>
<td>Barium</td>
<td>0.12</td>
</tr>
<tr>
<td>Beryllium</td>
<td>0.00049</td>
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<tr>
<td>Cadmium</td>
<td>0.0018</td>
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<tr>
<td>Chromium</td>
<td>0.012</td>
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<tr>
<td>Cobalt</td>
<td>0.0078</td>
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<tr>
<td>Lead</td>
<td>0.0099</td>
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<tr>
<td>Lithium</td>
<td>0.01</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>0.00222</td>
</tr>
<tr>
<td>Selenium</td>
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<tr>
<td>Thallium</td>
<td>0.000084</td>
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<tr>
<td>Mercury</td>
<td>0.0002</td>
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### Radiological (pCi/L)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Concentration (pCi/L)</th>
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<tbody>
<tr>
<td>Radon-222</td>
<td>1.07 ± 0.261</td>
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<tr>
<td>Radon-220</td>
<td>1.49 ± 0.769</td>
</tr>
<tr>
<td>Radon-222</td>
<td>0.417 ± 0.723</td>
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### Abbreviations and Notes:

- **CCR**: Coal Combustion Residuals
- **EPA**: Environmental Protection Agency
- **NTU**: nephelometric turbidity unit
- **pCi/L**: picocuries per liter
- **mg/L**: milligrams per liter
- **U**: Not detected value in the laboratory reporting limit
- **J**: value is rejected
- **J+**: value is estimated with a potentially low bias
- **J**: value is estimated with a high bias
- **R**: value is rejected
- **U**: Not detected value in the laboratory reporting limit
- **ppb**: parts per billion
- **API**: American Petroleum Institute
- **US EPA**: United States Environmental Protection Agency
<table>
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<tr>
<th>Location Group</th>
<th>Location Name</th>
<th>Downgradient</th>
</tr>
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<tbody>
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<td>CCR-AP-S-20161028</td>
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<td>180-72646-5</td>
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**Field Parameters**

- **Temperature (°C)**: 19.48
- **Turbidity, Field (NTU)**: 0.04
- **Dissolved Oxygen, Field (mg/L)**: 8.21
- **Conductivity, Field (μS/cm)**: 1.79
- **pH Field (su)**: 7

**Detection Monitoring - EPA Appendix III Constituents (mg/L)**

- **Boron, Total**: 53
- **Calcium, Total**: 520
- **Chloride (mg/L)**: 880
- **Fluoride (mg/L)**: 0.58
- **Sulfate (mg/L)**: 2.5

**Assessment Monitoring - EPA Appendix IV Constituents (mg/L)**

- **Antimony, Total**: 0.02
- **Arsenic, Total**: 0.01
- **Barium, Total**: 0.032
- **Beryllium, Total**: 0.01
- **Cadmium, Total**: 0.01
- **Chromium, Total**: 0.02
- **Cobalt, Total**: 0.006
- **Lead, Total**: 0.01
- **Lithium, Total**: 0.14
- **Molybdenum, Total**: 0.38
- **Selenium, Total**: 0.05
- **Thallium, Total**: 0.01
- **Mercury, Total**: 0.0002

**Radiological (pCi/L)**

- **Radon-222**: 0.224 ± 0.0858
- **Radon-222 & 228**: 0.174 ± 0.0113
- **Radium-226**: 0.350 ± 0.300

**ABBRVIATIONS AND NOTES**

- **CCR**: Coal Combustion Residuals
- **CFR**: Code of Federal Regulations
- **ft amsl**: feet above mean sea level
- **MCL**: Maximum Contaminant Level
- **mg/L**: milligrams per liter
- **μS/cm**: milliSiemen per centimeter
- **NTU**: Nephelometric Turbidity Units
- **pCi/L**: picocuries per liter

**QUALIFIERS**

- **J**: value is estimated
- **M**: value is estimated with a potentially high bias
- **N**: value is estimated with a potentially low bias
- **R**: value is rejected
- **T**: value is rejected


https://www.epa.gov/leaders/coal-ash-rule

**USFDA**: United States Environmental Protection Agency
## SUMMARY OF ANALYTICAL RESULTS

**F.B. CULLEY GENERATING STATION**  
**NEWBURGH, INDIANA**

### Table II

<table>
<thead>
<tr>
<th>Location Group</th>
<th>Location Name</th>
<th>Downgradient</th>
<th>Sample Name</th>
<th>Sample Date</th>
<th>Lab Sample ID</th>
<th>Water Level (ft amsl)</th>
<th>Monitoring Program</th>
<th>Field Parameters</th>
<th>Detection Monitoring - EPA Appendix III Constituents (mg/L)</th>
<th>Assesment Monitoring - EPA Appendix IV Constituents (mg/L)</th>
<th>Radiological (pCi/L)</th>
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<td>06/10/2016</td>
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**ABBRIVIATIONS AND NOTES:**

- CFR: Code of Federal Regulations
- AP: Annealed Potable
- 6 CCR: 6-Cell Combustion Residuals
- 20160812 CCR: 2016-08-12
- 20161207 CCR: 2016-12-07
- 20170208 CCR: 2017-02-08
- 20170406 CCR: 2017-04-06
- 20170607 CCR: 2017-06-07
- 20170929 CCR: 2017-09-29
- 20171117 CCR: 2017-11-17

**VALUES:**

- **J+** value is rejected
- **J** value is estimated with a potentially high bias
- **J** value is estimated with a potentially low bias
- **U** value is the reporting limit
- **U** Not detected value in the laboratory reporting limit

**ABBREVIATIONS:**

- Coal Combustion Residuals
- Milligrams per liter
- MilliSiemens per centimeter
- mg/L
- NA: Not Applicable
- NTU: Nephelometric Turbidity Units
- pCi/L: picoCurie per liter
- Seasonal
- USEPA: United States Environmental Protection Agency

**Qualifiers:**

- Detection Monitoring - EPA Appendix III Constituents (mg/L)
- Antimony, Total
- Arsenic, Total
- Barium, Total
- Beryllium, Total
- Cadmium, Total
- Chromium, Total
- Cobalt, Total
- Lead, Total
- Lithium, Total
- Molybdenum, Total
- Selenium, Total
- Thallium, Total
- Mercury, Total

**Radiological (pCi/L):**

- Radon-222
- Radon-222 & 228
- Radon-228

January 2018
<table>
<thead>
<tr>
<th>Location Group</th>
<th>Downgradient</th>
</tr>
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<tbody>
<tr>
<td>Sample Name</td>
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<tr>
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<td>362.695</td>
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### Field Parameters

- **Temperature (Deg C):**
- **Turbidity, Field (NTU):**
- **Dissolved Oxygen, Field (mg/L):**
- **Dissolved Solids (TDS):**
- **pH, Field (su):**
- **Conductivity, Field (mS/cm):**
- **ORP, Field (J):**
- **Chloride, mg/L:**
- **Fluoride, mg/L:**
- **Calcium, Total:** 300
- **Manganese, Total:** 0.014

### Lab Monitoring - EPA Appendix III Constituents (mg/L)

#### Qualifiers:
- **J:** value is estimated
- **R:** value is rejected
- **U:** Not detected value in the laboratory reporting unit

#### Abbreviations and Notes:
- **CCR:** Coal Combustion Residuals
- **RI:** Code of Federal Regulations
- **Haml:** feet above mean sea level
- **MCL:** Maximum Contaminant Level
- **mg/L:** milligram per liter
- **mS/cm:** milliSiemen per centimeter
- **NTU:** Nephelometric Turbidity Units
- **pCi/L:** picoCurie per liter
- **MCRL:** MCL Compliance Reporting Limit
- **USEPA:** United States Environmental Protection Agency

### Summary of Analytical Results

- **Date:** 03/09/2017
- **Sample:** CCR-AP-201707025
- **Water Level:** 362.235 ft amsl
- **Monitored Constituents:**
  - **Conductivity:** 2.39775 mg/L
  - **Dissolved Oxygen:** 2.09409 mg/L
  - **pH:** 6.14

### Quality Assurance/Quality Control (QA/QC)

- **Detection Monitoring - EPA Appendix III Constituents (mg/L):**
- **Assessment Monitoring - EPA Appendix IV Constituents (mg/L):**
### TABLE II
#### SUMMARY OF ANALYTICAL RESULTS
**F.B. CULLEY GENERATING STATION**  
**NEWBURGH, INDIANA**

<table>
<thead>
<tr>
<th>Location Group</th>
<th>Location Name</th>
<th>Sample Name</th>
<th>Sample Date</th>
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#### Field Parameters
- **Temperature (°C)**
  - 21.31
  - 25.58
  - 20.76
  - 8.43
  - 10.31
  - 14.42
  - 19.36
  - 18.61
  - 13.03
- **Turbidity, Field (NTU)**
  - 1.28
  - 0.13
  - 0.6
  - 11.68
  - 8.29
  - 5.13
  - 3.2
  - 1.01
  - 5.88
- **Dissolved Oxygen, Field (mg/L)**
  - 1.1255
  - 1.991
  - 1.0647
  - 1.0845
  - 1.1901
  - 1.5651
  - 1.1080
  - 1.20077
  - 1.23155
- **ORP, Field (mv)**
  - -148.68
  - -11.7
  - -171.8
  - -247.3
  - -60.52
  - -15.79
  - 90.06
  - -41.88
  - -14.37

#### Detection Monitoring - EPA Appendix III Constituents (mg/L)
- **Boron, Total**
  - 0.51
  - 0.54
  - 0.65
  - 0.68 J+
  - 0.69 J+
  - 0.62
  - 0.72 J+
  - 0.44
  - 0.82 J+
- **Calcium, Total**
  - 18.0 J
  - 18.0 J
  - 110 J+
  - 130
  - 140
  - 150
  - 150
  - 160
  - 170 J
- **Chloride (mg/L)**
  - 7.741
  - 8.11
  - 7.8 J
  - 7.7 J
  - 7.5 J
  - 7.1 J
  - 7.9 J
  - 7.7 J
  - 7.7 J

#### Total Dissolved Solids (TDS) (mg/L)
- 740
- 760
- 740
- 710
- 750
- 730
- 740
- 770
- 770

#### Assessment Monitoring - EPA Appendix IV Constituents (mg/L)
- **Antimony, Total**
  - 0.002 U
  - 0.002 U
  - 0.002 U
  - 0.00072 J
  - 0.00077 J
  - 0.00055 J
  - 0.0005 J
  - 0.0005 J
  - 0.002 U
- **Arsenic, Total**
  - 0.0045
  - 0.0067
  - 0.0024
  - 0.0036
  - 0.0068
  - 0.012
  - 0.012
  - 0.008
  - 0.0055
- **Barium, Total**
  - 0.077
  - 0.12
  - 0.05
  - 0.001
  - 0.11
  - 0.16
  - 0.11
  - 0.086
  - 0.15
- **Barium, Total**
  - 0.00053 J
  - 0.00074 J
  - 0.00111 J
  - 0.00049 J
  - 0.00058 J
  - 0.0014
  - 0.00073 J
  - 0.00035 J
  - 0.003 J
- **Cadmium, Total**
  - 0.011
  - 0.02
  - 0.0019 J
  - 0.0092
  - 0.012
  - 0.03
  - 0.015
  - 0.01
  - 0.021
- **Chromium, Total**
  - 0.0081
  - 0.003 J
  - 0.0031 J
  - 0.005
  - 0.0083
  - 0.007
  - 0.0088
  - 0.0059
  - 0.013
- **Cobalt, Total**
  - 0.0074
  - 0.013
  - 0.0011 J
  - 0.0057
  - 0.0083
  - 0.02 J+
  - 0.0093
  - 0.0068
  - 0.014
- **Copper, Total**
  - 0.045 J
  - 0.053
  - 0.035 J
  - 0.035 J
  - 0.043 J
  - 0.063
  - 0.049 J
  - 0.036 J
  - 0.059 J
- **Lead, Total**
  - 0.015
  - 0.013
  - 0.006
  - 0.0047 J
  - 0.0073
  - 0.0067
  - 0.0073
  - 0.0008 J
  - 0.0013 J
- **Lithium, Total**
  - 0.00071 J
  - 0.0014 J
  - 0.005 U
  - 0.0005 J
  - 0.0018 J
  - 0.0031 J
  - 0.0073
  - 0.00088 J
  - 0.0014 J
- **Mercury, Total**
  - 0.002 U
  - 0.002 U
  - 0.0002 U
  - 0.0002 U
  - 0.0002 U
  - 0.0002 U
  - 0.0002 U
  - 0.0002 U
  - 0.0002 U
- **Radon-222**
  - 0.607 J ± 0.204
  - 3.13 J ± 0.594
  - 0.533 J ± 0.558
  - 1.75 U ± 1.31
  - 2.99 ± 0.678
  - 2.78 ± 0.580
  - 1.74 ± 0.489
  - 1.94 ± 0.553
  - 3.33 ± 0.689
- **Radon-222 & 228**
  - 0.950 ± 0.690
  - 6.32 ± 1.31
  - 0.862 ± 0.753
  - 2.09 ± 1.18
  - 6.56 ± 1.18
  - 6.73 J ± 1.47
  - 5.00 ± 1.19
  - 6.46 ± 1.53
  - R
- **Radon-228**
  - 0.344 U ± 0.659
  - 3.20 J ± 0.39
  - 0.509 U ± 0.505
  - 0.340 U ± 1.48
  - 3.58 ± 0.962
  - 4.45 ± 1.35
  - 3.25 ± 1.09
  - 4.22 ± 1.43
  - R

### Abbreviations and Notes:
- **CCR**: Coal Combustion Residuals
- **CFR**: Code of Federal Regulations
- **ft amsl**: feet above mean sea level
- **mg/L**: milligram per liter
- **U**: milliSiemen per centimeter
- **mv**: millivolt
- **NTU**: Nephelometric Turbidity Units
- **pCi/L**: picocurie per liter
- **U**: Standard units
- **USEPA**: United States Environmental Protection Agency

### Qualifiers:
- J: Value is estimated
- J+: Value is estimated with a potentially high bias
- J−: Value is estimated with a potentially low bias
- R: Value is rejected
- U: Not detected value is the laboratory reporting limit

**Haley & Aldrich, Inc.**  
\haleyaldrich.com/share/grn_common/129420/Vectren/FB_Culley/East_Fish_Pond/Annual_Report/Table2018-0112_HAI_FB_Culley_GW_Table-F.xlsx January 2018
### Table II
SUMMARY OF ANALYTICAL RESULTS
F.B. CULLEY GENERATING STATION
NEWBURGH, INDIANA

<table>
<thead>
<tr>
<th>Location Group</th>
<th>Location Name</th>
<th>Sample Date</th>
<th>Sample ID</th>
<th>Water Level (ft baml)</th>
<th>Monitoring Program</th>
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</table>

**Field Parameters**
- Temperature (Deg C): 20.27, 19.2, 22.01, 15.31, 13.89, 16.15, 16.62, 17.93, 14.47
- Turbidity, Field (NTU): 20.27
- Dissolved Oxygen, Field (mg/L): 20.27
- Conductivity, Field (µS/cm): 20.27
- pH, Field: 20.27
- Field (su): 20.27

**Detection Monitoring - EPA Appendix III Constituents (mg/L)**
- Beroc, Total:
  - U: 0.0044
  - J+: 0.0044
- Calcium, Total: 86
- Chloride (mg/L): 26
- Fluoride (mg/L): 0.24
- Sulfate (mg/L): 9.31
- pH (lab) (su): 7.37
- Total Dissolved Solids (TDS) (mg/L): 590

**Assessment Monitoring - EPA Appendix IV Constituents (mg/L)**
- Aluminum: Total
- Arsenic, Total
- Barium, Total: 0.5
- Beryllium, Total
- Cadmium, Total
- Chromium, Total
- Cobalt, Total
- Lead, Total
- Lithium, Total
- Molybdenum, Total
- Selenium, Total
- Thallium, Total
- Mercury: Total

**Radiological (pCi/L)**
- Radium-226
- Radium-228

**Abbreviations and Notes:**
- CCR: Coal Combustion Residuals
- CFR: Code of Federal Regulations
- ft: feet
- mg/L: milligrams per liter
- NTU: Nephelometric Turbidity Units
- pCi/L: picoCurie per liter

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**References:**
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<th>Lab Sample ID</th>
<th>Water Level (ft amsl)</th>
<th>Monitoring Program</th>
<th>Field Parameters</th>
<th>Turbidity, Field (FNU)</th>
<th>Dissolved Oxygen, Field (mg/L)</th>
<th>Conductivity, Field (μS/cm)</th>
<th>ORP, Field (mV)</th>
<th>Turbidity, Field (NTU)</th>
<th>pH, Field (Isu)</th>
<th>Detection Monitoring - EPA Appendix III Constituents (mg/L)</th>
<th>Assessment Monitoring - EPA Appendix IV Constituents (mg/L)</th>
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**Notes:**
- Combustion Residuals estimated CFR of Regulations with AMSL of feet above mean sea level.
- USEPA: United States Environmental Protection Agency

**Abbreviations and Notes:**
- **CCR:** Coal Combustion Residuals
- **CFR:** Code of Federal Regulations
- **AP:** Ambient
- **mV:** Millivolt
- **NTU:** Nephelometric Turbidity Units
- **ppb:** Parts per billion
- **ppm:** Parts per million
- **pCi/L:** picocurie per liter
- **NTU:** Nephelometric Turbidity Units
- **ppb:** Parts per billion
- **ppm:** Parts per million
- **pCi/L:** picocurie per liter
- **US EPA:** United States Environmental Protection Agency
OHIO RIVER
EAST ASH POND
FB CULLEY STATION
LITTLE PIGEON CREEK

LEGEND
- UPGRADIENT MONITORING WELL
- DOWNGRADIENT MONITORING WELL

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

VECTREN CORPORATION
F.B. CULLEY GENERATING STATION
3111 DARLINGTON ROAD
NEWBURGH, INDIANA

MONITORING WELL NETWORK
JANUARY 2018
FIGURE 1

GIS FILE PATH: \haleyaldrich.com\share\boi_common\Projects\Vectren_Corporation\42796_Evansville_CCR_GWMP_Development\Global\GIS\Maps\2017_12\42796_000_000MB_FB_CULLEY_GROUNDWATER_CONTOURS.mxd USER: ajospe LAST SAVED: 12/12/2017 5:26:45 PM