



Andy Beshear  
GOVERNOR

## ENERGY AND ENVIRONMENT CABINET

300 Sower Boulevard  
Frankfort, Kentucky 406 01  
Phone: (502) 564 -3350

John S. Lyons  
SECRETARY

June 5, 2026

Mrs. April Ladd  
US Department of Energy  
Portsmouth/Paducah Project Office  
5501 Hobbs Road  
Kevil, Kentucky 42053

Myrna Redfield, Program Manager  
Four Rivers Nuclear Partnership, LLC  
5511 Hobbs Road  
Kevil, Kentucky 42053

**RE: Notice of Final Permit Decision – Class I Modification #1**  
Paducah Site  
Paducah, McCracken County, Kentucky  
KY8-890-008-982

Mrs. Ladd and Mrs. Redfield,

The Kentucky Division of Waste Management (Division) is in receipt of the Revised Class 1 Permit Modification request (Mod #1) to the Hazardous Waste Facility Permit (HWFP), dated June 2, 2026. The Permittee is requesting this Modification in accordance with 40 CFR § 270.42 (Permit Modification at the Request of the Permittee). The intent of this request is to reflect the current status of each permitted facility, to make general administrative changes, to clarify information, and to ensure compliance with all applicable regulations.

A Class 1 Permit Modification requires the permittee to send a notice of the modification to all persons on the facility mailing list within 90 calendar days after the change is put into effect. The permittee stated that the public notification mailer was issued on March 26, 2026.

Please find Modification #1, to the Hazardous Waste Management Facility Permit issued to the U.S. Department of Energy (DOE) and Four Rivers Nuclear Partnership, LLC. Please insert the attached cover sheet and the permit modification in front of the cover sheet of the existing permit.

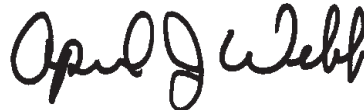
If you are aggrieved by this decision, you may request a hearing. The request must be made in writing within thirty (30) days of your receipt of this decision and must conform to 40 CFR §124.19 (Appeal of RCRA Permits). The requirement of condition III.E.9.b of the attached

Mrs. April Ladd  
Mrs. Myrna Redfield  
Page 2 of 2  
June 5, 2026

permit and 40 CFR §270.10(i), is to keep records of all data used to complete the permit modification application for at least three (3) years.

If you have any questions or require additional information, please contact Leo W. Williamson at (502) 782-6478 or e-mail at [leo.williamson@ky.gov](mailto:leo.williamson@ky.gov).

Sincerely,



April J. Webb, P.E., Manager  
Hazardous Waste Branch  
Division of Waste Management

AJW/SS/lww

EC: Brian Begley, U.S EPA – Region 4; [Begley.Brian@epa.gov](mailto:Begley.Brian@epa.gov)  
Kelly Adams, U.S. EPA – Region 4; [Adams.Kelly@epa.gov](mailto:Adams.Kelly@epa.gov)  
David Egetter, U.S. EPA – Region 4; [Egetter.david@epa.gov](mailto:Egetter.david@epa.gov)  
Carlos Merizalde, U.S. EPA – Region 4; [Merizalde.Carlos@epa.gov](mailto:Merizalde.Carlos@epa.gov)  
Brooke York, U.S. EPA – Region 4; [York.Brooke@epa.gov](mailto:York.Brooke@epa.gov)  
April Ladd, DOE – Paducah; [April.Ladd@pppo.gov](mailto:April.Ladd@pppo.gov)  
Ryan Callihan; DOE – Portsmouth; [Ryan.Callihan@pppo.gov](mailto:Ryan.Callihan@pppo.gov)  
Abigail Parish, DOE – Lexington; [Abigail.Parish@pppo.gov](mailto:Abigail.Parish@pppo.gov)  
Bruce Ford, FRNP – Paducah; [Bruce.Ford@pad.pppo.gov](mailto:Bruce.Ford@pad.pppo.gov)  
Myrna Redfield, FRNP – Paducah; [Myrna.Redfield@pad.pppo.gov](mailto:Myrna.Redfield@pad.pppo.gov)  
Megan Mulry, FRNP – Paducah; [Megan.Mulry@pad.pppo.gov](mailto:Megan.Mulry@pad.pppo.gov)  
Katrina Hall, FRNP – Paducah; [Katrina.Hall@pad.pppo.gov](mailto:Katrina.Hall@pad.pppo.gov)  
General Correspondence, FRNP; [frnpcorrespondence@pad.pppo.gov](mailto:frnpcorrespondence@pad.pppo.gov)  
Administrative Record, FRNP; [arcorrespondence@pad.pppo.gov](mailto:arcorrespondence@pad.pppo.gov)  
Records Management, SSI; [pad.rmc@pad.pppo.gov](mailto:pad.rmc@pad.pppo.gov)  
Kelly Layne, ETAS – Paducah; [Kelly.Layne@pppo.gov](mailto:Kelly.Layne@pppo.gov)  
ETAS – Paducah; [Paducah.mail@pppo.gov](mailto:Paducah.mail@pppo.gov)  
Hayly Wiggins, CAB – Paducah; [Hayly@pgdpcab.org](mailto:Hayly@pgdpcab.org)  
Shannon McLeary, KDOW – Paducah; [Shannon.McLeary@ky.gov](mailto:Shannon.McLeary@ky.gov)  
April Webb, KDWM – Frankfort; [April.Webb@ky.gov](mailto:April.Webb@ky.gov)  
Paducah Section Personnel; [NREPCDEP-DWM-HWB-PGPD@ky.gov](mailto:NREPCDEP-DWM-HWB-PGPD@ky.gov)

DWM File: #1431; Graybar APE20260002 (2025-2035 Haz Waste Permit Mod #1)

**Kentucky Energy and Environment Cabinet  
Department for Environmental Protection  
Division of Waste Management**

**HAZARDOUS WASTE MANAGEMENT FACILITY PERMIT**

United States Department of Energy, Paducah Site  
5501 Hobbs Road  
Kevil, Kentucky 42053  
and  
Four Rivers Nuclear Partnership, LLC  
5511 Hobbs Road  
Kevil, Kentucky 42053

The Division of Waste Management hereby grants the above-named facility a permit modification to reflect the transfer of operational control at the Paducah Site. This permit modification has been issued under the provision of KRS Chapter 224 and 401 KAR 38:040, Section 2, effective October 21, 2008, and is subject to all conditions and operating limitations contained herein. Issuance of this permit modification does not relieve the permittee from the responsibility of obtaining any other permits, licenses, or approvals required by this Cabinet and/or other federal, state, and local agencies.

|                  |                                     |
|------------------|-------------------------------------|
| <b>Part I</b>    | <b>-Legal Authority</b>             |
| <b>Part II</b>   | <b>-Specific Conditions</b>         |
| <b>Part III</b>  | <b>-Standard Conditions</b>         |
| <b>Part IV</b>   | <b>-Corrective Action</b>           |
| <b>Part V</b>    | <b>-Waste Minimization</b>          |
| <b>Part VI</b>   | <b>-Land Disposal Restrictions</b>  |
| <b>Part VII</b>  | <b>-RCRA Air Emission Standards</b> |
| <b>Part VIII</b> | <b>-Referenced Attachments</b>      |

No deviation from the plans and specifications submitted with your application or the conditions specified herein is allowed, unless authorized in writing from the Division of Waste Management. Violation of the terms and conditions specified herein shall render this permit null and void. All rights of inspection by representatives of the Division of Waste Management are reserved. Conformance with all applicable Waste Management Regulations is the responsibility of the permittee. Receipt of the permit fee and any financial assurance specified below is hereby acknowledged.

|                                          |                                   |                         |                   |
|------------------------------------------|-----------------------------------|-------------------------|-------------------|
| <b>PERMIT TYPE:</b>                      | Operating                         | <b>PERMIT NUMBER:</b>   | KY8-890-008-982   |
| <b>TYPE OF ACTIVITY:</b>                 | Storage, Treatment & Post-closure | <b>COUNTY:</b>          | McCracken         |
| <b>PERMIT FEE:</b>                       | \$0.00                            | <b>EFFECTIVE DATE:</b>  | November 12, 2025 |
| <b>CLOSURE AMOUNT:</b>                   | N/A                               | <b>EXPIRATION DATE:</b> | December 12, 2035 |
| <b>POST-CLOSURE AMOUNT:</b>              | N/A                               |                         |                   |
| <b>CLOSURE INSTRUMENT:</b>               | N/A                               |                         |                   |
| <b>SUDDEN LIABILITY INSURANCE:</b>       | N/A                               |                         |                   |
| <b>HAZARDOUS WASTE MANAGEMENT UNITS:</b> | Containers and Landfill           |                         |                   |
| <b>NON-SUDDEN LIABILITY INSURANCE:</b>   | N/A                               |                         |                   |

Issued this 5<sup>th</sup> day of June, 2026



A. Brian Osterman, Director  
Division of Waste Management

**PART E**

**C-404 GROUNDWATER MONITORING  
HAZARDOUS WASTE MANAGEMENT FACILITY PERMIT  
CLASS 1 MODIFICATION**

**40 *CFR* Part 264, Subpart F**

**THIS PAGE INTENTIONALLY LEFT BLANK**

# CONTENTS

|                                                                                                                   |       |
|-------------------------------------------------------------------------------------------------------------------|-------|
| FIGURES.....                                                                                                      | E-v   |
| TABLES .....                                                                                                      | E-v   |
| ACRONYMS.....                                                                                                     | E-vii |
| 1. INTRODUCTION.....                                                                                              | E-1   |
| 1.1 C-404 GROUNDWATER MONITORING .....                                                                            | E-1   |
| 1.2 C-404 SITE HISTORY AND DESCRIPTION.....                                                                       | E-1   |
| 2. SITE GEOLOGY AND HYDROGEOLOGY .....                                                                            | E-2   |
| 2.1 GEOLOGY.....                                                                                                  | E-2   |
| 2.2 HYDROGEOLOGY.....                                                                                             | E-3   |
| 2.3 AN EVALUATION OF SUBSURFACE GEOLOGIC FORMATIONS AND SURFACE<br>TOPOGRAPHY FOR SOLUTION OR KARST FEATURES..... | E-4   |
| 3. TOPOGRAPHIC MAP .....                                                                                          | E-4   |
| 4. GROUNDWATER MONITORING SYSTEM .....                                                                            | E-6   |
| 4.1 UPPERMOST AQUIFER .....                                                                                       | E-6   |
| 4.2 BOUNDARIES OF THE UPPERMOST AQUIFER.....                                                                      | E-6   |
| 4.3 UNDERLYING INTERCONNECTIONS BETWEEN UPPERMOST AQUIFER AND<br>LOWER AQUIFER.....                               | E-6   |
| 4.4 HYDRAULIC DOWNGRAIDENT LIMITS.....                                                                            | E-7   |
| 4.5 POINT OF COMPLIANCE .....                                                                                     | E-7   |
| 4.6 DESCRIPTION OF WELLS .....                                                                                    | E-7   |
| 4.6.1 Replacement Wells .....                                                                                     | E-8   |
| 5. DETECTION MONITORING.....                                                                                      | E-8   |
| 5.1 SAMPLING AND ANALYSIS PROCEDURES.....                                                                         | E-8   |
| 5.2 STATISTICAL PROCEDURES.....                                                                                   | E-11  |
| 5.3 PROCEDURES FOR ESTABLISHING BACKGROUND.....                                                                   | E-12  |
| 5.4 MONITORING PROGRAM AND DATA EVALUATION .....                                                                  | E-13  |
| 5.5 RECORDKEEPING AND REPORTING.....                                                                              | E-13  |
| 6. CONFIRMED STATISTICALLY SIGNIFICANT EXCEEDANCE/INCREASE.....                                                   | E-13  |
| 7. GROUNDWATER COMPLIANCE MONITORING FOR THE C-404 HAZARDOUS WASTE<br>LANDFILL .....                              | E-15  |
| 7.1 COMPLIANCE MONITORING PROGRAM.....                                                                            | E-15  |
| 8. CORRECTIVE ACTION FOR REGULATED UNITS .....                                                                    | E-17  |
| 9. CORRECTIVE ACTION FOR SWMUs AND AOCs.....                                                                      | E-18  |
| 9.1 NOTIFICATION AND ASSESSMENT REQUIREMENTS FOR NEWLY IDENTIFIED<br>SWMUS AND AOCS .....                         | E-18  |
| 9.1.1 Notification of Discovery of SWMU or AOC.....                                                               | E-19  |
| 9.1.2 Submittal of an Integrated Site Evaluation Report.....                                                      | E-19  |

|              |                                                                                                                                                                                                                                                                                    |      |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 9.1.3        | Notification and Submittal of an Integrated Site Evaluation Report [in Accordance with Section IX, Site Evaluation(s) of the FFA] for Newly Designated SWMUs or AOCs Associated with a Deactivated Facility Being Evaluated Under a Site Evaluation in Appendix 4 of the SMP ..... | E-19 |
| 9.2          | RCRA FACILITY INVESTIGATION (RFI) .....                                                                                                                                                                                                                                            | E-20 |
| 9.3          | INTERIM MEASURES/REMOVAL ACTION .....                                                                                                                                                                                                                                              | E-20 |
| 9.4          | CORRECTIVE MEASURES STUDY/FEASIBILITY STUDY .....                                                                                                                                                                                                                                  | E-20 |
| 9.5          | REMEDY APPROVAL AND PERMIT MODIFICATION .....                                                                                                                                                                                                                                      | E-21 |
| APPENDIX E1: | RESERVED .....                                                                                                                                                                                                                                                                     | E1-1 |
| APPENDIX E2: | WELL CONSTRUCTION DIAGRAMS .....                                                                                                                                                                                                                                                   | E2-1 |
| APPENDIX E3: | MONITORING WELL REQUIREMENTS .....                                                                                                                                                                                                                                                 | E3-1 |
| APPENDIX E4: | SOLID WASTE MANAGEMENT UNIT (SWMU) SUMMARY .....                                                                                                                                                                                                                                   | E4-1 |
| APPENDIX E5: | SWMU AREA OF CONCERN MAP .....                                                                                                                                                                                                                                                     | E5-1 |

## FIGURES

|   |                                     |      |
|---|-------------------------------------|------|
| 1 | Monitoring Wells .....              | E-5  |
| 2 | Example Groundwater Data Form ..... | E-10 |

## TABLES

|    |                                                           |      |
|----|-----------------------------------------------------------|------|
| 1. | Monitoring Wells for C-404 Hazardous Waste Landfill ..... | E-7  |
| 2. | C-404 Landfill Analyses and Laboratory Methods .....      | E-11 |
| 3. | Schedule for Submitting Sampling Results .....            | E-13 |
| 4. | Concentration Limits .....                                | E-15 |
| 5. | Schedule for Submitting Sampling Results .....            | E-16 |

**THIS PAGE INTENTIONALLY LEFT BLANK**

## ACRONYMS

|            |                                                                               |
|------------|-------------------------------------------------------------------------------|
| AOC        | area of concern                                                               |
| CERCLA     | Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |
| <i>CFR</i> | <i>Code of Federal Regulations</i>                                            |
| CMS        | corrective measures study                                                     |
| DOE        | U.S. Department of Energy                                                     |
| EEC        | Energy and Environment Cabinet                                                |
| EPA        | U.S. Environmental Protection Agency                                          |
| FFA        | Federal Facility Agreement                                                    |
| FS         | feasibility study                                                             |
| HWBM       | Hazardous Waste Branch Manager                                                |
| HWMFP      | Hazardous Waste Management Facility Permit                                    |
| IM         | interim measures                                                              |
| <i>KAR</i> | <i>Kentucky Revised Statutes</i>                                              |
| KDWM       | Kentucky Division of Waste Management                                         |
| MSL        | mean sea level                                                                |
| MW         | monitoring well                                                               |
| N/A        | not applicable                                                                |
| PGDP       | Paducah Gaseous Diffusion Plant                                               |
| PL         | prediction limit                                                              |
| RA         | removal action                                                                |
| RCRA       | Resource Conservation and Recovery Act                                        |
| RFI        | RCRA facility investigation                                                   |
| RGA        | Regional Gravel Aquifer                                                       |
| RI         | remedial investigation                                                        |
| SAR        | SWMU assessment report                                                        |
| SE         | site evaluation                                                               |
| SMP        | site management plan                                                          |
| SWMU       | solid waste management unit                                                   |
| UCRS       | Upper Continental Recharge System                                             |

**THIS PAGE INTENTIONALLY LEFT BLANK**

# **1. INTRODUCTION**

## **1.1 C-404 GROUNDWATER MONITORING**

The C-404 Low-Level Radioactive Waste Burial Ground (C-404) was closed under the closure requirements for landfills containing hazardous waste. The postclosure permit for this facility was incorporated into the hazardous waste management permit for Paducah Gaseous Diffusion Plant (PGDP) in 1992. Groundwater monitoring is required for this landfill. This part of the application describes the groundwater monitoring at the C-404 Landfill.

## **1.2 C-404 SITE HISTORY AND DESCRIPTION**

The C-404 Low-Level Radioactive Burial Ground is located in the west-central portion of PGDP (see Attachment A1, Figure 1). The C-404 unit originally was constructed in the early 1950s as a rectangular aboveground surface impoundment with a floor area of approximately 53,000 ft<sup>2</sup> (387 ft by 137 ft). The floor of the surface impoundment was constructed of well-tamped earth, and clay dikes provided liquid containment to an operating depth of approximately 6 ft.

From 1952 through 1957, the surface impoundment was operated as a neutralization/sedimentation treatment facility for uranium-contaminated wastewater generated at the C-400 facility. Liquid wastes from the C-400 facility were pumped through an underground steel pipe to the eastern end of the impoundment. A weir at the southwest corner of the impoundment decanted the treated wastewater for discharge. Use of the surface impoundment for treatment of wastewater was terminated in 1957 upon installation of a treatment system at the C-400 facility. At that time, all free liquids were removed from the C-404 impoundment.

From 1957 through 1976, the impoundment was used for the bulk disposal of uranium-contaminated solid waste. The surface impoundment was filled with bulk solid wastes to within 1–2 ft of the top of the original dikes. The facility then was covered with compacted earth to the top of the original dikes and sloped to facilitate runoff. The exit weir was converted to an enclosed concrete basin for use as a leachate collection sump. Since covering the surface impoundment, leachate accumulations in the collection sump have amounted to approximately 2,000 gal per year. This leachate is transferred to portable tanks and placed in storage for appropriate treatment and/or disposition.

In 1977, the placement of bulk and containerized uranium-contaminated solid wastes on top of the previously filled area began. As these wastes were placed on the upper portion of the facility, they were covered with earth. In 1983, the eastern quarter of the site was covered with a clay cap that extends over the out-slope of the dike.

One of the types of containerized solid wastes disposed of in the upper portion of the facility is gold dissolver precipitate, a solid waste containing no free liquid. During a routine testing program, the gold dissolver precipitate disposed of in early 1986 was found to be hazardous based upon the Extraction Procedure Toxicity test. The constituents of concern are lead and cadmium and, to a lesser extent, selenium. The C-404 disposal site was never intended for use as a hazardous waste disposal site and was not included in PGDP's Resource Conservation and Recovery Act (RCRA) permitting process. In May 1986, following the discovery of the presence of characteristic hazardous waste in the C-404 Landfill, disposal of wastes at the site was terminated. Though only a minor portion of the solid waste in the site was found to be hazardous, the decision was made to close the site as a hazardous waste landfill pursuant to the applicable state and federal regulations.

The U.S. Department of Energy (DOE) submitted a Postclosure Permit Application for this unit in 1989. The Hazardous Waste Management Permit incorporated the closure and monitoring requirements for this unit in 1992. The C-404 Low-Level Radioactive Burial Ground was never intended for the burial of hazardous waste and, therefore, does not meet the design requirements as specified in 40 *CFR* § 264.301 *et seq.*

## 2. SITE GEOLOGY AND HYDROGEOLOGY

PGDP, located in the Jackson Purchase region of western Kentucky, lies within the northern tip of the Mississippi Embayment portion of the Gulf Coastal Plain Province. The stratigraphic sequence in the region consists of Cretaceous, Tertiary, and Quaternary sediments unconformably overlying Paleozoic bedrock (see Part B, Figure 3). The *Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation Phase III* (Clausen 1992) discusses geology and hydrogeology of PGDP in detail. Additional information regarding the geology and hydrogeology at PGDP is covered in the *Northeast Plume Preliminary Characterization Summary Report* (Garner 1995). A number of geological investigations performed in recent years further have refined the basic geological understanding of PGDP. Below is a summary of the PGDP geology and hydrogeology.

### 2.1 GEOLOGY

Paleozoic bedrock located below PGDP consists of Mississippian age limestone. The Upper Cretaceous McNairy Formation and the overlying Paleocene Clayton Formation, hereafter referred to collectively as the McNairy Formation, which consists of interbedded and interlensing sand, silt, and clay, overlies the site bedrock. Data indicate that sand may account for 40–50% of this formation near the site. The Porters Creek Clay is Paleocene in age and occurs in the southern portions of the site. It consists of dark-gray-to-black clay with varying amounts of silt, and fine-grained micaceous, commonly glauconitic sand. The Eocene Sands, consisting of interbedded and interlensing sand, silt, and clay, overlie the Porters Creek Clay in the extreme southern portion of the PGDP.

Pliocene, and Pleistocene continental deposits unconformably overlie Cretaceous through Eocene strata at PGDP. The Continental Deposits extend from the southern end of the PGDP to the Ohio River, and overlay an unconformable surface at the base of the deposits that exhibits steps or terraces. The Continental Deposits have been divided into a basal gravel facies (Lower Continental Deposits) and an upper, fine-grained clastic facies (Upper Continental Deposits).

The lower continental deposits consist of chert gravel in a matrix of poorly sorted sand and silt. A Pliocene facies, ranging in thickness from 0–30 ft and averaging less than 10 ft, exists in the southern portions of the site, occurring on the upper surfaces of a buried terrace at elevations greater than 350 ft above mean sea level (MSL). A second gravel facies, ranging in thickness from 15–20 ft, exists in southeastern and eastern portions of the site, occurring on an erosional surface at approximately 320–345-ft elevation. The third and most prominent of the three gravel facies beneath the site consists of Pleistocene deposits, which occur north of a buried terrace face on an erosional surface with elevations varying from approximately 245–310 ft. This thicker sequence of Pleistocene Continental Deposits represents a valley fill that overall comprises a thick, fining upward sequence. The upper surface of these gravel deposits occurs at an average elevation of 310 ft with an average thickness of approximately 30 ft. Thicker deposits, up to 50 ft, exist in deeper scoured channels which trend east-west across the site.

The Upper Continental Deposits primarily consist of clayey silt, with thin zones of sand and occasional gravel, and vary in thickness from approximately 15–55 ft. These deposits have been differentiated into three general lithofacies based on grain-size distributions: (1) clay and silt sediments, (2) sand sediments, and (3) gravel sediments. Sand- and gravel-dominated lithofacies exist at different elevations throughout the upper continental deposits; however, most occur at consistent elevations. Sand and gravel lithofacies appear relatively discontinuous in cross-section, but may be more connected in three dimensions. Eolian origin loess, consisting of yellowish-brown silt and clayey silt, overlies the continental deposits at the site and varies in thickness from approximately 5–25 ft with an average of approximately 15 ft. Holocene alluvial deposits occur at lower elevations within the Ohio River floodplain north of PGDP.

## 2.2 HYDROGEOLOGY

The local groundwater flow system at PGDP occurs within four specific components: the terrace gravels, the Upper Continental Recharge System (UCRS), the Regional Gravel Aquifer (RGA), and the McNairy Flow System [Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation Phase III (Clausen 1992)]. The components are defined as follows:

- (1) Terrace Gravels—This component consists of Pliocene-aged gravel deposits found at elevations higher than 350 ft in the southern portion of the PGDP. This feature is not expressed in the vicinity of C-404. These deposits usually lack sufficient thickness and saturation to constitute an aquifer. Alluvial channels intersecting the terrace may provide groundwater underflow to recharge the RGA.
- (2) UCRS—The UCRS consists of three distinct hydrogeologic units: HU 1, HU 2, and HU 3. The uppermost unit, HU 1, is the overlying loess that blankets the entire site. HU 2, the second unit, consists of discontinuous sand and gravel lenses with groundwater flow ultimately downward to recharge the RGA. The lowermost unit, HU 3, consists predominantly of clay, silt, or clayey silt. Composition of HU 3 may vary, but it appears to form a partial confining layer due to relatively low hydraulic conductivity. The sand and gravel lithofacies appear relatively discontinuous in cross-section but may be more connected in three dimensions. The most prevalent sand and gravel deposits occur at an elevation of approximately 345–351 ft with less prevalent deposits occurring at an elevation of 337–341 ft. Groundwater flows downward into the RGA from the UCRS in the vicinity of PGDP.
- (3) RGA—This component consists primarily of the lower continental deposits HU 5 of the Quaternary sand and gravel facies, but also includes sands of the hydrogeologic unit HU 4 and coarse-grained upper McNairy sediments in direct contact with the lower continental deposits, and Holocene alluvium found adjacent to the Ohio River, which are of sufficient thickness and saturation to constitute an aquifer. These deposits commonly are thicker than the Pliocene terrace gravel deposits with an average thickness of 30 ft and range up to 50 ft along an axis that trends east-west through the site. The RGA is the uppermost aquifer used locally.
- (4) McNairy Flow System—This component consists of the interbedded and interlensing sand, silt, and clay of the McNairy Formation. The top of the McNairy Formation occurs at a depth of approximately 90 ft below ground surface. Sand facies account for 40–50% of the total formation thickness of approximately 225 ft.

Topographically-controlled recharge and discharge areas to the south and north, respectively, bound the local groundwater flow system. Recharge within the Eocene sands has resulted in a groundwater divide located southwest of the PGDP. The main recharge area for the RGA is located nearer to the site and occurs as percolation through the UCRS. From the PGDP, groundwater flows northward toward the Ohio River, which is the local base level for the system. Flow originates south of the PGDP within the Eocene sands

and subsequently moves into the Pliocene terrace gravels that separate the Eocene sands from the RGA. Groundwater within the Pliocene gravels either discharges to local streams or flows into the RGA, which eventually discharges to the Ohio River.

Differences in permeability and aquifer thickness affect the hydraulic gradient. Toward the southern part of the site, the RGA is either truncated or thins and grades laterally into the Pliocene terrace gravels. The restriction results in a high gradient and probably causes groundwater in the Pliocene terrace gravels to discharge to adjoining streams. In the north central portion of the site, the lower gradients are a result of the thickened Pleistocene sequence containing high fractions of coarse sand and gravel. Northward, near the Ohio River, the hydraulic gradient increases as a result of either a thinner section of the RGA and Holocene alluvium or the low permeability of bottom sediments in the Ohio River.

The major pathway of groundwater flow is within the RGA, which dominates the flow regime. Conceptually, a larger hydraulic conductivity in the aquifer than in the overlying sediments produces high vertical gradients in the aquitard and low horizontal gradients in the aquifer (Freeze and Witherspoon 1967).

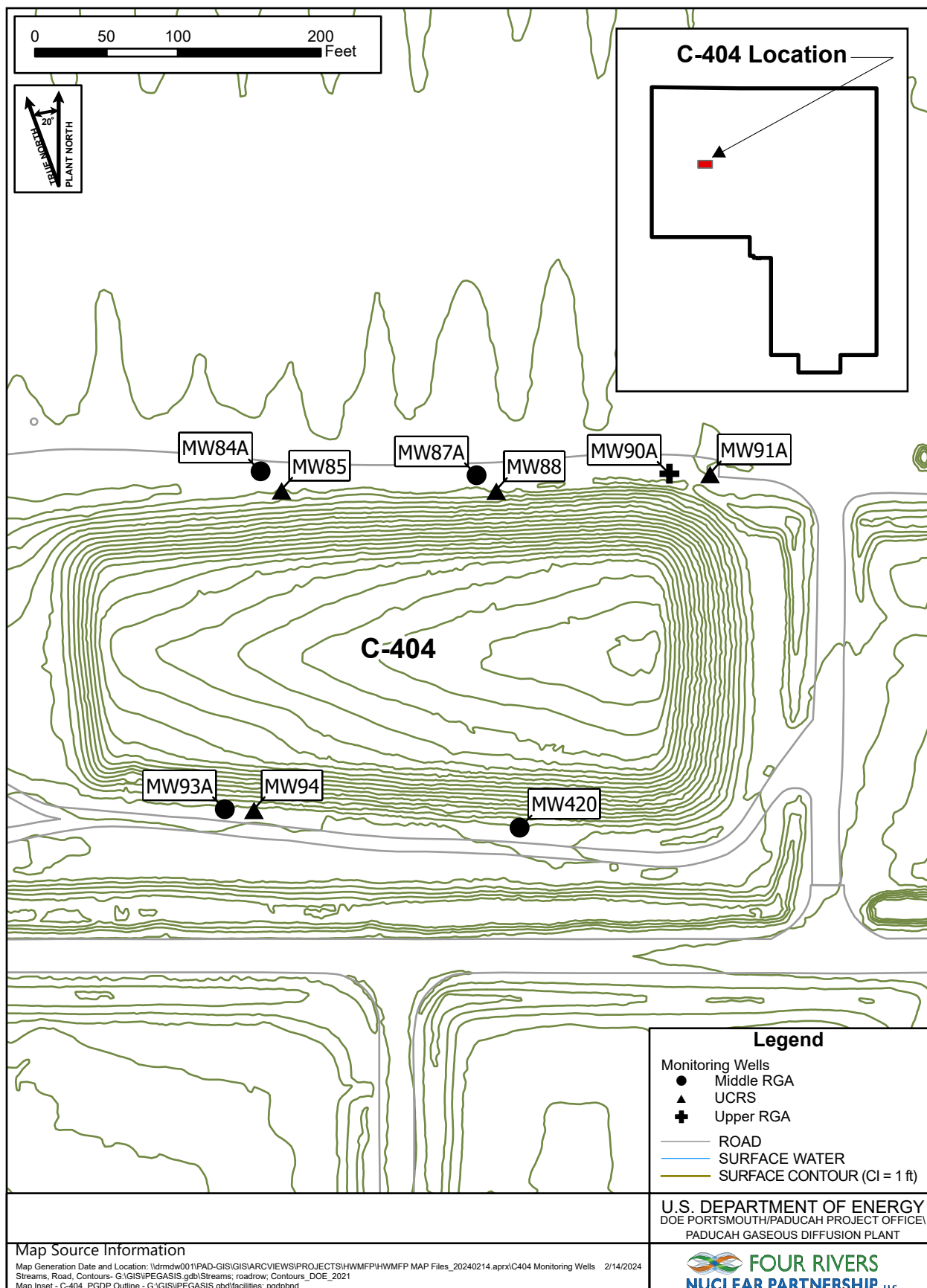
The conceptual model of the RGA flow system is based on the results of a three-dimensional computer model of PGDP. The RGA receives recharge via underflow from the Pliocene terrace gravels to the south and percolation through the UCRS. The discontinuous nature of sands and gravels in the UCRS and the large vertical gradient require groundwater flow in the UCRS to be oriented downward. Indeed, measured hydraulic gradients and results from analytical and numerical analyses suggest that most of the water entering the shallow system flows vertically into the RGA. Some horizontal flow in the UCRS likely occurs, but, near the site, it is probably insignificant because of the lateral discontinuity of shallow sand and gravel lenses. Groundwater flow in the RGA is to the north and discharges into the Ohio River. Hydraulic conductivities of the RGA commonly range between 100–1000 ft/d. Existing regional maps show the RGA thin or absent beneath the Ohio River, suggesting that flow under the river is unlikely.

### **2.3 AN EVALUATION OF SUBSURFACE GEOLOGIC FORMATIONS AND SURFACE TOPOGRAPHY FOR SOLUTION OR KARST FEATURES**

Based on the known subsurface geology at PGDP, the only rock units that are susceptible to solution (karst forming) processes are Mississippian limestones, which lie at a depth approximately 330–350 ft below the surface. For this reason, no sinkholes are evident within the PGDP area.

## **3. TOPOGRAPHIC MAP**

United States Geological Survey quadrangle map is presented in Attachment A1, Figure 2. Site generated topographic maps of the area are presented in Part B, Appendix B1, Maps 1 through 5. Part E, Figure 1 depicts the boundaries for the C-404 Landfill and the monitoring wells (MWs) for this unit on a topographic map.



Part E, Figure 1. Monitoring Wells

## **4. GROUNDWATER MONITORING SYSTEM**

[40 *CFR* § 264.97 and 40 *CFR* § 264.90(b)(3)]

The C-404 Low-Level Radioactive Waste Burial Ground was closed in 1991 under the closure requirements for landfills. The postclosure permit for this facility was incorporated into the hazardous waste management permit for the PGDP in 1992. Groundwater monitoring is required for this landfill but not for the hazardous waste storage facilities. This part addresses the requirements for groundwater monitoring at the C-404 Landfill.

The groundwater monitoring plan for the C-404 Low-Level Radioactive Waste Burial Ground originally provided for the installation of four MW clusters. The locations were determined when the groundwater flow direction in the RGA was verified. The Kentucky Division of Waste Management (KDWM) approved the locations prior to installation of the wells. Each well cluster consisted of two wells screened at depths in the RGA such that detection of waste constituents within the vertical limits of the RGA was assured. One well at each of these location was screened in the UCRS.

In 2008, the MW network was redesigned based on groundwater monitoring results and the *Well Plan for Addition of Wells for C-404 Monitoring Well Network, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PRS/PROJ/0028, July 2007 (Well Plan) to better orient the groundwater monitoring system relative to groundwater flow directions. The redesigned MW network is described in Section 4.6, Description of Wells.

### **4.1 UPPERMOST AQUIFER**

[40 *CFR* § 270.14(c)(2)]

At the C-404 Landfill, the RGA is the uppermost aquifer. The McNairy Formation occupies the interval between the bottom of the RGA and the top of the Mississippian limestones and consists predominantly of fine sand and silt facies.

Saturated sand lenses within the silt and clay facies in the UCRS at the C-404 Landfill historically have demonstrated low and inconsistent yield characteristics, which limit the usefulness of samples from these wells.

### **4.2 BOUNDARIES OF THE UPPERMOST AQUIFER**

The top of the RGA at C-404 varies between 61–65 ft below the surface at an elevation ranging from 307–310 ft MSL. The thickness of the aquifer varies from 20–22-ft thick with the bottom of the aquifer at an elevation ranging from approximately 285 ft to 290 ft MSL. The RGA is continuous locally at C-404 as well as regionally at PGDP.

### **4.3 UNDERLYING INTERCONNECTIONS BETWEEN UPPERMOST AQUIFER AND LOWER AQUIFER**

[40 *CFR* § 270.14(c)(2)]

The McNairy Formation occurs between the lower boundary of the RGA and the top of Mississippian limestones at a depth approximately 400 ft below the surface. The much lower hydraulic conductivity of the fine sands, silts, and clays of the McNairy Formation is a significant contrast with the high hydraulic conductivity of the sand and gravel units of the RGA. As a result, little communication exists between the two units and the McNairy Formation serves as a lower confining unit to the RGA, with a thickness of approximately 300 ft, which effectively prevents downward migration of groundwater to underlying rock units.

#### 4.4 HYDRAULIC DOWNGRAIENT LIMITS

The hydraulic downgradient limit of the RGA is the Ohio River 4 miles to the north.

#### 4.5 POINT OF COMPLIANCE

[40 *CFR* § 264.95]

The point of compliance for the C-404 site is identified to be the vertical plane at the synthetic liner anchor trench that surrounds the unit. This trench is constructed near the edge of the closure cap. The uppermost aquifer below the regulated unit is the RGA.

The compliance wells were constructed within the uppermost aquifer (RGA). The well numbers are MW84A, MW87A, and MW90A. These wells should detect a release from the unit to the uppermost aquifer.

#### 4.6 DESCRIPTION OF WELLS

[40 *CFR* § 264.97]

Nine wells currently are used as part of the groundwater monitoring network for the C-404 Landfill. Part E, Table 1 lists the MWs for the C-404 Landfill groundwater monitoring network. The current MWs are shown in Part E, Figure 1. Well construction diagrams are contained in Appendix E2.

Several additional wells are located in the vicinity of the C-404 are routinely monitored, but currently are not used as part of the detection monitoring program. These wells (e.g., MW67, MW76, MW86, MW89, MW92, MW95A, MW226, MW227, MW333, MW337, MW338, MW414, MW416, MW548, MW549, MW550, MW551) also support groundwater flow and direction measurements in the vicinity of the C-404 Landfill.

**Part E, Table 1. Monitoring Wells for C-404 Hazardous Waste Landfill**

| Downgradient |       | Upgradient<br>(Background Wells) |      |
|--------------|-------|----------------------------------|------|
| Upper RGA    | UCRS  | Upper RGA                        | UCRS |
| MW84A        | MW85  | MW93A                            | MW94 |
| MW87A        | MW88  | MW420                            |      |
| MW90A        | MW91A |                                  |      |

#### **4.6.1 Replacement Wells**

Replacement wells will be installed as needed to maintain the monitoring program. Wells deleted from the compliance monitoring program and substandard RCRA MWs no longer in use and not used in the environmental monitoring program will be plugged and abandoned in accordance with Appendix E3, Section 2. The Hazardous Waste Branch Manager (HWBM) may approve an alternate method for well decommissioning. Well plugging and abandonment methods and certification will be submitted to the HWBM within 30 days from the date the wells are removed from the monitoring program if the wells are determined to have no further uses (environmental surveillance monitoring and/or water level monitoring).

DOE will install a replacement well for any well that no longer meets the requirements in 40 *CFR* § 264.97. Replacement wells will be designated by the letter “A” following the well number. In the event that an “A” series well is deleted from the monitoring system, the replacement well will be designated as a “B” series and follows C, D, E, etc., for any individual MW that is replaced.

DOE will submit a plan to the HWBM for installation of any replacement wells. The plan will be submitted within 30 days from the date the replacement well is proposed to be installed. The plan will consist of the following items:

- (1) Location(s) of each proposed MW(s);
- (2) Methods and equipment that will be used to install the proposed MW(s);
- (3) Materials and construction details of each MW;
- (4) The proposed methods for developing the newly installed MW(s); and
- (5) Schedules for installation and development.

DOE will submit to the HWBM within 90 days a report of the surveyed elevation and the well construction details and specifications upon completion of any new MW construction, including well development and surveying.

## **5. DETECTION MONITORING**

[40 *CFR* § 264.97]

### **5.1 SAMPLING AND ANALYSIS PROCEDURES**

Specific activities and/or requirements related to groundwater monitoring and MWs are provided in this section.

Groundwater flow rate and direction will be determined annually. Groundwater monitoring is conducted on a semiannual basis and will continue throughout the compliance period (40 years from permit initiation of compliance monitoring in October 1988). Monitoring and testing data will be maintained in the operating record until closure of the facility. The groundwater monitoring results are submitted on forms approved by the Kentucky Energy and Environment Cabinet (EEC).

Water level measurements will be made in all MWs prior to evacuation or collection of samples. The depth to groundwater is measured to an accuracy of 0.01 ft using a water level indicator. The groundwater surface elevation is calculated and recorded in conjunction with each groundwater monitoring event. See Appendix E3, Section 1.3, Water Level Measurements, for additional information on the process of how water level measurements are collected and how equipment decontamination, between each well, is handled. Water level measurements will be collected at the wells of the C-404 MW network, listed in Section 4.6.

Field parameters [pH, temperature, specific conductance, dissolved oxygen, oxidation-reduction potential (Eh), and turbidity] are measured using a water quality meter. Other field parameters, such as depth to water and barometric pressure, are measured prior to sampling. Measurements of the field parameters are documented using the groundwater sample data forms (similar to the example in Part E, Figure 2) prior to collection of the groundwater samples. Water quality stabilization criteria are met prior to sampling analytical parameters for the C-404 MWs. Appendix E3, Section 1.4, Groundwater Sampling, summarizes the acceptance criteria. Once stabilization has occurred, samples are collected in certified clean sample containers. Sample containers are chosen and preserved according to requirements in Appendix E3, Section 1.6. Clean pairs of protective disposable gloves are utilized during all phases of groundwater sampling.

Collection of field quality control samples (e.g., equipment blanks, field blanks, trip blanks) are done according to Appendix E3, Section 1.5, Field Quality Control. With prior approval from the KDWM, equivalent water specifications are acceptable for field quality control samples. Trip blanks accompany the sample containers for volatile organics and are analyzed for organics identified in Part E, Table 2.

Samples are collected in the following preferred order:

- (1) Samples to be analyzed for volatile organics.
- (2) Samples to be analyzed for total metals.
- (3) Samples to be analyzed for radionuclides.

### MW GROUNDWATER DATA FORM

|                                 |  |                               |  |                                        |  |
|---------------------------------|--|-------------------------------|--|----------------------------------------|--|
| LOCATION: _____                 |  | FREQUENCY: _____              |  | DATE: _____                            |  |
| ARRIVAL TIME: _____             |  | SAMPLE TIME: _____            |  | DEPARTURE TIME: _____                  |  |
| PROJECT ID: _____               |  | LCOC NUMBER(S): _____         |  |                                        |  |
| SAMPLE ID(S): _____             |  | TRIP BLANK: _____             |  |                                        |  |
| SAMPLED BY: _____               |  |                               |  |                                        |  |
| WELL DEPTH (ft): _____          |  | POINT DATUM: _____            |  | PURGE VOLUME (L): _____                |  |
| WATER LEVEL (START) (ft): _____ |  | WATER LEVEL (END) (ft): _____ |  | BAROMETRIC PRESSURE (inches/Hg): _____ |  |
| PURGE START TIME: _____         |  | PURGE END TIME: _____         |  |                                        |  |

| Time | Conductivity |            | D.O.<br>(mg/L) | Temp<br>(deg F) | pH<br>(S.U.) | Eh (approx)<br>(mV) | ORP<br>(mV) | Turbidity<br>(NTU) |
|------|--------------|------------|----------------|-----------------|--------------|---------------------|-------------|--------------------|
|      | (mS/cm)      | (µmhos/cm) |                |                 |              |                     |             |                    |
|      |              |            |                |                 |              |                     | N/A         |                    |
|      |              |            |                |                 |              |                     |             |                    |
|      |              |            |                |                 |              |                     |             |                    |
|      |              |            |                |                 |              |                     |             |                    |
|      |              |            |                |                 |              |                     |             |                    |
|      |              |            |                |                 |              |                     |             |                    |
|      |              |            |                |                 |              |                     |             |                    |

**EQUIPMENT INFORMATION**

DISPLAY #: \_\_\_\_\_ TRANSMITTER #: \_\_\_\_\_

SAMPLE BOX #: \_\_\_\_\_ DEPTH INDICATOR #: \_\_\_\_\_ DI WATER SOURCE: \_\_\_\_\_

**EQUIPMENT DECONTAMINATION DESCRIPTION:**

Decon sample control box with 600mL of DI water and decon water level with DI wipe.

**FIELD COMMENTS AND OBSERVATIONS:**

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

*Data Form Verification*

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

PEMS Entry Initials: \_\_\_\_\_ DATE: \_\_\_\_\_

MW Groundwater Data Form generated from PEIMS database.

\*This form represents the type of information gathered. Changes may be made as necessary without modification of this permit application.

**Part E, Figure 2. Example Groundwater Data Form**

Samples are preserved in accordance with the procedures in Appendix E3. Samples are analyzed according to the procedures specified in 40 *CFR* § 264 Appendix IX and in Part E, Table 2, for the constituents listed. Alternative SW-846 methods may be substituted with prior written approval from the KDWM. The analytical methods utilized are specified in SW-846 3rd edition (or most recent edition as approved by the Commonwealth of Kentucky).

**Part E, Table 2. C-404 Landfill Analyses and Laboratory Methods**

| Analyte Type | Constituent Type | Analysis                                  | Analytical Method**  |
|--------------|------------------|-------------------------------------------|----------------------|
| METAL        | HAZARDOUS        | Arsenic                                   | 6020                 |
| METAL        | HAZARDOUS        | Cadmium                                   | 6020                 |
| METAL        | HAZARDOUS        | Chromium                                  | 6020                 |
| METAL        | HAZARDOUS        | Lead                                      | 6020                 |
| METAL        | HAZARDOUS        | Mercury                                   | 7470                 |
| METAL        | HAZARDOUS        | Selenium                                  | 6020                 |
| METAL        | RADIONUCLIDE     | Uranium                                   | 6020                 |
| RADS         | RADIONUCLIDE     | Technetium-99 (total)                     | Liquid Scintillation |
| RADS         | RADIONUCLIDE     | Uranium 234<br>Uranium 235<br>Uranium 238 | Alpha Spectroscopy   |
| VOA          | HAZARDOUS        | Trichloroethene (TCE)                     | 8260                 |

\*Liquid Scintillation—no SW-846 Method is available for analysis of technetium-99. Analytical chemistry, volume 28, page 1651 (1956).

\*\*Newer methods approved by EPA under SW-846 or ASTM may be used.

The analytical laboratory also will report spike recovery data for each applicable series of groundwater samples collected. At least one duplicate sample will be collected and analyzed according to the methods specified in Part E, Table 2, each time the groundwater quality is determined at the compliance point. Samples are tracked and controlled using the chain of custody requirements specified in Appendix E3, Section 1.1.

## 5.2 STATISTICAL PROCEDURES

[40 *CFR* § 264.97(h)(5)]

DOE will perform statistical analysis of C-404 groundwater MW data. The statistical analysis will be performed in accordance with the procedures found in the U.S. Environmental Protection Agency (EPA) guidance document, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance*, now referred to as Unified Guidance (EPA 2009). In accordance with 40 *CFR* § 264.97(h)(5), the statistical testing methods that will be utilized on C-404 groundwater monitoring data are discussed in the following paragraphs.

Prediction limits (PLs) will be the statistical analysis method for C-404 groundwater data, without a retesting strategy, as found in Section 18 of the Unified Guidance. The method will utilize the current data set and 20 previous data sets.

The percentage of nondetects (censored data) of the data set determines how censored data are treated in determining PLs.

- If less than 15% of the background observations are nondetects, then these will be replaced with one-half of the method reporting limit prior to running the analysis.
- If more than 15% but less than 50% of the background data are less than the detection limit, then the data's sample mean and sample standard deviation are adjusted according to the method of Cohen, Aitchison, or Kaplan-Meier.
- If more than 50% of the background data are less than the detection limit, then a nonparametric PL will be computed. Poisson-based PLs are available as an alternative method when greater than 90% of the background data are less than the detection limit.

The data will be tested for statistical outliers using Dixon's and Rosner's outlier evaluation methods. Potential outliers will be evaluated for potential sources of error or evidence that the data point is not representative. Nonrepresentative data points may be excluded from the statistical analysis based on professional judgment. After testing for and exclusion of statistical outliers, the data set will be evaluated for normality distribution using the Shapiro-Wilk or Shapiro-Francia testing methods. If normality of the data set is confirmed, or can be confirmed by transforming the data, parametric PLs will be performed. If normality of the raw or transformed data set cannot be confirmed, nonparametric PLs will be computed.

Groundwater data collected from background MWs will be used to construct a concentration limit PL, which is then compared to one or more observations from a compliance well. The acceptable range of concentrations includes all values no greater than the PL. The appropriate prediction interval will generally have the form [0, PL], with the upper limit PL as the comparison of importance (EPA 2009).

If the PL indicates no statistically significant difference between concentrations in downgradient wells and concentrations in background wells, then there are no indications of statistically significant impacts on the groundwater from the C-404 Landfill.

If the PLs method identifies a statistically significant difference between concentrations in downgradient wells and concentrations in background wells, then the data will be evaluated further to determine if the concentrations in downgradient and vicinity wells are consistent with the findings of the 2007 Alternate Source Demonstration (ASD) (*Revised C-404 Landfill Statistically Significant Increase Source Demonstration*, PRS-ENM-0031/R2, transmitted via DOE correspondence, PPPO-02-506-07, August 1, 2007).

### **5.3 PROCEDURES FOR ESTABLISHING BACKGROUND**

[40 *CFR* § 264.97(h)(5)]

Background water quality data for the original C-404 Landfill MWs has been established from all upgradient MWs for the constituents listed in Part E, Table 2 during the initial year of closure activities. The background data was based on one complete year of data. The initial background concentration was based on four consecutive quarters of data pursuant to 40 *CFR* § 264.97(h)(5). Subsequent background values are calculated continuously (rolling average) on a semiannual basis.

For the statistical analysis of C-404 Landfill groundwater monitoring data, background values are calculated continuously (rolling average) on a semiannual basis utilizing 20 previous data sets and the

current data set. In the statistical procedures discussed in Section 5.2, analytical data from compliance point wells are compared to the PLs calculated from both background wells. For the nonparametric PL statistical analysis to be valid and in accordance with EPA Unified Guidance document, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (EPA 2009), each well must have 19 data sets and a current data set.

## 5.4 MONITORING PROGRAM AND DATA EVALUATION

DOE will determine whether a confirmed statistically significant exceedance/increase of one of the constituents listed in Part E, Table 2, has occurred over the background values for each time the groundwater quality is determined at the compliance point in accordance with Section 5.2. The measured concentration at each compliance monitoring point will be compared statistically.

DOE will monitor for all hazardous constituents in Part E, Table 2, of this permit during the compliance period. The compliance period is 40 years. The compliance period began when the detection monitoring program was initiated in accordance with 40 *CFR* § 264.96 on October 11, 1988, and will end on October 11, 2028 (unless the C-404 Hazardous Waste Landfill has moved into a Corrective Action Program).

## 5.5 RECORDKEEPING AND REPORTING

DOE will enter all monitoring, testing, and analytical data obtained in the operating record. The data will include all computations, calculated means, variances, and results of the statistical tests under 40 *CFR* § 264.97(j).

The established background values and the calculation and computation necessary to determine background values will be submitted to the HWBM. DOE will submit the analytical and statistical results in accordance with the schedule shown in Part E, Table 3. The annual evaluation of groundwater flow rate and direction will be submitted by November 30 of each year of the postclosure period.

**Part E, Table 3. Schedule for Submitting Sampling Results**

| <b>Samples to be Collected<br/>During the Months of:</b> | <b>Results Due to the<br/>Division by:</b> |
|----------------------------------------------------------|--------------------------------------------|
| January–March                                            | May 30                                     |
| July–September                                           | November 30                                |

## 6. CONFIRMED STATISTICALLY SIGNIFICANT EXCEEDANCE/INCREASE

Part E, Table 2 identifies the analytes to be measured by constituent type (i.e., hazardous or radionuclide). If it is determined that there has been a confirmed statistically significant exceedance, as defined in Section 5.2, for any hazardous constituents in any compliance point wells, all applicable steps for hazardous constituents will be followed [40 *CFR* § 264.98(g)]. If it is determined that there has been a confirmed statistically significant increase, as defined in Section 5.2, for any of the radionuclide constituents in any compliance point wells, all applicable steps for radionuclide constituents will be followed.

- (1) For any constituent, the HWBM will be notified in writing within seven days, indicating what constituents have shown statistically significant evidence of contamination;
- (2) If the statistically significant evidence of contamination is of a hazardous constituent, the groundwater wells will be sampled immediately<sup>1</sup> to determine the concentration of all constituents identified in 40 *CFR* § 264 Appendix IX or a site-specific subset of constituents, based on the discretion of the HWBM. If the statistically significant evidence of contamination is of a radionuclide constituent, the groundwater wells will be resampled for radionuclides only;
- (3) For any constituents found in the analysis in Step (2), the groundwater wells may be resampled within one month or at an alternative site-specific schedule approved by the HWBM for those constituents detected. If the results of the second analysis confirm the initial results, then these constituents will form the basis for compliance monitoring. If the wells are not resampled within one month or at an alternate schedule, the constituents found during the initial analysis will form the basis for compliance monitoring;
- (4) An application for a permit modification will be submitted to the HWBM within 90 days to establish a compliance monitoring program that meets the requirements of 40 *CFR* § 264.99, unless the constituent which has been confirmed as having a statistically significant increase at any point of compliance well(s) is a radionuclide. If a radionuclide has a confirmed statistically significant increase, DOE will establish a compliance monitoring program in accordance with Section 7.1 of this part: Step (1).a., Step (2), Step (2).b., Step (3), Step (6), and Step (7); and,
- (5) For hazardous constituents, an engineering feasibility plan for a corrective action or all data necessary to justify an alternate concentration limit, as governed by 40 *CFR* 264.98(g)(5), will be submitted to the HWBM within 180 days. This condition is not applicable when a statistically significant increase has been confirmed for a radionuclide.

Alternatively, if DOE determines, pursuant to Section 5.4, there is a statistically significant exceedance/increase at the compliance point for any of the constituents specified in Part E, Table 2, DOE may demonstrate that a source other than a regulated unit caused the increase or that the increase resulted from an error in sampling, analysis, statistical evaluation, or natural variation in groundwater, in accordance with 40 *CFR* §§ 264.98(g)(6).

- (1) In making a demonstration, DOE must notify the HWBM in writing within seven days of determining statistically significant evidence of contamination at the compliance point that DOE intends to make this demonstration;
- (2) Within 90 days, submit a report to the HWBM that demonstrates that a source other than a regulated unit caused the contamination or that the contamination resulted from error in sampling, analysis, or evaluation;
- (3) Within 90 days, submit to the HWBM an application for a permit modification to make any appropriate changes to the detection monitoring program; and
- (4) Continue to monitor in accordance with the detection monitoring program.

---

<sup>1</sup> For purposes of this section of the permit application, the term “immediately” means within a reasonable amount of time. The amount of time will also be dependent upon whether or not a site-specific subset of constituents is requested and the amount of time taken for the HWBM to respond to that request.

The Hazardous Waste Management Facility Permit (HWMFP) allows also for demonstrating that the exceedance is consistent with the 2007 Alternate Source Demonstration, which demonstrated that the C-404 Landfill was not the source of the historical, statistically significant background exceedance of TCE in MW84. Furthermore, the HWMFP allows for demonstrations consistent with the 2007 ASD (*Revised C-404 Landfill Statistically Significant Increase Source Demonstration*, PRS-ENM-0031/R2, transmitted via DOE correspondence, PPPO-02-506-07, August 1, 2007) to be submitted within the semiannual report.

## 7. GROUNDWATER COMPLIANCE MONITORING FOR THE C-404 HAZARDOUS WASTE LANDFILL

If it is determined that there is a confirmed statistically significant exceedance as defined in Section 5.2 for the hazardous constituents listed in Section 5.1, a Compliance Monitoring Program will be initiated within 180 days of the confirmed statistical exceedance. If there has been a confirmed statistically significant increase for a radionuclide constituent, then DOE will implement a Compliance Monitoring Program in accordance with Section 7.1 of this Part: Step (1) a., Step (2); Step (2) b; Step (3); Step (6); and Step (7).

### 7.1 COMPLIANCE MONITORING PROGRAM

If compliance monitoring is implemented, DOE will monitor wells to ensure that the regulated unit is in compliance with the groundwater protection standard and 40 *CFR* § 264.99. The hazardous constituents and the concentration limits presented in Part E, Table 4 comprise the groundwater protection standard. Additional hazardous constituent concentrations will be determined pursuant to Section 7.

**Part E, Table 4. Concentration Limits**

| Parameter     | Chemical Abstract Number | Concentration Limits<br>(mg/L) |
|---------------|--------------------------|--------------------------------|
| Arsenic       | 7440-38-2                | 0.05                           |
| Cadmium       | 7440-43-9                | 0.005                          |
| Chromium      | 7440-47-3                | 0.10                           |
| Lead          | 7439-92-1                | 0.05                           |
| Selenium      | 7782-49-2                | 0.05                           |
| Mercury       | 7439-97-6                | 0.002                          |
| TCE           | 79-01-6                  | 0.005                          |
| Technetium-99 | Not applicable (N/A)     | *                              |
| Uranium-234   | N/A                      | *                              |
| Uranium-235   | N/A                      | *                              |
| Uranium-238   | N/A                      | *                              |
| Uranium       | N/A                      | *                              |

\*There are no concentration limits for radionuclides.

- (1) If compliance monitoring is implemented, DOE will monitor for all hazardous constituents in Part E, Table 4 during the compliance period. The compliance period is the number of years equal to the active life of the waste management area including any waste management activity prior to issuance of the postclosure permit. This compliance period is 40 years. The compliance monitoring period will begin when the compliance monitoring program is initiated.
  - a. Beginning with the calendar quarter following the month for which a statistically significant increase was reported for a radionuclide, DOE will begin quarterly monitoring for the radionuclides

and will report the results to the EEC in accordance with Part E, Table 5. At the end of one year of quarterly monitoring, DOE will submit a report to the HWBM that identifies the groundwater fate and transport of the radionuclides. DOE may request that the frequency of the monitoring be modified after one year of quarterly monitoring.

**Part E, Table 5. Schedule for Submitting Sampling Results**

| <b>Samples to be Collected<br/>During the Month of:</b> | <b>Results Due to the<br/>Division by:</b> |
|---------------------------------------------------------|--------------------------------------------|
| October–March                                           | May 30                                     |
| April–September                                         | November 30                                |

- (2) DOE will, in accordance with 40 *CFR* § 264.95 and § 264.99, determine groundwater quality upgradient and at the compliance point, as described in Section 5.3 as follows:
  - a. DOE will determine groundwater quality throughout the postclosure care period pursuant to 40 *CFR* § 264.117. These determinations will be made semiannually, from at least one sample for each MW described in Part E, Table 1 and in accordance with 40 *CFR* § 264.97 and 40 *CFR* § 264.99.
  - b. DOE will express the groundwater quality at each MW in a form necessary for the determination of statistically significant exceedances in accordance with Section 5.2.
- (3) Compliance monitoring required in Section 7.1—Step (1) and Step (1).a—will consist of collecting, preserving, transporting, and analyzing samples from each upgradient and downgradient MW in Part E, Table 1 for those constituents listed in Part E, Table 4.
- (4) DOE will, in accordance with 40 *CFR* § 264.99(e), determine the groundwater flow rate and direction in the uppermost aquifer at least annually.
- (5) DOE will analyze samples from all MWs at the compliance point for all constituents contained in 40 *CFR* Part 264 Appendix IX, at least annually, to determine if additional hazardous constituents are present in the uppermost aquifer. If DOE finds additional hazardous constituents present, excluding those constituents in Part E, Table 4, their concentrations will be reported to the HWBM in writing within seven days of analysis, and they will be added to the monitoring list of Part E, Table 4 through permit modification.
- (6) DOE will perform a statistical comparison on a semiannual basis as specified in Section 5.4 pursuant to the reporting schedule in Part E, Table 5.
- (7) DOE will submit the analytical and statistical results required in accordance with the following schedule presented in Part E, Table 5.
- (8) If there has been a confirmed statistically significant exceedance above the groundwater protection standards established in Part E, Table 4, the DOE will do the following, pursuant to 40 *CFR* § 264.99(h):
  - a. Notify the HWBM in writing within seven days.
  - b. Submit to the HWBM an application for a permit modification to establish a corrective action program meeting the requirements of 40 *CFR* § 264.100 within 180 days or within 90 days if an

engineering feasibility study has been submitted previously to the HWBM. This requirement is not applicable when a statistically significant increase has been confirmed for a radionuclide.

- c. If it is demonstrated successfully that a source other than the regulated unit caused the increase or that the increase resulted from an error in sampling, analysis, statistical evaluation, or natural variation in the groundwater, as specified by 40 *CFR* § 264.99(i), a permit modification application will be submitted within 90 days for any appropriate changes to the compliance monitoring program.

## **8. CORRECTIVE ACTION FOR REGULATED UNITS**

The C-404 Landfill currently is in detection monitoring and currently is not required to establish a RCRA corrective action plan under 40 *CFR* § 264.100; however, EEC, DOE, and EPA (Region 4) have indicated an intention in the Federal Facility Agreement (FFA) for PGDP to coordinate DOE's Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) response obligations with the corrective measures/actions required by Kentucky's hazardous waste statutes and regulations. Accordingly, the C-404 Landfill has been included in the Burial Ground Operable Unit under the FFA. If corrective action is necessary, any remedial actions taken under the FFA will be coordinated with the corrective action program under this administrative regulation.

DOE will begin corrective action within a reasonable time period after the groundwater protection standard is exceeded. The corrective action program will include establishing and implementing a groundwater monitoring program to demonstrate the effectiveness of the corrective action program. Such a monitoring program may be based on the requirements for a compliance monitoring program under Section E7 and will be as effective as that program in determining compliance with the groundwater protection standard and in determining the success of a corrective action program.

In addition to the other requirements of the corrective action program, DOE will conduct a corrective action program to remove or treat in place any hazardous constituents listed in Part E, Table 4 that exceed concentration limits in groundwater:

- (1) Between the compliance point and the downgradient property boundary; and
- (2) Beyond the facility boundary, where necessary to protect human health and the environment, unless DOE demonstrates to the satisfaction of the EEC that, despite DOE's best efforts, DOE was unable to obtain the necessary permission to undertake such action. DOE is not relieved of all responsibility to cleanup a release that has migrated beyond the facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis.

Corrective action measures under this subsection may be terminated upon approval of the EEC once the concentration of hazardous constituents listed in Part E, Table 4 is reduced to levels below their respective concentration limits.

DOE will continue corrective action measures during the compliance period to the extent necessary to ensure that the groundwater protection standard is not exceeded. If DOE is conducting corrective action at the end of the compliance period, DOE will continue that corrective action for as long as necessary to achieve compliance with the groundwater protection standard. DOE may terminate corrective action measures taken beyond the period equal to the active life of the waste management area (including the closure period) if DOE can demonstrate to the satisfaction of the EEC based on data from the groundwater

monitoring program that the groundwater protection standard has not been exceeded for a period of three consecutive years. DOE will submit a report to the EEC on the effectiveness of the corrective action program at least semiannually.

If DOE determines that the corrective action program no longer satisfies the requirements of 40 *CFR* § 264.100, DOE will, within 90 days, submit an application for a permit modification to make any appropriate changes to the program.

Alternative requirements for groundwater monitoring and corrective action for releases to groundwater may be used under 40 *CFR* § 264.90(f), if the KDWM determines the alternative requirements will protect human health and the environment.

## **9. CORRECTIVE ACTION FOR SWMUs AND AOCs**

The EEC, DOE, and EPA (Region 4) have indicated an intention in the FFA for the PGDP to coordinate DOE's CERCLA response obligations with the corrective measures/actions required by Kentucky's hazardous waste statutes and regulations. Several solid waste management units (SWMUs), areas of concern (AOCs), and operable units have been identified and investigated under CERCLA. New SWMUs and AOCs are continually being identified at the PGDP. Information regarding these units is provided to the KDWM in an SWMU assessment report (SAR) and in investigation reports submitted under the FFA. Accordingly, these SWMUs are included in appropriate operable units for investigation and corrective actions under the FFA.

Appendix E4 lists SWMUs and AOCs that have been identified at PGDP. Table E4.1 lists the current SWMUs and AOCs at PGDP. Table E4.2 lists former SWMUs and AOCs at PGDP that were removed from the permit. These former SWMUs were deemed not to present a danger to human health or the environment and were granted no further action status. Appendix E5 presents a map, which depicts the location of the current SWMUs/AOCs.

SWMUs/AOCs, which have not been sufficiently addressed, will be addressed by a RCRA facility investigation (RFI)/remedial investigation (RI) or corrective measures study (CMS)/feasibility study (FS) in accordance with this section.

For purposes of compliance with the corrective action requirements of the HWMFP described below, these activities will include RCRA actions and their CERCLA counterparts.

### **9.1 NOTIFICATION AND ASSESSMENT REQUIREMENTS FOR NEWLY IDENTIFIED SWMUs AND AOCs**

DOE will prioritize any newly identified SWMUs/AOCs based on the threat that they present to human health and the environment. DOE will assign the new SWMU/AOC to an operable unit that best reflects the priority of the SWMUs/AOCs. DOE will notify the HWBM and recommend assigning the SWMUs/AOCs to an operable unit either within the SAR or within 30 days of approval of the SAR.

### **9.1.1 Notification of Discovery of SWMU or AOC**

DOE will notify the HWBM in writing, within 15 calendar days of discovery, of any additional SWMUs or AOCs [excluding any newly-designated SWMUs or AOCs that are associated with a facility being evaluated under a site evaluation (SE) in Appendix 4 of the site management plan (SMP)] that are discovered under any conditions consistent with the FFA. The notification will include, at a minimum, the location of the units and all available information pertaining to the nature of the release (e.g., media affected, hazardous constituents released, magnitude of release). If the HWBM determines that further investigations are required, then the permit will be modified. The requirements for notifications of Appendix 4 facilities are in the current, approved SMP.

### **9.1.2 Submittal of an Integrated Site Evaluation Report**

DOE will prepare and submit to the HWBM, within 90 calendar days of the notification, an integrated SE report that will consist of an integrated removal/remedial SE and SWMU assessment report [hereinafter referred to as an integrated SE report] for each new SWMU identified at the facility consistent with the FFA. The requirements for the submittal of an integrated SE report of Appendix 4 facilities in the SMP will be in accordance with condition of the Permit. At a minimum, the integrated SE report will provide the following information:

1. Location of unit(s) on a topographic map of appropriate scale as required under 40 *CFR* Part 270, Subpart B;
2. Designation of type and function of unit(s);
3. General dimensions, capacities, and structural description of unit(s) (supply any available plans/drawings);
4. Dates that the unit(s) was operated;
5. Specification of all wastes that have been managed at/in the unit(s) to the extent available (include any available data on constituents in the wastes); and
6. All available information pertaining to any release of hazardous waste or hazardous constituents from such unit(s) (to include groundwater data, soil analysis, air, and/or surface water data).

### **9.1.3 Notification and Submittal of an Integrated Site Evaluation Report [in Accordance with Section IX, Site Evaluation(s) of the FFA] for Newly Designated SWMUs or AOCs Associated with a Deactivated Facility Being Evaluated Under a Site Evaluation in Appendix 4 of the SMP**

DOE will notify the HWBM in the integrated SE report referenced in Section 9.1.2, within 120 days after completion of deactivation of any facility with any SWMUs or AOCs discovered during the deactivation process. The integrated SE report will include, at a minimum, the location of the newly discovered SWMUs or AOCs and all available information pertaining to the nature of the release (e.g., media affected, hazardous constituents released, magnitude of release). If the HWBM determines that further investigations are required, then the permit will be modified.

## **9.2 RCRA FACILITY INVESTIGATION (RFI)**

DOE will prepare and submit RFI work plans to the HWBM. For the investigation, units have been prioritized and assembled into operable units. The RFI work plan(s) will be developed to meet the requirements of the HWMFP.

In many instances, operable units contain both SWMUs/AOCs requiring an RFI and SWMUs/AOCs already being addressed under the FFA.

The RFI work plan(s) will meet all requirements, as applicable. The work plan(s) will include schedules of implementation and completion of specific actions necessary to determine the nature and extent of releases and the potential pathways of contaminant releases to the air, land, surface water, and groundwater. DOE will provide sufficient justification and/or documentation that a release is not probable if a unit or a media/pathway associated with a unit (groundwater, surface water, soil, subsurface gas, or air) is not included in the RFI work plan(s). Such deletions of a unit, media or pathway from the RFI(s) are subject to the approval of the HWBM. DOE will provide sufficient written justification for any omissions or deviations from the minimum requirements. Such omissions or deviations are subject to the approval of the HWBM. In addition, the scope of the RFI work plan(s) will include all investigations necessary to ensure compliance.

## **9.3 INTERIM MEASURES/REMOVAL ACTION**

Upon notification by the HWBM, DOE will prepare and submit an interim measures (IM)/removal action (RA) work plan for any SWMU or AOC that the HWBM determines poses a current or potential threat to human health or the environment. The IM/RA is necessary in order to minimize or prevent the further migration of contaminants and limit human and environmental exposure to contaminants while long-term corrective action remedies are evaluated and, if necessary, implemented. The IM/RA work plan will be submitted within 90 calendar days of such notification. Such interim measures may be conducted concurrently with investigations required under the terms of this permit. The IM/RA work plan will ensure that the interim measures are designed to mitigate any current or potential threat(s) to human health or the environment and is consistent with and integrated into any long-term solution at the facility. The IM/RA work plan will include the interim measures objectives, procedures for implementation (including any designs, plans, or specifications), and schedules for implementation. DOE will notify the HWBM as soon as possible of any planned changes, reductions, or additions to the IM/RA work plan.

## **9.4 CORRECTIVE MEASURES STUDY/FEASIBILITY STUDY**

DOE will submit a CMS/FS for those units requiring a CMS/FS within 180 calendar days of notification by the HWBM that a CMS/FS is required. The CMS/FS will meet all requirements, as applicable. The CMS/FS will include schedules of implementation and completion of specific actions necessary to complete the study. DOE will provide sufficient justification and/or documentation for any unit deleted from the CMS/FS. Such deletion of a unit is subject to the approval of the HWBM. DOE will provide sufficient written justification for any omissions or deviations from the minimum requirements. Such omissions or deviations are subject to the approval of the HWBM.

## **9.5 REMEDY APPROVAL AND PERMIT MODIFICATION**

A remedy will be selected from the remedial alternatives evaluated in the CMS/FS. It will be based at a minimum on protection of human health and the environment, as per specific site conditions, existing regulations, and guidance. The selected remedy may include any interim measures implemented to date.

**THIS PAGE INTENTIONALLY LEFT BLANK**

**APPENDIX EI**

**RESERVED**

**THIS PAGE INTENTIONALLY LEFT BLANK**

## **APPENDIX E2**

### **WELL CONSTRUCTION DIAGRAMS**

**THIS PAGE INTENTIONALLY LEFT BLANK**

## **WELL CONSTRUCTION DIAGRAMS AND BORING LOGS**

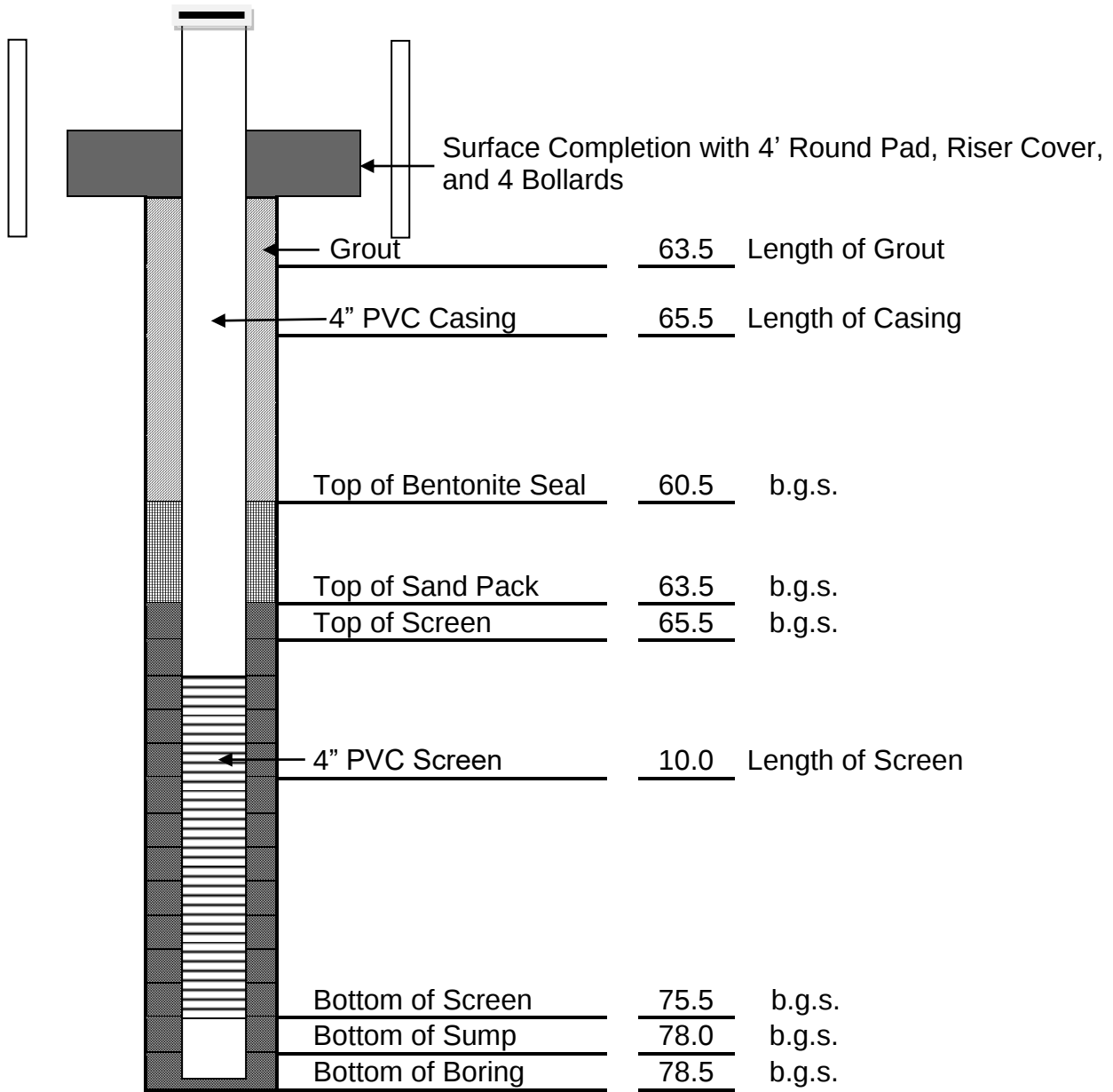
The ground elevation on some boring logs is higher than the ground elevation on the corresponding well construction diagrams. This is due to the fact that a gravel platform was utilized on some boring/well locations to allow operation of the drilling rig in the sloped toe of C-404 closure cap. Boring depths were measured relative to the top of the gravel platform. The top of ground subsequent to removal of the gravel platform is the ground zero elevation indicated on the well construction diagrams. One boring log is included for multiple cluster wells installed in close proximity.

The elevations of C-404 monitoring wells (MWs) are resurveyed, as needed, to ensure groundwater flow and direction calculations are accurate. The results of the resurveys are kept on site and supersede the elevations in the well construction diagrams.

The following well construction diagrams and maps document the materials used in the MWs, the locations of the wells, and the depths and heights of well screens and casings. Depths are presented in ft; diameters are presented in inches. The elevations are relative to mean sea level.

# MONITORING WELL CONSTRUCTION LOG

|                 |                 |                     |           |
|-----------------|-----------------|---------------------|-----------|
| Location Name:  | PGDP            | State Assigned #    | 8007-4849 |
| Address:        | 5600 Hobbs Road | AI #                | 3059      |
| City/State/Zip: | Kevil, KY 42053 | Facility Assigned # | MW-84A    |



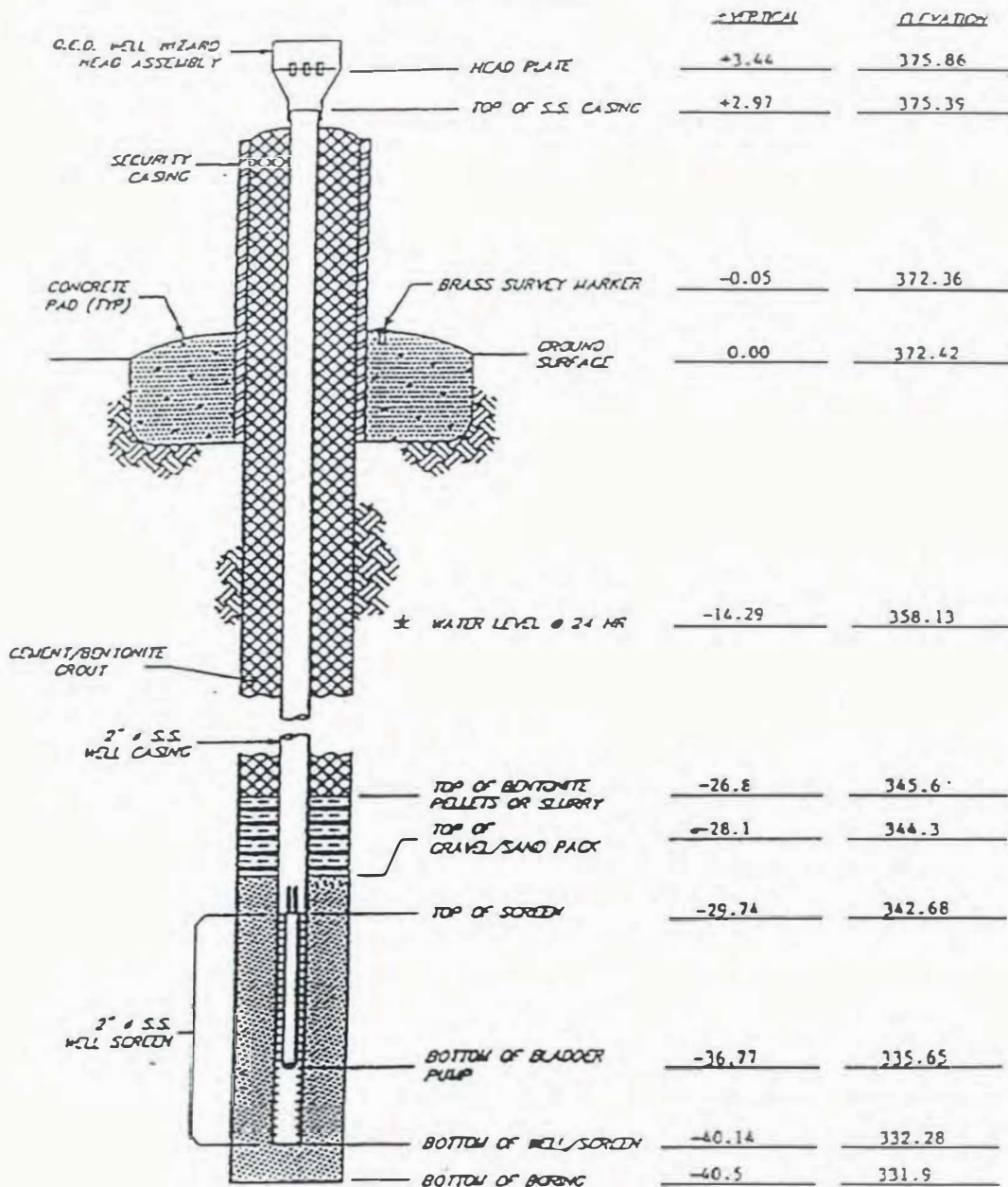
|                      |        |                            |               |                          |           |                          |        |
|----------------------|--------|----------------------------|---------------|--------------------------|-----------|--------------------------|--------|
| Depth to Groundwater | 50     | Total Depth of Boring (ft) | 78.5          | Total Depth of Well (ft) | 78.0      | Borehole Diameter        | 12.5   |
| Well Diameter (in)   | 4.0    | Slot Size (in)             | 0.010         | Grout Type               | Bentonite | Drilling in Consolidated | N/A    |
| Date:                | 8-2-19 | Completed By:              | Todd W. Mills |                          |           | Top of Casing            | 374.93 |

**ceg CHASE**  
Environmental Group INC

Comments: Drawing not to scale.

Four bollards were installed around each well. This is a 2D depiction of the well; therefore, you only see two bollards.

MONITORING WELL NO. ES  
 MONITORING WELL COORDINATES 0804.80 S 5960.21 W  
 INSTALLATION DATE 4 AUGUST 1988



PROJECT MARTIN MARIETTA ENERGY SYSTEMS  
PADUCAH GASEOUS DIFFUSION PLANT, KENTUCKY  
C-404 COMPLIANCE WELLS  
PROJECT NO. ESO 16749/GWM PHASE 2

PROJECT NO. X619112  
 DATE 7-18-88

SURFACE ELEVATION 374.35  
 BOTTOM OF HOLE DEPTH 106.5 ELEV 267.85  
 BORING LOCATION C-404 NW cluster @ 804.905 5945.24W  
 COMPLETION DATE 7-26-88

DRILLER R. Gossage  
 HELPER Geotek Staff  
 DRILLED FOR ESO 16749  
 RIG Mobile B-53  
 LOGGED BY W. S. Anderson

| LITHOLOGY<br>BREAK | SAMPLE<br>NO. | DEPTH |       | SAMPLE<br>BLOW* | DESCRIPTIONS AND REMARKS                                                                                       |
|--------------------|---------------|-------|-------|-----------------|----------------------------------------------------------------------------------------------------------------|
|                    |               | FROM  | TO    |                 |                                                                                                                |
| 3.5<br>18 ±        | 1             | 5.0   | 6.5   | 5-8-13          | Clay, very silty, light grayish-brown. (Loess)                                                                 |
|                    | 2             | 10.0  | 11.5  | 6-9-9           | Clay, very silty, light grayish-brown. (Loess)                                                                 |
|                    | 3             | 15.0  | 16.5  | 4-7-8           | Silt, very clayey, light brown, occasional mottled black. (Loess)                                              |
| 28 ±               | 4             | 20.0  | 21.5  | 50/0.5          | Gravel, very clayey, sandy, silty, brown.                                                                      |
|                    | 5             | 25.0  | 26.5  | 50/0.4          | Gravel, very clayey, silty, reddish-brown.                                                                     |
| 19.3<br>37 ±       | 6             | 30.0  | 31.5  | 4-5-7           | Sand, very clayey, very silty, brown. (Cohesive)                                                               |
|                    | 7             | 35.0  | 36.5  | 5-7-8           | Sand, very clayey, very silty, brown. (Cohesive)                                                               |
| 29.2<br>56 ±       | 8             | 40.0  | 41.5  | 7-12-16         | Clay, slightly silty, tan mottled light yellowish-brown.                                                       |
|                    | 9             | 45.0  | 46.5  | 8-13-19         | Clay, slightly silty, tan mottled light yellowish-brown.                                                       |
|                    | 10            | 50.0  | 51.5  | 7-8-15          | Clay, slightly silty, tan mottled light yellowish-brown.                                                       |
|                    | 11            | 55.0  | 56.5  | 9-9-11          | Clay, slightly silty, tan mottled light yellowish-brown.                                                       |
|                    | 12            | 60.0  | 61.5  | 6-9-12          | Clay, very sandy, very silty, tan mottled grayish-brown to gray (to 66.0 feet).                                |
| 11.2               | 13            | 65.0  | 66.5  | 7-18-32         | Sand, coarse to medium, light brown.                                                                           |
| 20.5<br>87 ±       | 14            | 70.0  | 70.5  | 50/0.5          | Gravel and sand, coarse to fine, slightly silty, brown.                                                        |
|                    | 15            | 75.0  | 76.0  | 28-50/0.5       | Gravel and sand, coarse to fine, slightly silty, brown.                                                        |
|                    | 16            | 80.0  | 81.5  | 18-21-25        | Gravel and sand, coarse, slightly silty, brown.                                                                |
|                    | 17            | 85.0  | 86.5  | 32-40-50/0.4    | Gravel and sand, coarse, slightly silty, brown.                                                                |
| 19.5<br>105.5      | 18            | 90.0  | 91.0  | 29-43           | Sand, fine to very fine, very silty, occasionally clayey, brown.                                               |
|                    | 19            | 95.0  | 96.5  | 18-39-50/0.3    | Sand, very fine to fine, silty, variably clayey with numerous clay seams, brown.                               |
|                    | 20            | 100.0 | 101.5 | 14-19-40        | Sand, fine, slightly silty, slightly clayey, reddish-brown.                                                    |
|                    | 21            | 105.0 | 106.5 | 24-16-49        | Sand, very fine, very clayey, very silty, light reddish-brown to light gray mottled reddish-brown, variegated. |
|                    |               |       |       |                 | Boring terminated @ 106.5 feet.                                                                                |

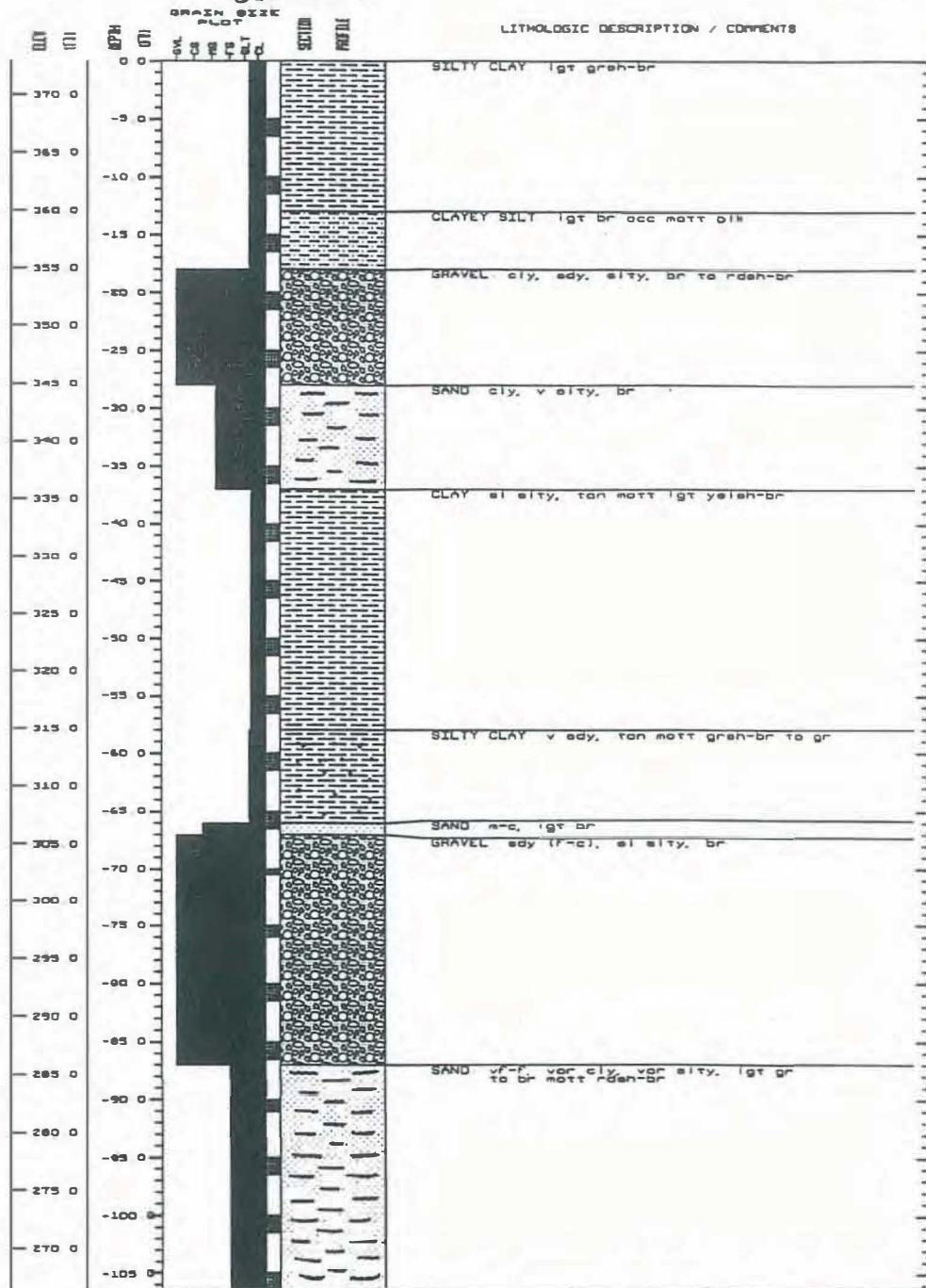
- \* NUMBER OF BLOWS PER 6" INTERVALS, TO DRIVE 1-3/8 I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES  
 • DENOTES SAMPLES ON WHICH GRAIN SIZE ANALYSES WERE PERFORMED.

MW 86

MW-86

GL = 372.03

TD = 107



C-404 cluster

Loc. Inside PGDP N Virginia Ave/6<sup>th</sup> St. Intersec

W 5945 - S 805

MAP B, D

CLUSTERED WITH MW 84, 85

Location Inside PGDP, C-404, (W5945 - S805)

MW-86

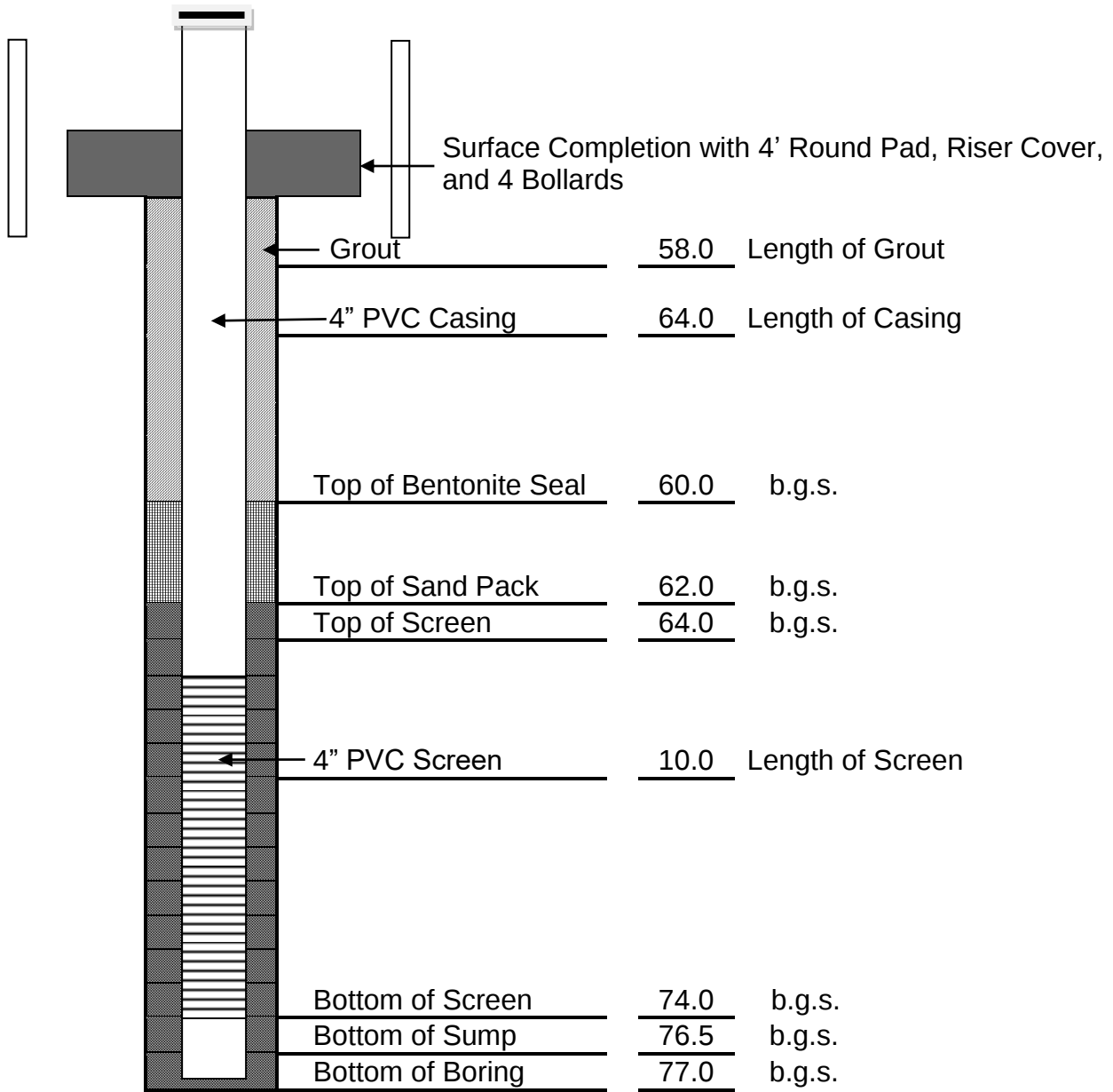
TD 106.5' (Driller)

GL 372.8'

| ELEV<br>(FT) | DEPTH<br>(FT) | LITHOLOGY | Sample<br>REC. | LITHOLOGIC DESCRIPTION / COMMENTS                      |
|--------------|---------------|-----------|----------------|--------------------------------------------------------|
| 370.0        | 0.0           |           |                | No Sample                                              |
| 365.0        | -5.0          |           |                | Silty Clay lt. gray-brown                              |
| 360.0        | -10.0         |           |                |                                                        |
| 355.0        | -15.0         |           |                | Clayey Silt lt. brown with occasional black mottling   |
| 350.0        | -20.0         |           |                | Sandy Gravel clayey, silty, brown to red-brown         |
| 345.0        | -25.0         |           |                |                                                        |
| 340.0        | -30.0         |           |                | Clayey Silty Sand cohesive, brown                      |
| 335.0        | -35.0         |           |                |                                                        |
| 330.0        | -40.0         |           |                |                                                        |
| 325.0        | -45.0         |           |                | Clay slightly silty, mottled tan and lt. yellow-brown  |
| 320.0        | -50.0         |           |                |                                                        |
| 315.0        | -55.0         |           |                |                                                        |
| 310.0        | -60.0         |           |                | Sandy Clay silty, mottled tan and gray-brown           |
| 305.0        | -65.0         |           |                | Sand m-c, lt. brown                                    |
| 300.0        | -70.0         |           |                | Gravel and Sand sand c-f, slightly silty, brown        |
| 295.0        | -75.0         |           |                |                                                        |
| 290.0        | -80.0         |           |                | Gravel and Sand sand c, slightly silty, brown          |
| 285.0        | -85.0         |           |                |                                                        |
| 280.0        | -90.0         |           |                | Silty Sand f-vf, occasionally clayey, brown            |
| 275.0        | -95.0         |           |                | Silty Sand interbedded with clay, sand as above, brown |
| 270.0        | -100.0        |           |                | Sand slightly silty, slightly clayey, f, red-brown     |
|              | -105.0        |           |                | Silty Clayey Sand vf, mottled lt. gray and red-brown   |

# MONITORING WELL CONSTRUCTION LOG

|                 |                 |                     |           |
|-----------------|-----------------|---------------------|-----------|
| Location Name:  | PGDP            | State Assigned #    | 8007-4850 |
| Address:        | 5600 Hobbs Road | AI #                | 3059      |
| City/State/Zip: | Kevil, KY 42053 | Facility Assigned # | MW-87A    |



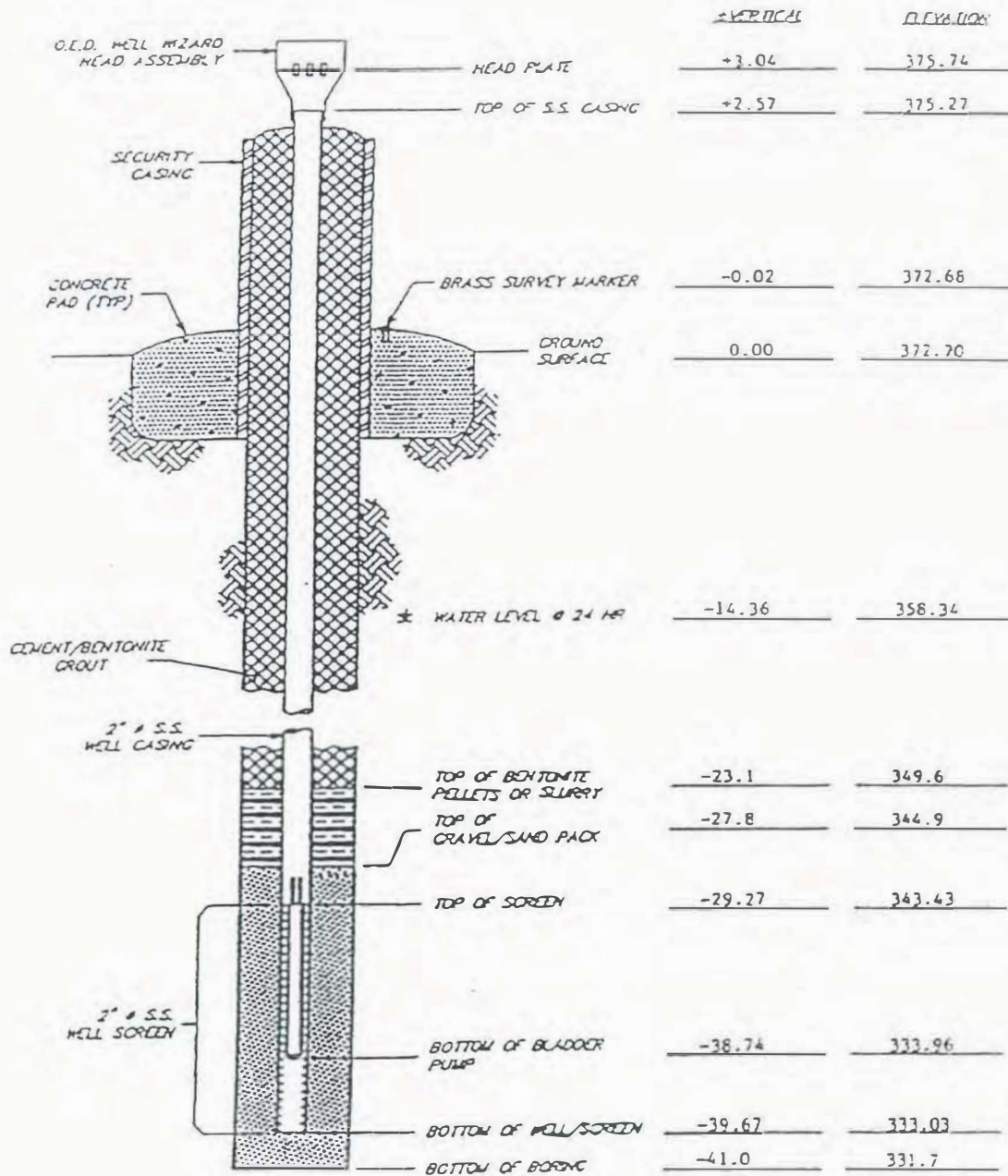
|                      |        |                            |               |                          |           |                          |        |
|----------------------|--------|----------------------------|---------------|--------------------------|-----------|--------------------------|--------|
| Depth to Groundwater | 50     | Total Depth of Boring (ft) | 77.0          | Total Depth of Well (ft) | 76.5      | Borehole Diameter        | 12.5   |
| Well Diameter (in)   | 4.0    | Slot Size (in)             | 0.010         | Grout Type               | Bentonite | Drilling in Consolidated | N/A    |
| Date:                | 8-2-19 | Completed By:              | Todd W. Mills |                          |           | Top of Casing            | 374.89 |

**ceg CHASE**  
Environmental Group INC

Comments: Drawing not to scale.

Four bollards were installed around each well. This is a 2D depiction of the well; therefore, you only see two bollards.

MONITORING WELL NO. 6E  
 MONITORING WELL COORDINATES 0805.09 S 5805.90 W  
 INSTALLATION DATE 15 JULY 1966



PROJECT MARTIN MARIETTA ENERGY SYSTEMS  
PADUCAH GASEOUS DIFFUSION PLANT, KENTUCKY  
C-404 COMPLIANCE WELLS  
PROJECT NO. ESO 16749/GWM PHASE 2

PROJECT NO. X619112

DATE

SURFACE ELEVATION 372.84  
BOTTOM OF HOLE DEPTH 96.5 ELEV 276.34  
BORING LOCATION C-404 north center cluster @ 804.135 5795.14W  
COMPLETION DATE 7-13-88

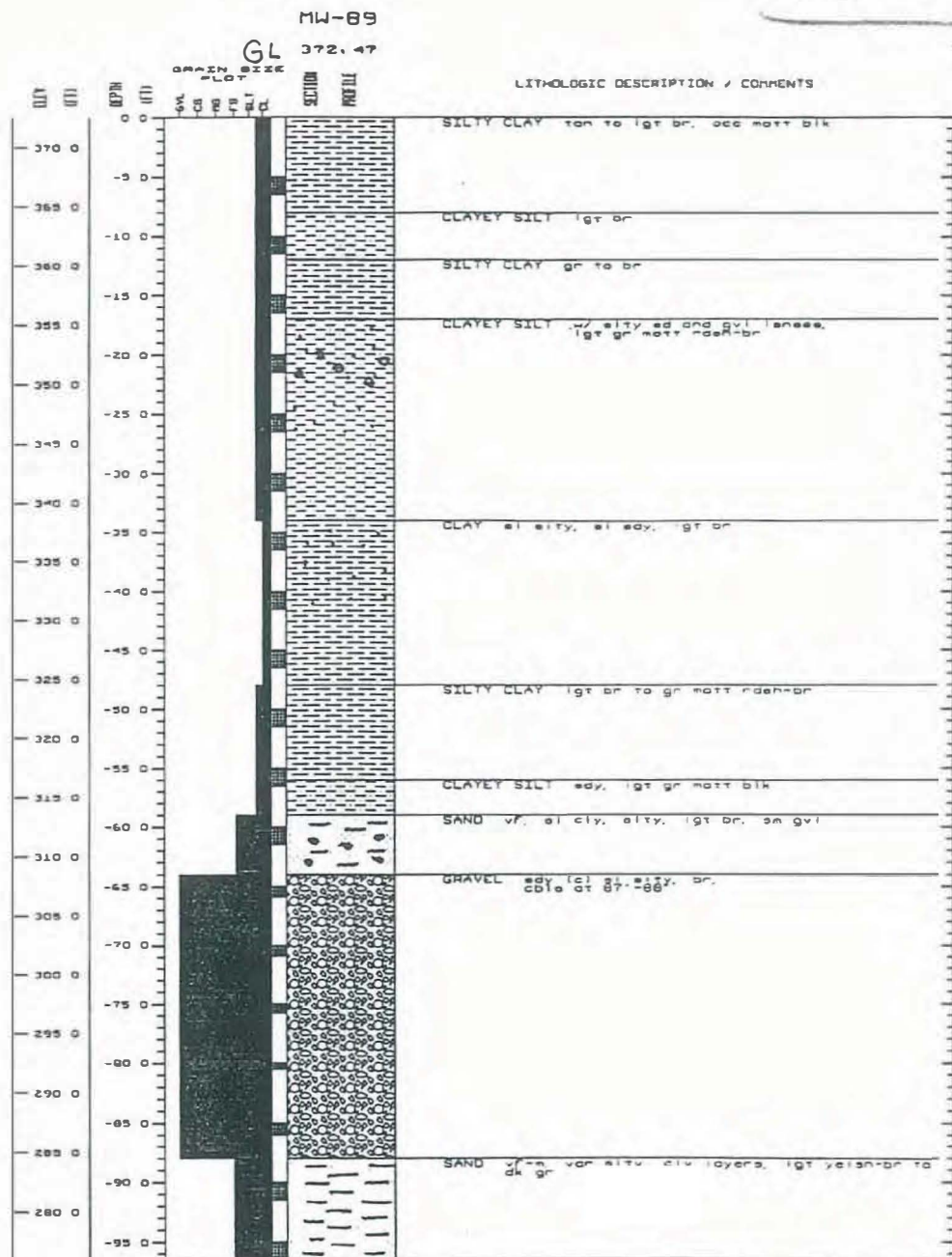
DRILLER R. Gossage  
HELPER Geotek Staff  
DRILLED FOR ESO 16749  
RIG Mobile B-53  
LOGGED BY W. S. Anderson

| LITHOLOGY<br>BREAK | SAMPLE<br>NO. | DEPTH |      | SAMPLE<br>BLOW* | DESCRIPTIONS AND REMARKS                                                                               |
|--------------------|---------------|-------|------|-----------------|--------------------------------------------------------------------------------------------------------|
|                    |               | FROM  | TO   |                 |                                                                                                        |
| 15                 | 1             | 5.0   | 6.5  | 4-6-9           | Clay, silty, tan to light brown, occasional mottled black (Loess).                                     |
|                    | 2             | 10.0  | 11.5 | 4-5-8           | Silt, very clayey, light brown (Loess).                                                                |
|                    | 3             | 15.0  | 16.5 | 5-8-10          | Clay, very silty, gray to brown (Loess).                                                               |
| 17 ±<br>17 3       | 4             | 20.0  | 21.5 | 4-10-10         | Silt, very clayey with silty sand lenses and small gravel, light brown (Moist).                        |
|                    | 5             | 25.0  | 26.5 | 7-8-13          | Silt, very clayey, sandy, light gray mottled reddish-brown (Dry).                                      |
|                    | 6             | 30.0  | 31.5 | 20-27-31        | Silt, slightly clayey, light gray mottled reddish-brown (Dry)(Dense).                                  |
| 25 3               | 7             | 35.0  | 36.5 | 6-7-7           | Clay, slightly silty, slightly sandy, light brown (Moist/Highly cohesive)                              |
|                    | 8             | 40.0  | 41.5 | 5-8-11          | Clay, slightly silty, slightly sandy, light brown (Moist/Highly cohesive)                              |
|                    | 9             | 45.0  | 46.5 | 8-13-17         | Clay, slightly silty, slightly sandy, light brown (Moist/Highly cohesive)                              |
|                    | 10            | 50.0  | 51.5 | 9-11-13         | Clay, silty, light brown to gray mottled reddish-brown.                                                |
|                    | 11            | 55.0  | 56.5 | 6-6-7           | Clay, silty, light brown (to 56.0 feet) then Silt, sandy, clayey, light gray mottled black             |
| 1.59 ±             | 12            | 60.0  | 61.5 | 9-19-22         | Sand, very fine, silty, slightly clayey to clayey, light brown, small gravel @ 63.3 feet.              |
| 26 5               | 13            | 65.0  | 65.9 | 30-50/0.4       | Gravel and coarse sand, slightly silty, brown.                                                         |
|                    | 14            | 70.0  | 70.9 | 21-50/0.4       | Gravel and coarse sand, slightly silty, brown.                                                         |
|                    | 15            | 75.0  | 75.8 | 24-50/0.3       | Gravel and coarse sand, slightly silty, brown.                                                         |
|                    | 16            | 80.0  | 80.5 | 50/0.5          | Gravel and coarse sand, slightly silty, brown.                                                         |
|                    | 17            | 85.0  | 86.0 | 49-50/0.4       | Sand, coarse with abundant gravel, silty, brown (very dense cobbles, gravel 87.0 to 88.0 feet).        |
| 88 ±<br>8.1 -      | 18            | 90.0  | 91.5 | 25-30-28        | Sand, fine occasionally medium to very fine, variably silty, with clay stringers.                      |
|                    | 19            | 95.0  | 96.5 | 12-8-15         | Sand, fine to very fine, silty with very clayey layers, light yellowish-brown, occasionally dark gray. |
|                    |               |       |      |                 | Boring terminated @ 96.5 feet.                                                                         |

- \* NUMBER OF BLOWS PER 5" INTERVALS, TO DRIVE 1-3/8 I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES  
• DENOTES SAMPLES ON WHICH GRAIN SIZE ANALYSES WERE PERFORMED.

MW 89

TCE = 2



Loc. inside PGDP N of Virginia Ave/6th ST

W 5795 - S 804

C-404 cluster

MAP B, D

Same Location  
as MW 55, 56, 87, 88  
Close to MW 72

\* Part of Aquifer test (Terran, 1984)

| ELEV<br>(FT) | DEPTH<br>(FT) | LITHOLOGY | Sample<br>REC. | LITHOLOGIC DESCRIPTION / COMMENTS                                                          |
|--------------|---------------|-----------|----------------|--------------------------------------------------------------------------------------------|
|              | 0.0           |           |                |                                                                                            |
| 370.0        |               |           |                | No Sample                                                                                  |
|              | -5.0          |           |                | Silty Clay tan to lt. brown with occasional black mottling                                 |
| 365.0        |               |           |                |                                                                                            |
|              | -10.0         |           |                | Clayey Silt lt. brown                                                                      |
| 360.0        |               |           |                |                                                                                            |
|              | -15.0         |           |                | Silty Clay gray to brown                                                                   |
| 355.0        |               |           |                |                                                                                            |
|              | -20.0         |           |                | Clayey Silt with sand and gravel interbeds, lt. brown, moist                               |
| 350.0        |               |           |                |                                                                                            |
|              | -25.0         |           |                | Clayey Silt with sand, mottled lt. gray and red-brown, dry                                 |
| 345.0        |               |           |                |                                                                                            |
|              | -30.0         |           |                | Silt dense, slightly clayey, mottled lt. gray and red-brown, dry                           |
| 340.0        |               |           |                |                                                                                            |
|              | -35.0         |           |                |                                                                                            |
| 335.0        |               |           |                |                                                                                            |
|              | -40.0         |           |                | Clay cohesive, slightly silty and sandy, lt. brown, moist                                  |
| 330.0        |               |           |                |                                                                                            |
|              | -45.0         |           |                |                                                                                            |
| 325.0        |               |           |                |                                                                                            |
|              | -50.0         |           |                | Silty Clay lt. brown to gray mottled red-brown                                             |
| 320.0        |               |           |                |                                                                                            |
|              | -55.0         |           |                |                                                                                            |
| 315.0        |               |           |                | Sandy Silt clayey, lt. gray mottled black                                                  |
|              | -60.0         |           |                | Silty Sand variable clay, vf, lt. brown                                                    |
| 310.0        |               |           |                |                                                                                            |
|              | -65.0         |           |                | Gravelly Sand with silt, vf, lt. brown                                                     |
| 305.0        |               |           |                |                                                                                            |
|              | -70.0         |           |                |                                                                                            |
| 300.0        |               |           |                | Gravel and Sand sand c, slightly silty, brown                                              |
| 295.0        |               |           |                |                                                                                            |
|              | -75.0         |           |                |                                                                                            |
| 290.0        |               |           |                |                                                                                            |
|              | -80.0         |           |                |                                                                                            |
|              | -85.0         |           |                | Gravelly Sand silty, c. brown                                                              |
| 285.0        |               |           |                | Gravel very dense cobbles                                                                  |
|              | -90.0         |           |                | Sand and Clay Interbedded, sand f-vf, occasionally m                                       |
| 280.0        |               |           |                |                                                                                            |
|              | -95.0         |           |                | Silty Sand vf-l, with very thin clay Interbeds. lt. yellow-brown and occasionally dk. gray |

|                                       |                                                        |
|---------------------------------------|--------------------------------------------------------|
| Well No. MW90A                        | Installation: N/A                                      |
| Project No. N/A                       | Client/Project: BJC/C-404 Well Abandonment/Replacement |
| Contractor SAIC                       | Drill Contractor: Miller Government Services           |
| Start Date: 10/17/2001 (1456 M)       | End Date: 10/22/2001 (1224 M)                          |
| Well Coord: N - 794.77<br>E - 5988.21 |                                                        |

Elev.: 374.46 (TOC)  
Height: 3 ft  
Elev.: 374.25 (WWP)  
GS Elev. 372.41 (brass cap)

Depth

2'

44'

55'

59.5'

62'

72'

75'

N/A

19.5'

4.5'

11'

**Protective CSG**  
Material Type: Steel  
Diameter: 10"  
Depth BGS: 2' Weep Hole? (Y/N) (N)  
Guard Posts (Y/N) (Y)  
No. 2 Type Steel

**Surface Pad**  
Composition and Size 4' x 4' Concrete

**Riser Pipe**  
Type PVC, Schedule 40  
Diameter 4"  
Total Depth (TOC to TOS) 65'  
Ventilated Cap (Y/N) N/A

**Grout**  
Composition & Proportions Pure Grout  
Grout Type Bentonite  
Weight (lbs/gal.) 1.00 - 10.2  
% Solids 30%  
Tremied (Y/N) (Y) Yes  
Interval BGS 0' - 55'

**Centralizers (Y/N)** (N)  
Depth(s) N/A

**Seal**  
Type High Yield Western Bentonite 3/8" Pellets  
Source Pel Plug  
Setup/Hydration Time 16 hours Vol. Fluid Added N/A  
Tremied (Y/N) (N)

**Filter Pack**  
Graduation Designation #1 DSI Filter Sand  
Grain Size Analysis available in project file  
Type Sand  
Amt. Used 8.5 bags  
Tremied (Y/N) (Y) N/A  
Source Available in project file  
GR Size Dist Analysis available in project file

**Screen**  
Type PVC  
Diameter 4"  
Length 10'  
Slot Size and Type 10-slot  
Interval BGS 62' - 72'

**Isolation Casing (Y/N)** (Y)  
Type PVC  
Diameter 12"  
Total Length 44'

**Sump (Y/N)** (Y)  
Interval BGS 72' - 75'  
Bottom Cap (Y/N) (Y) Yes

**Backfill Plug**  
Material N/A  
Setup/Hydration Time N/A  
Tremied (Y/N) (N)

U. S. DEPARTMENT OF ENERGY  
DOE OAK RIDGE OPERATIONS  
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL BECHTEL JACOBS COMPANY, LLC  
JACOBS  MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER  
US GOVERNMENT CONTRACT DE-AC-05-98OR22700  
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

**SAIC**

Science Applications  
International Corporation  
P.O. Box 2502  
Oak Ridge, Tennessee 37831

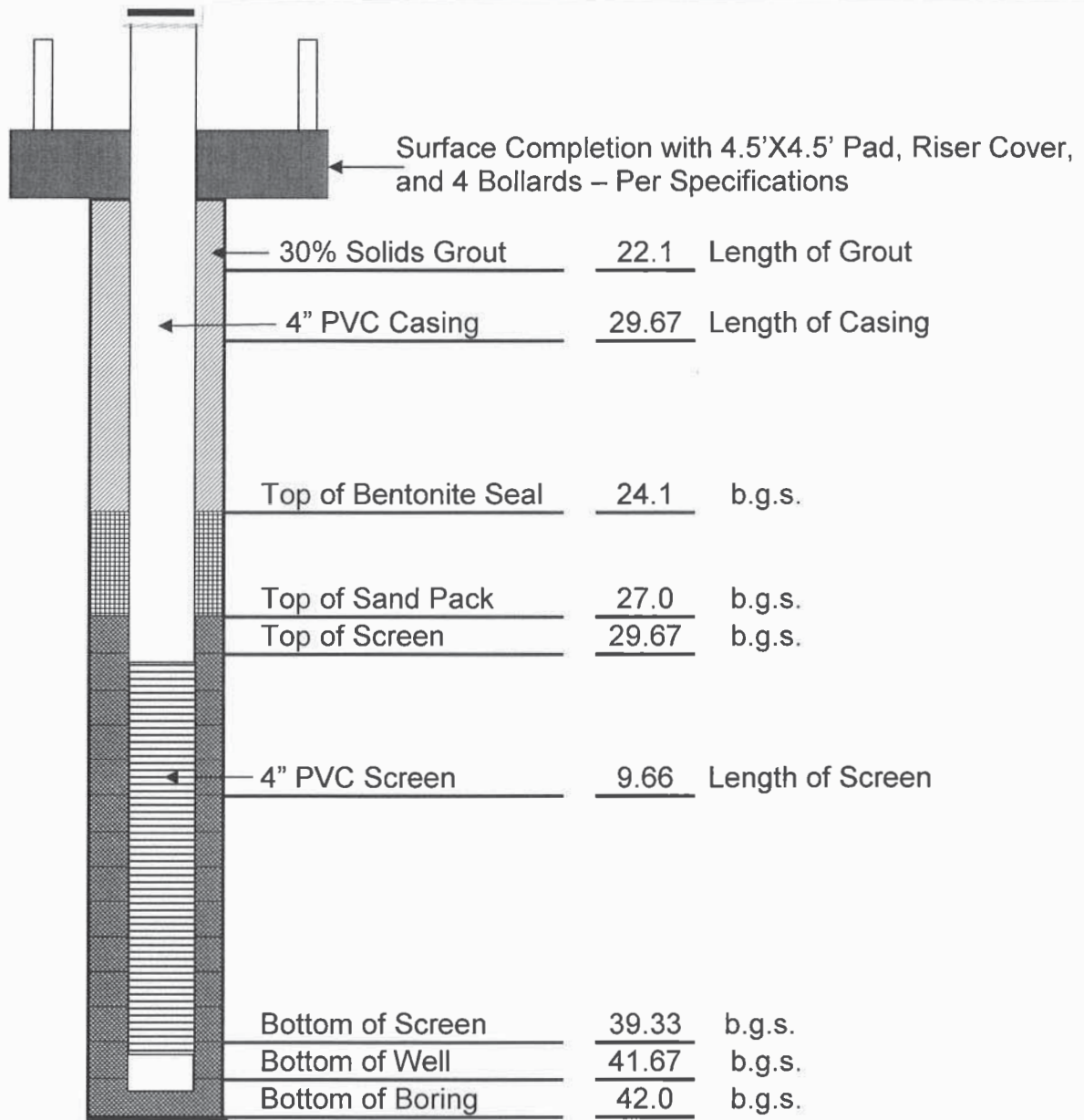
Monitoring Well 90A Construction Log.

FIGURE No. c5ac90001sk147.ppt  
DATE 12-12-01

# MONITORING WELL CONSTRUCTION LOG

Location Name: PGDP NE Plume  
Address: 5600 Hobbs Road  
City/State/Zip: Kevil, KY 42053

State Assigned # 8007-2917  
AI # 3059  
Facility Assigned # MW-91A



|                      |          |                            |               |                          |           |                          |        |
|----------------------|----------|----------------------------|---------------|--------------------------|-----------|--------------------------|--------|
| Depth to Groundwater | 21.0     | Total Depth of Boring (ft) | 42.0          | Total Depth of Well (ft) | 41.67     | Borehole Diameter        | 12.5   |
| Well Diameter        | 4        | Slot Size                  | 0.010         | Grout Type               | Bentonite | Drilling in Consolidated | N/A    |
| Date:                | 10-12-17 | Completed By:              | Todd W. Mills |                          |           | Top Of Inside Casing     | 375.34 |

**ceg CHASE**  
Environmental Group INC

Comments: Drawing not to scale.

PROJECT MARTIN MARIETTA ENERGY SYSTEMS  
PADUCAH GASEOUS DIFFUSION PLANT, KENTUCKY  
C-404 COMPLIANCE WELLS  
PROJECT NO. ESO 16749/GWM PHASE 2

PROJECT NO. X619112  
 DATE 6-13-88

SURFACE ELEVATION 371.8  
 BOTTOM OF HOLE DEPTH 91.0 ELEV 280.8  
 BORING LOCATION Northeast cluster @ 805.26 5645.00 W  
 COMPLETION DATE 6-15-88

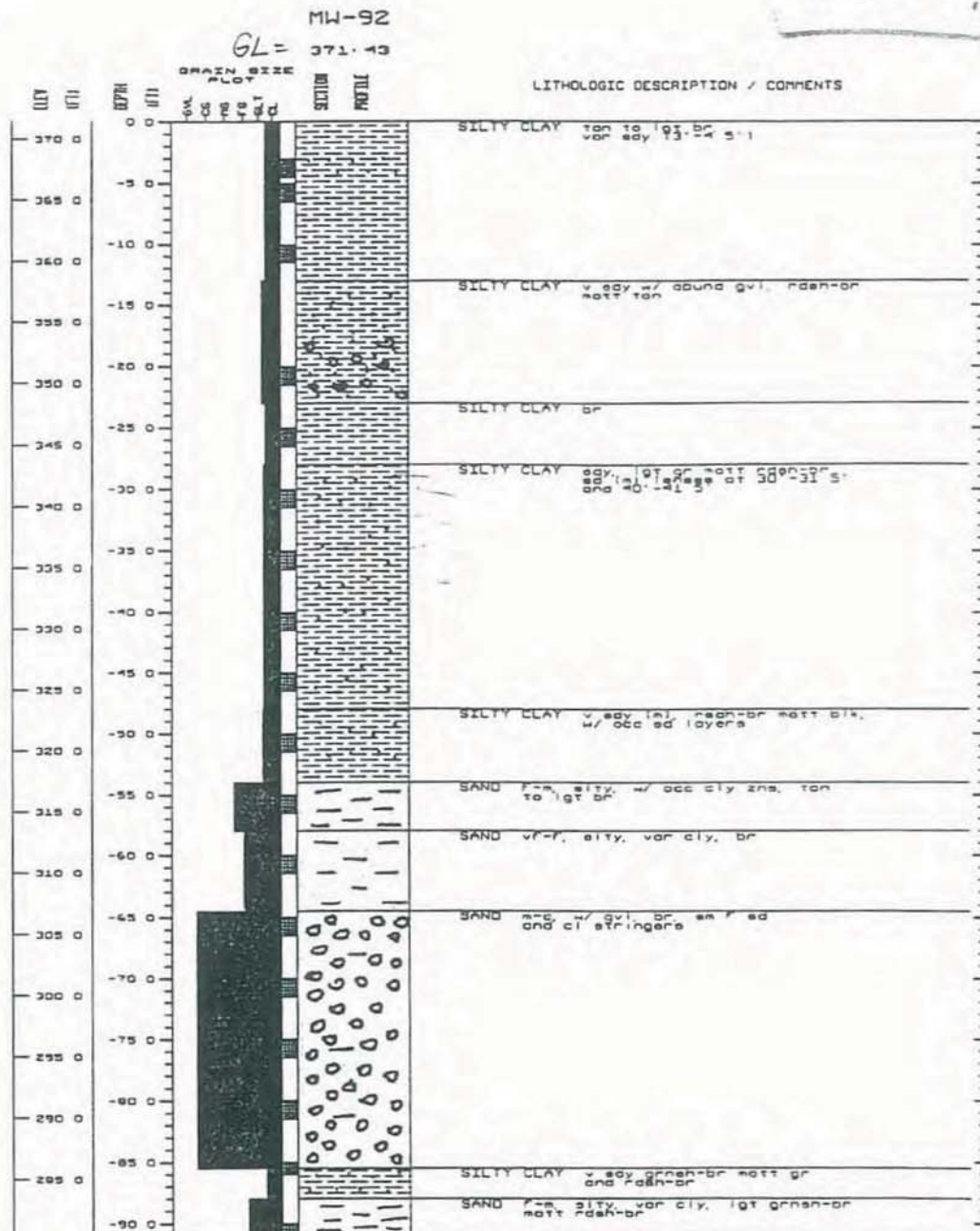
DRILLER R. Gossage  
 HELPER Geotek Staff  
 DRILLED FOR ESO 16749  
 RIG Mobile B-53  
 LOGGED BY W. S. Anderson

| LITHOLOGY<br>BREAK    | SAMPLE<br>NO. | DEPTH |      | SAMPLE<br>BLOW* | DESCRIPTIONS AND REMARKS                                                                                                                   |
|-----------------------|---------------|-------|------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|                       |               | FROM  | TO   |                 |                                                                                                                                            |
| 17<br>13±             | 1             | 3.0   | 4.5  | 6-9-13          | Clay, silty, variably sandy, light brown (Loess).                                                                                          |
|                       | 2             | 5.0   | 6.5  | 5-5-7           | Clay, silty, light brown to tan (Loess).                                                                                                   |
|                       | 3             | 10.0  | 11.5 | 6-8-9           | Clay, silty, light brown to tan (Loess).                                                                                                   |
| 0 (2)<br>4 (3)<br>54± | 4             | 20.0  | 21.5 | 16-18-13        | Clay, very silty, very sandy with abundant gravel, reddish-brown mottled tan.                                                              |
|                       | 5             | 25.0  | 26.5 | 9-13-13         | Clay, silty, brown.                                                                                                                        |
|                       | 6             | 30.0  | 31.5 | 19-23-27        | Clay, very silty, sandy, light yellowish-brown with sand (medium) lenses.                                                                  |
|                       | 7             | 35.0  | 36.5 | 7-9-14          | Clay, very silty, sandy, light gray to gray mottled reddish-brown.                                                                         |
|                       | 8             | 40.0  | 41.5 | 10-14-22        | Clay, slightly silty, brown with occasional sand seams.                                                                                    |
|                       | 9             | 45.0  | 46.5 | 14-21-29        | Clay, silty, sandy, brown.                                                                                                                 |
|                       | 10            | 50.0  | 51.5 | 8-3-20          | Clay, very sandy (medium), very silty, reddish-brown mottled black with occasional sand seams.                                             |
| 10.5±<br>64.5±        | 11            | 55.0  | 56.5 | 9-16-25         | Sand, fine to medium, silty with occasional clayey zones, tan to light brown.                                                              |
|                       | 12            | 60.0  | 61.5 | 10-15-16        | Sand, fine to very fine, silty, variably clayey, brown.                                                                                    |
| 21<br>85.5            | 13            | 65.0  | 66.5 | 28-35-50/0.4    | Sand, (coarse) and gravel with occasional seams of fine sand, very silty, brown.                                                           |
|                       | 14            | 70.0  | 71.5 | 16-18-50/0.3    | Sand, coarse to medium with gravel, brown.                                                                                                 |
|                       | 15            | 75.0  | 76.5 | 19-25-30        | Sand, coarse, slightly silty with occasional diagonal clay stringers, brown.                                                               |
|                       | 16            | 80.0  | 81.5 | 21-50/0.3       | Sand, coarse to medium with abundant gravel, brown.                                                                                        |
|                       | 17            | 85.0  | 86.0 | 26-27           | Sand, coarse to medium with gravel, brown (to 85.5 feet) then Clay, very sandy, very silty, greenish-brown mottled gray and reddish-brown. |
| 1--                   | 18            | 90.0  | 91.0 | 28-50/0.5       | Sand, fine to medium, variably clayey, silty, light greenish-brown mottled reddish-brown.                                                  |
|                       |               |       |      |                 | Boring terminated @ 91.0 feet.                                                                                                             |

- \* NUMBER OF BLOWS PER 6" INTERVALS, TO DRIVE 1-3/8 I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES  
 • DENOTES SAMPLES ON WHICH GRAIN SIZE ANALYSES WERE PERFORMED.

MW 92

TD = 1



C-404 cluster

Loc. Inside P6DP, Virginia / 6<sup>th</sup> Intersection

W 5645 - S 805

MAP B, D

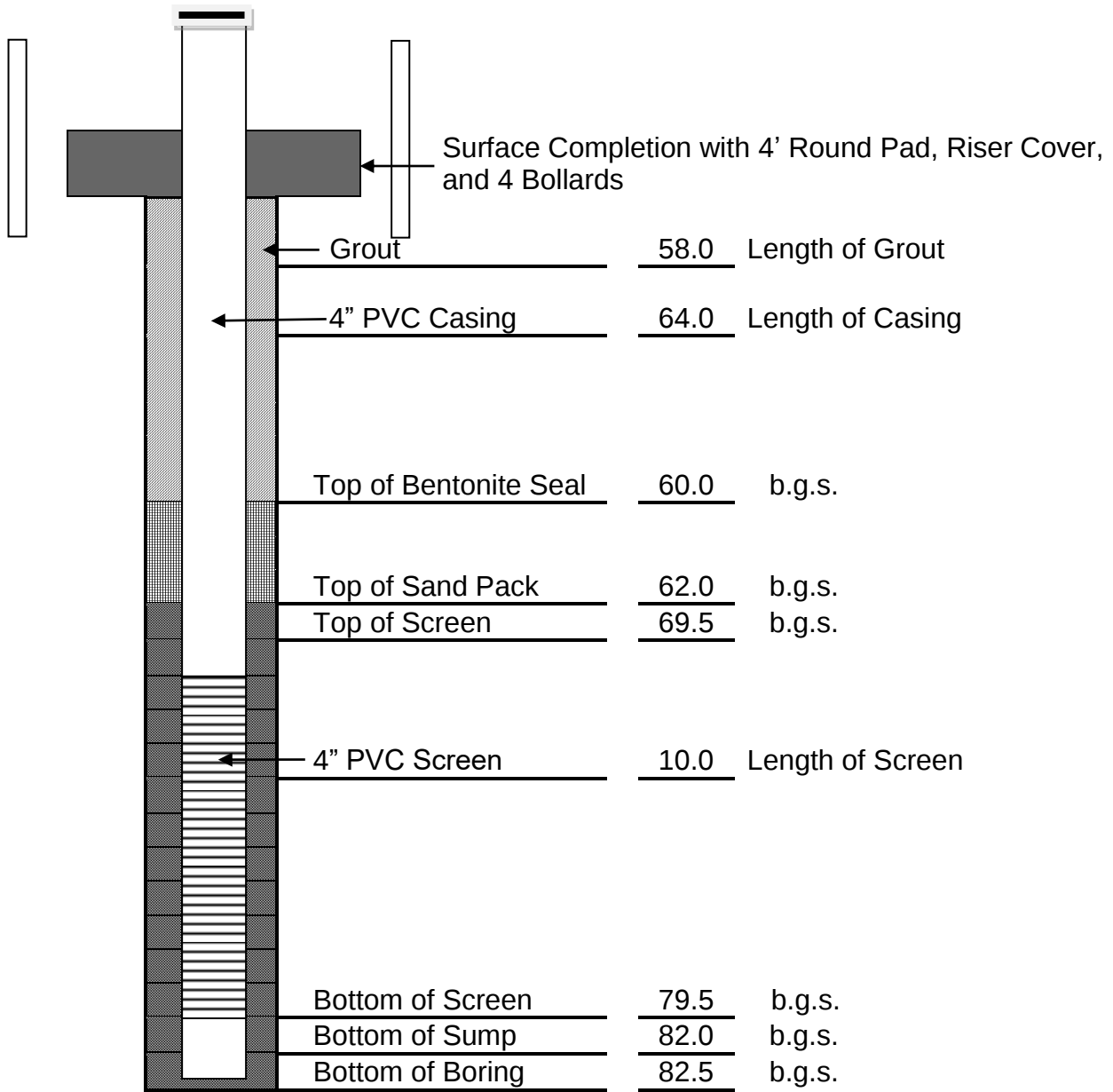
Loc. near MW 75

Twins to MW 90, 91

| ELEV<br>(FT) | DEPTH<br>(FT) | LITHOLOGY | Sample<br>REC. | LITHOLOGIC DESCRIPTION / COMMENTS                                     |
|--------------|---------------|-----------|----------------|-----------------------------------------------------------------------|
| 370.0        | 0.0           |           |                | No Sample                                                             |
| 365.0        | -5.0          |           |                | Silty Clay variably Sandy, lt. brown                                  |
| 360.0        | -10.0         |           |                |                                                                       |
| 355.0        | -15.0         |           |                |                                                                       |
| 350.0        | -20.0         |           |                | Silty Clay with sand and gravel, mottled tan and red-brown            |
| 345.0        | -25.0         |           |                | Silty Clay brown                                                      |
| 340.0        | -30.0         |           |                | Sandy Clay interbedded with sand, m, lt. yellow-brown                 |
| 335.0        | -35.0         |           |                | Sandy Clay with silt, mottled lt. gray to mottled gray and red-brown  |
| 330.0        | -40.0         |           |                | Clay with occasional sand interbeds, slightly silty, brown            |
| 325.0        | -45.0         |           |                | Sandy Clay with silt, brown                                           |
| 320.0        | -50.0         |           |                | Sandy Clay with silt and occasional sand interbeds, red-brown         |
| 315.0        | -55.0         |           |                | Silty Sand f-m, with occasional clayey zones, tan to lt. brown        |
| 310.0        | -60.0         |           |                | Silty Sand f-vf, variably clayey, brown                               |
| 305.0        | -65.0         |           |                | Sand and Gravel occasional sand interbeds, silty, brown               |
| 300.0        | -70.0         |           |                | Sand and Gravel sand c-m, brown                                       |
| 295.0        | -75.0         |           |                | Sand c, slightly silty with occasional diagonal clay stringers, brown |
| 290.0        | -80.0         |           |                | Sand and Gravel sand c-m, brown                                       |
| 285.0        | -85.0         |           |                | Sandy Clay with silt, green-brown mottled gray and red-brown          |
|              | -90.0         |           |                | Silty Sand f-m, variably clayey, lt. green-brown and red-brown        |

# MONITORING WELL CONSTRUCTION LOG

|                 |                 |                     |           |
|-----------------|-----------------|---------------------|-----------|
| Location Name:  | PGDP            | State Assigned #    | 8007-4851 |
| Address:        | 5600 Hobbs Road | AI #                | 3059      |
| City/State/Zip: | Kevil, KY 42053 | Facility Assigned # | MW-93A    |



|                      |        |                            |               |                          |           |                          |        |
|----------------------|--------|----------------------------|---------------|--------------------------|-----------|--------------------------|--------|
| Depth to Groundwater | 50     | Total Depth of Boring (ft) | 82.5          | Total Depth of Well (ft) | 82.0      | Borehole Diameter        | 12.5   |
| Well Diameter (in)   | 4.0    | Slot Size (in)             | 0.010         | Grout Type               | Bentonite | Drilling in Consolidated | N/A    |
| Date:                | 8-2-19 | Completed By:              | Todd W. Mills |                          |           | Top of Casing            | 378.20 |

**ceg CHASE**  
Environmental Group INC

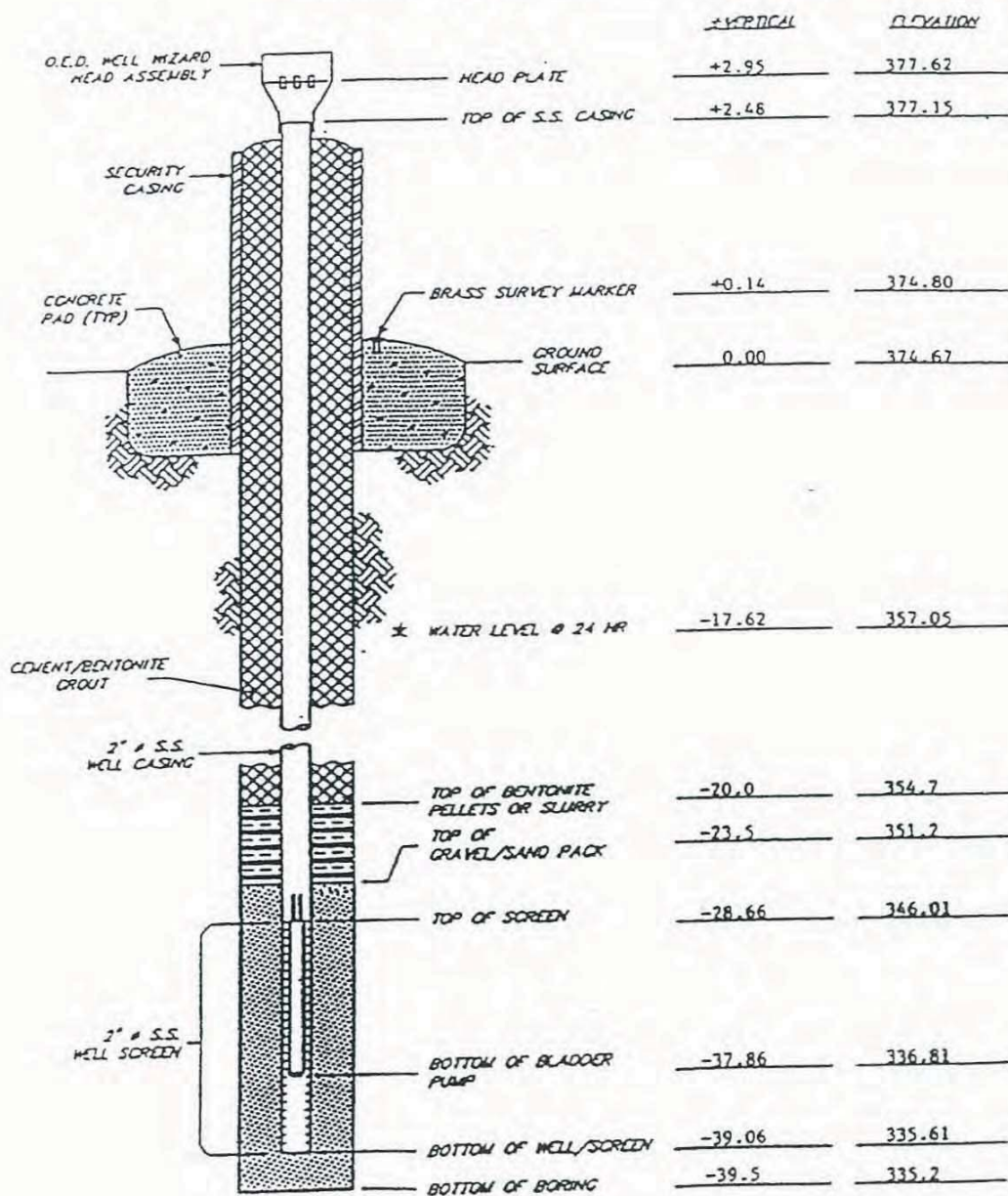
Comments: Drawing not to scale.

Four bollards were installed around each well. This is a 2D depiction of the well; therefore, you only see two bollards.

MONITORING WELL NO. 94

MONITORING WELL COORDINATES 1028.64 S 5979.52 W

INSTALLATION DATE 17 AUGUST 1986



PROJECT MARTIN MARIETTA ENERGY SYSTEMS  
PADUCAH GASEOUS DIFFUSION PLANT, KENTUCKY  
C-404 COMPLIANCE WELLS  
PROJECT NO. ESO 16749/GWM PHASE 2

PROJECT NO. X619112  
 DATE 8-11-88

SURFACE ELEVATION 376.36  
 BOTTOM OF HOLE DEPTH 101.5 ELEV 274.86  
 BORING LOCATION Up-gradient cluster @ 1028.74 S. 5964.35 W  
 COMPLETION DATE 8-12-88

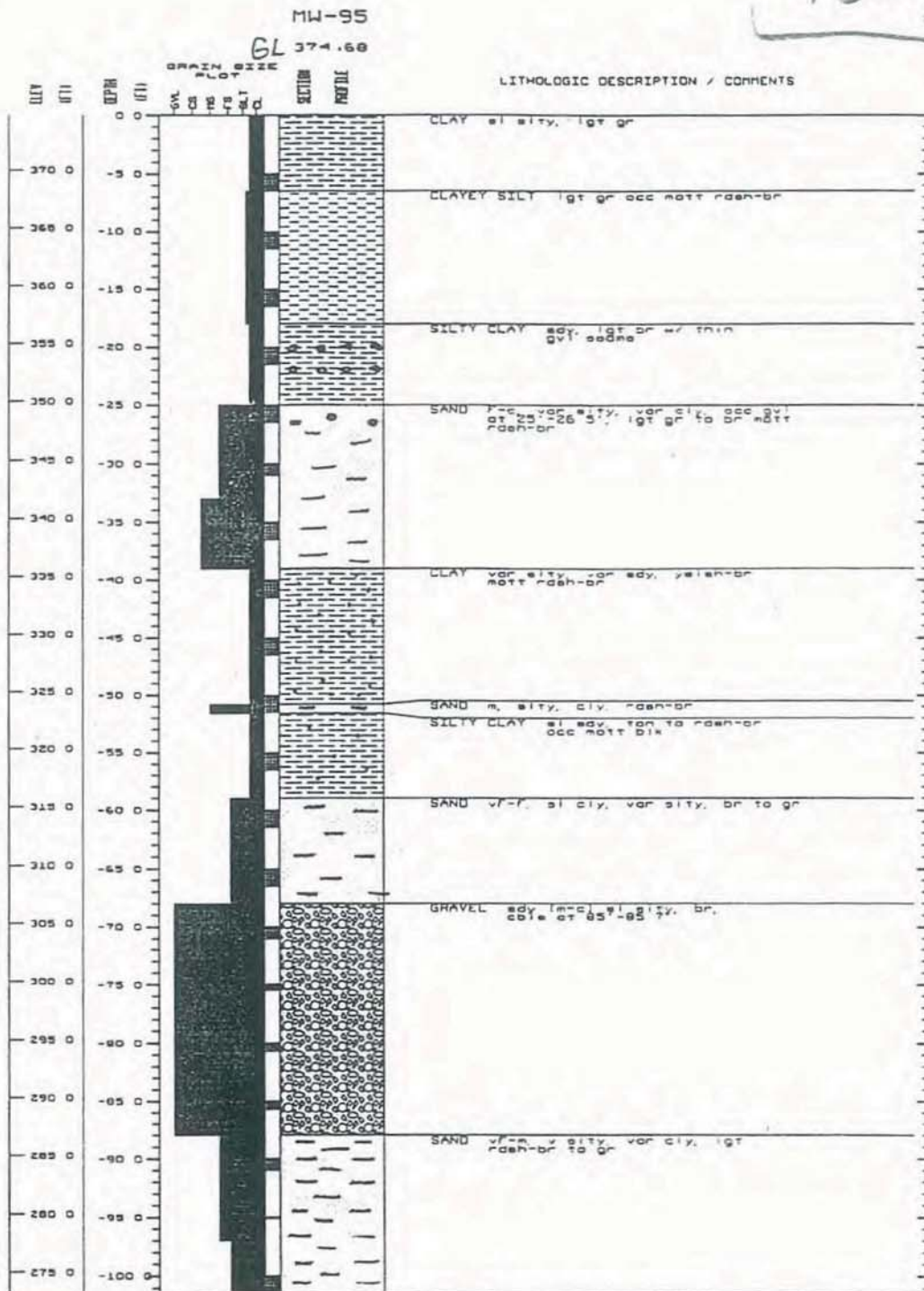
DRILLER R. Gossage  
 HELPER S. Ernest/S. Gaylor  
 DRILLED FOR ESO 16749  
 RIG Mobile B-53  
 LOGGED BY W. S. Anderson

| LITHOLOGY<br>BREAK | SAMPLE<br>NO. | DEPTH |       | SAMPLE<br>BLOW*     | DESCRIPTIONS AND REMARKS                                                                           |
|--------------------|---------------|-------|-------|---------------------|----------------------------------------------------------------------------------------------------|
|                    |               | FROM  | TO    |                     |                                                                                                    |
|                    | 1             | 5.0   | 6.5   | 6-6-8               | Clay, slightly silty, light gray, unstratified (Loess).                                            |
| 2 <sup>5</sup>     | 2             | 10.0  | 11.5  | 5-6-7               | Silt, clayey, light gray occasional mottled reddish-brown (Loess).                                 |
| 18 ±               | 3             | 15.0  | 16.5  | 5-7-10              | Silt, clayey, light gray occasional mottled reddish-brown (Loess).                                 |
| 25.0 ±             | 4             | 20.0  | 21.5  | 8-9-15              | Clay, very silty, very sandy, light brown with thin gravel seams (moist, wet tube).                |
|                    | 5             | 25.0  | 26.5  | 21-27-31            | Sand, fine to medium, variably silty, occasionally clayey with thin gravel seams (wet).            |
| 14 <sup>2</sup>    | 6             | 30.0  | 31.0  | 23-50/0.5           | Sand, very clayey, very silty with silt seams, light gray to brown mottled reddish-brown (moist).  |
| 39.0               | 7             | 35.0  | 36.5  | 18-31-50/0.3        | Sand, coarse to medium, occasionally fine to very fine, light brown to brown.                      |
|                    | 8             | 40.0  | 41.5  | 8-13-18             | Clay, slightly silty, slightly sandy, light yellowish-brown mottled reddish-brown (very cohesive). |
| 21 <sup>5</sup>    | 9             | 45.0  | 46.5  | 7-12-15             | Clay, silty, sandy, light yellowish-brown (cohesive).                                              |
| 50.8               | 10            | 50.0  | 51.5  | 8-9-21              | Clay, silty, sandy, light yellowish-brown (cohesive) (to 50.8 feet), then                          |
| 51.6 ±             |               |       |       |                     | Sand, medium, clayey, silty, reddish-brown.                                                        |
| 59.0               | 11            | 55.0  | 56.5  | 6-6-7               | Clay, silty, slightly sandy, tan to reddish-brown occasionally mottled black.                      |
| 9 <sup>2</sup>     | 12            | 60.0  | 61.5  | 5-14-23             | Sand, fine to very fine, slightly silty, brown with occasional clay seams                          |
| 68.0               | 13            | 65.0  | 66.5  | 13-21-32            | Sand, fine to very fine, variably silty with clay seams, light brown to gray                       |
|                    | 14            | 70.0  | 71.0  | 38-50/0.5           | Sand, medium to coarse and gravel, brown, slightly silty.                                          |
| 71                 | 15            | 75.0  | 75.5  | 81/0.5              | Probably dense gravel and sand. (No recovery.)                                                     |
|                    | 16            | 80.0  | 80.7  | 48-50/0.2           | Gravel, sandy (coarse to medium), brown.                                                           |
| 88.0               | 17            | 85.0  | 85.7  | 120-50/0.2          | Gravel and cobbles, sandy (coarse to medium), brown.                                               |
|                    | 18            | 90.0  | 91.0  | 27-39               | Sand, fine to medium, occasionally very fine, very silty, variably clayey, reddish-brown.          |
| 13 <sup>2</sup>    | 19            | 95.0  | 95.0  | inside augers<br>NA | Two attempts (sample of pipe-in), Sand, fine to medium, silty, brown.                              |
|                    | 20            | 100.0 | 101.5 | 5-12-26             | Sand, fine to very fine, very silty with clay seams brown to gray.                                 |
|                    |               |       |       |                     | Boring terminated @ 101.5 feet.                                                                    |

- \* NUMBER OF BLOWS PER 6" INTERVALS, TO DRIVE 1-3/8 I.D., 2" O.D. SPLIT BARREL SAMPLER WITH 140 POUND HAMMER FALLING 30 INCHES  
 • DENOTES SAMPLES ON WHICH GRAIN SIZE ANALYSES WERE PERFORMED.

MW 95

TD=102



Loc. Inside PGDP near Virginia Ave/6<sup>th</sup> st. intersect

W 5964 - S 1029

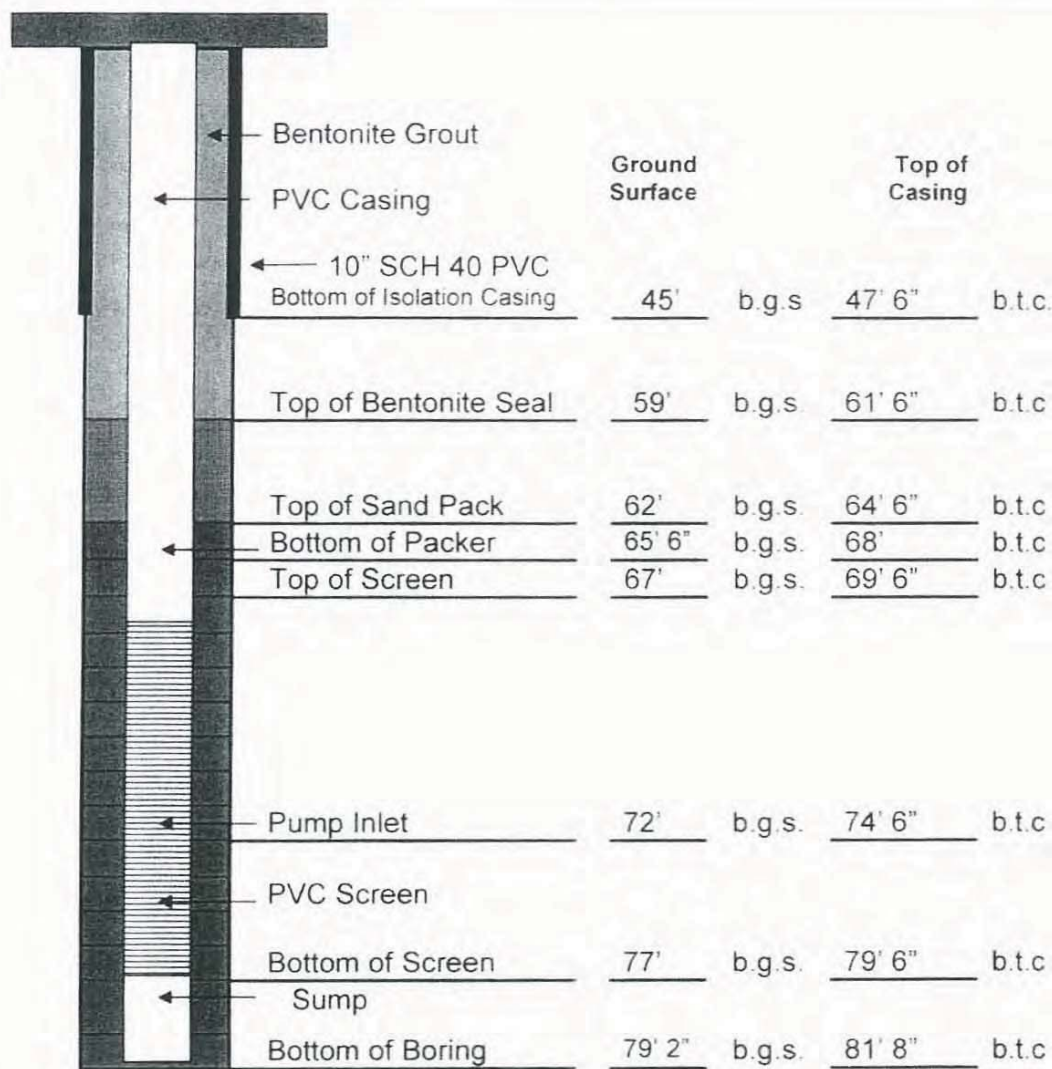
MAP B, D

Loc Near MW 46, 47  
Twin to MW 93, 94

| ELEV<br>(FT) | DEPTH<br>(FT) | LITHOLOGY | Sample<br>REC. | LITHOLOGIC DESCRIPTION / COMMENTS                                                     |
|--------------|---------------|-----------|----------------|---------------------------------------------------------------------------------------|
|              | 0.0           |           |                | No Sample                                                                             |
| 370.0        | -5.0          |           |                | Clay slightly silty, lt. gray                                                         |
| 365.0        | -10.0         |           |                | Clayey Silt lt. brown with occasional red-brown mottling                              |
| 360.0        | -15.0         |           |                |                                                                                       |
| 355.0        | -20.0         |           |                | Sandy Clay with gravel and silt, lt. brown, moist                                     |
| 350.0        | -25.0         |           |                | Sand f-m, variably silty, with gravel interbeds, wet                                  |
| 345.0        | -30.0         |           |                | Clayey Silty Sand lt. gray to mottled brown and red-brown, moist                      |
| 340.0        | -35.0         |           |                | Sand c-m, occasionally f-vf, lt. brown to brown                                       |
| 335.0        | -40.0         |           |                | Clay cohesive, slightly silty, slightly sandy, mottled lt. yellow-brown and red-brown |
| 330.0        | -45.0         |           |                | Clay cohesive, silty, sandy, lt. yellow-brown                                         |
| 325.0        | -50.0         |           |                | Clayey Silty Sand m, red-brown                                                        |
| 320.0        | -55.0         |           |                | Silty Clay slightly sandy, tan to red-brown occasionally mottled black                |
| 315.0        | -60.0         |           |                |                                                                                       |
| 310.0        | -65.0         |           |                | Sand interbedded with clay, sand vf-f, slightly silty, lt. brown to gray              |
| 305.0        | -70.0         |           |                | Sand and Gravel sand m-c, slightly silty, brown                                       |
| 300.0        | -75.0         |           |                |                                                                                       |
| 295.0        | -80.0         |           |                | Sandy Gravel sand m-c, brown                                                          |
| 290.0        | -85.0         |           |                |                                                                                       |
| 285.0        | -90.0         |           |                | Silty Sand f-m, variably clayey, red-brown                                            |
| 280.0        | -95.0         |           |                | Silty Sand f-m, brown (piped in @ 95 ft.)                                             |
| 275.0        | -100.0        |           |                | Silty Sand vf-f, interbedded with clay, brown to gray                                 |

# MONITORING WELL CONSTRUCTION LOG

|                |                                           |                     |           |
|----------------|-------------------------------------------|---------------------|-----------|
| Location Name: | Paducah Gaseous Diffusion Plant           | State Assigned #    | 8005-3263 |
| Address:       | 5600 Hobbs Road<br>West Paducah, KY 42053 | Facility Assigned # | MW-420    |



|                                                                                                                                                                            |           |                            |                                                                 |                          |        |                   |                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------|-----------------------------------------------------------------|--------------------------|--------|-------------------|-----------------------|
| Depth to Groundwater                                                                                                                                                       |           | Total Depth of Boring (ft) | 79' 2"                                                          | Total Depth of Well (ft) | 79' 2" | Borehole Diameter | 10" from 0 to 45'     |
| Well Diameter                                                                                                                                                              | 4"        | Slot Size                  | .010                                                            | Drilling Unconsolidated  | X      |                   | 8" from 45' to 79' 2" |
| Continuous Split Spoon Sampling (LF)                                                                                                                                       | 0' to 79' | Random SS Samples          |                                                                 |                          |        |                   |                       |
| Date                                                                                                                                                                       | 12/4-5/07 | Completed By               | Mark Gartner                                                    |                          |        |                   |                       |
|  CHASE ENVIRONMENTAL GROUP, INC.<br>environmental engineering, remediation & consulting |           |                            | Comments: Drawing not to scale                                  |                          |        |                   |                       |
|                                                                                                                                                                            |           |                            | The 8" casing is 2' 6" above the ground surface                 |                          |        |                   |                       |
|                                                                                                                                                                            |           |                            | b t c = below the top of casing    b g s = below ground surface |                          |        |                   |                       |
|                                                                                                                                                                            |           |                            | Draft                                                           |                          |        |                   |                       |

| LITHOLOGIC LOG                                                     |          |        | BORING/WELL ID MW-420                                                                                                                               |                                                                                       | Page 1 of 2     |
|--------------------------------------------------------------------|----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------|
| Facility: Paducah Gaseous Diffusion Plant, Paducah, KY             |          |        | Site: SWMU- C-404                                                                                                                                   |                                                                                       |                 |
| Project: BGOU RI                                                   |          |        | Client: USDOE/PRS                                                                                                                                   |                                                                                       |                 |
| Drilling Contractor: Chase Environmental, LLC                      |          |        | Driller: Michael Coleman/Jeff Brownfield                                                                                                            |                                                                                       |                 |
| Start Time/Date: 10:28 / 12-4-07                                   |          |        | End Time/Date: 12-5-07                                                                                                                              |                                                                                       |                 |
| Borehole Diameter (BHD): 0 TO 45' is 10" BHD & 45 to 79' is 8" BHD |          |        | Drilling Method: Multi-Case Override System                                                                                                         |                                                                                       |                 |
| Sampling Method: Continuous Soil Sampling                          |          |        | Drill Rig: Boart Longyear - SR-150                                                                                                                  |                                                                                       |                 |
| Total Depth (Vertical): 79 feet and 2 inches                       |          |        | Angle: Vertical                                                                                                                                     |                                                                                       |                 |
| Logged By: Mark Gartner                                            |          |        | Protective Level: Modified Level D                                                                                                                  |                                                                                       |                 |
| Coordinates: E N                                                   |          |        | Kentucky Monitoring Well Tag: 8005-3263                                                                                                             |                                                                                       |                 |
| Depth (ft)                                                         | SAMPLE   |        | LITHOLOGIC DESCRIPTION                                                                                                                              | GRAPHIC LOG                                                                           | COMMENTS        |
|                                                                    | INTERVAL | NUMBER |                                                                                                                                                     |                                                                                       |                 |
| 0                                                                  |          |        | CLAY from 0 to 7', light brown, 7.5YR 6/3, soft, moist, gray and orange streaks with black platy organic layers                                     |    | 10:28 / 12-4-07 |
| 4                                                                  |          |        |                                                                                                                                                     |    |                 |
| 8                                                                  |          |        | CLAY from 7 to 20', light brown, 7.5YR 5/6, stiff, moist, gray and orange streaks with black platy organic layers                                   |    |                 |
| 12                                                                 |          |        |                                                                                                                                                     |    | 10:42           |
| 16                                                                 |          |        |                                                                                                                                                     |    |                 |
| 20                                                                 |          |        | CLAY from 19 to 22', light brown, 7.5YR 5/6, stiff, moist, gray and orange streaks, black platy organic layers, with 5% sand                        |    |                 |
| 24                                                                 |          |        | SAND from 22-23', fine grained, dark red and well sorted                                                                                            |    | 10:54           |
| 28                                                                 |          |        | SAND, CLAY and CHERT from 23-27', sand, poorly sorted, from fine grained to 1" across, clay, tan, firm, moist, Chert, angular and up to 1" across   |   |                 |
| 32                                                                 |          |        | CLAY from 27-35', light brown, (7.5YR 6/6), stiff, mottled, gray and orange streaks, with a few chert pebbles up to 1/4" across                     |  |                 |
| 36                                                                 |          |        | SAND, CLAY, CHERT from 35 to 37', sand (50%), gray, fine grained, clay (40%), light brown, (7.5YR 6/6), firm, moist, chert (10%), up to 1/4" across |  |                 |
| 40                                                                 |          |        | CLAY from 37 to 45', light brown, (7.5YR 6/6), very soft, moist                                                                                     |  | 11:15           |
| 44                                                                 |          |        | SAND and CLAY from 45 to 47', sand (60%), fine grained, reddish brown, clay (40%), light brown, (7.5YR 6/6), very soft, moist                       |  |                 |
|                                                                    |          |        |                                                                                                                                                     |  |                 |
|                                                                    |          |        |                                                                                                                                                     |  | 11:35           |

| LITHOLOGIC LOG                                                     |          |        |                                                                                                                                                                                      | BORING/WELL ID MW-420                       |                 | Page 2 of 2 |
|--------------------------------------------------------------------|----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------|-------------|
| Facility: Paducah Gaseous Diffusion Plant, Paducah, KY             |          |        |                                                                                                                                                                                      | Site: SWMU- C-404                           |                 |             |
| Project: BGOU RI                                                   |          |        |                                                                                                                                                                                      | Client: USDOE/PRS                           |                 |             |
| Drilling Contractor: Chase Environmental, LLC                      |          |        |                                                                                                                                                                                      | Driller: Michael Coleman/Jeff Brownfield    |                 |             |
| Start Time/Date: 10:28 / 12-4-07                                   |          |        |                                                                                                                                                                                      | End Time/Date: 12-5-07                      |                 |             |
| Borehole Diameter (BHD): 0 TO 45' is 10" BHD & 45 to 79' is 8" BHD |          |        |                                                                                                                                                                                      | Drilling Method: Multi-Case Override System |                 |             |
| Sampling Method: Continuous Soil Sampling                          |          |        |                                                                                                                                                                                      | Drill Rig: Boart Longyear - SR-150          |                 |             |
| Total Depth (Vertical): 79 feet and 2 inches                       |          |        |                                                                                                                                                                                      | Angle: Vertical                             |                 |             |
| Logged By: Mark Gartner                                            |          |        |                                                                                                                                                                                      | Protective Level: Modified Level D          |                 |             |
| Coordinates: E N                                                   |          |        |                                                                                                                                                                                      | Direction (plant grid): N/A                 |                 |             |
| Depth (ft)                                                         | SAMPLE   |        | LITHOLOGIC DESCRIPTION                                                                                                                                                               | GRAPHIC LOG                                 | COMMENTS        |             |
|                                                                    | INTERVAL | NUMBER |                                                                                                                                                                                      |                                             |                 |             |
| 48                                                                 |          |        | CLAY from 47 to 50', light brown, (7.5YR 6/6), very soft, 50% recovery                                                                                                               |                                             |                 |             |
|                                                                    |          |        | SAND, 50 to 51', very fine grained, dark red, well sorted                                                                                                                            |                                             |                 |             |
| 52                                                                 |          |        | CLAY and SAND from 51 to 53', clay (60%), dark red, soft, sand (40%), very fine grained, dark red, well sorted                                                                       |                                             |                 |             |
|                                                                    |          |        | SAND, 53 to 63', light brown, fine grained, well sorted                                                                                                                              |                                             |                 |             |
| 56                                                                 |          |        |                                                                                                                                                                                      |                                             | 11:48           |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
| 60                                                                 |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        | CLAY from 63 to 67', light brown, (7.5YR 6/6), firm, moist, gray and orange streaks, with sand (5%), fine grained, light brown                                                       |                                             |                 |             |
| 64                                                                 |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        | SAND to GRAVEL from 67 to 79', sand ranged from a very fine grained sand up to coarse gravel, light brown, the chert is angular to sub angular, up to 3" across and 1" in thickness. |                                             |                 |             |
| 68                                                                 |          |        |                                                                                                                                                                                      |                                             | 12:12           |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
| 72                                                                 |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
| 76                                                                 |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             | 12:54 / 12-4-07 |             |
| 80                                                                 |          |        | Total Depth is 79 feet 2 inches.<br>Completed on 12-4-07                                                                                                                             |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        |                                                                                                                                                                                      |                                             |                 |             |
|                                                                    |          |        | LEGEND: CLAY                                                                                                                                                                         |                                             |                 |             |
|                                                                    |          |        | SAND                                                                                                                                                                                 |                                             |                 |             |

**APPENDIX E3**

**MONITORING WELL REQUIREMENTS**

**THIS PAGE INTENTIONALLY LEFT BLANK**

## CONTENTS

|                                                  |       |
|--------------------------------------------------|-------|
| 1. GROUNDWATER SAMPLING .....                    | E3-5  |
| 1.1 SAMPLE CHAIN-OF-CUSTODY .....                | E3-5  |
| 1.2 TEMPERATURE CONTROL FOR SAMPLE STORAGE ..... | E3-7  |
| 1.3 WATER LEVEL MEASUREMENTS .....               | E3-7  |
| 1.4 GROUNDWATER SAMPLING.....                    | E3-9  |
| 1.5 FIELD QUALITY CONTROL .....                  | E3-12 |
| 1.6 SAMPLE TRACKING AND HANDLING GUIDANCE .....  | E3-15 |
| 2. WELL ABANDONMENT.....                         | E3-16 |
| 2.1 PROCEDURES FOR WELL ABANDONMENT .....        | E3-16 |
| 2.2 BENTONITE.....                               | E3-17 |
| 2.3 BENTONITE SLURRY .....                       | E3-17 |
| 3. EQUIPMENT CLEANING AND DECONTAMINATION.....   | E3-17 |

**THIS PAGE INTENTIONALLY LEFT BLANK**

# 1. GROUNDWATER SAMPLING

## 1.1 SAMPLE CHAIN-OF-CUSTODY

### **Initiation and Completion of Chain-of-Custody Form**

Chain-of-custody is required for analytical samples to provide traceability of possession from initial sample collection through sample transfer and/or final disposition. The field sampler is responsible for the proper handling and custody of the samples collected until they are properly and formally transferred to another person or the laboratory. To simplify the chain-of-custody record, as few people as possible should handle samples.

Chain-of-custody procedures are **not** required for transfer of samples between field personnel or between lab personnel in same work group.

All entries on chain-of-custody forms shall be made using black indelible ink.

Chain-of-custody forms are generated from the Paducah Project Environmental Measurements System (Paducah PEMS). In the event Paducah PEMS is not accessible and sampling is required, a Paducah PEMS-equivalent chain-of-custody shall be used.

The following steps are performed to meet chain-of-custody requirements.

1. Generate the chain-of-custody record prior to sampling with the appropriate information to uniquely identify the sample.
2. Enter the following information (prior to sampling event, if possible):
  - Matrix of sample
  - Project number or name
  - Unique sample identification number
  - Sampling description and location
  - Type of sample collected (i.e., grab or composite)
  - Number of sample containers
  - Storage and preservation requirements
  - Parameters to be analyzed
  - Sample team member
  - Name of the laboratory
  - Any pertinent information in “Remarks” or “Comments” section
3. Complete the chain-of-custody information at the time of the sampling event by recording the following information at this time:
  - Date and time sampled (military time)
  - Volume of sample (if required for specific analysis and calculations)

**NOTE:** “Positive control” requires one or more of the following:

- Physical possession
  - Visual control/oversight
  - Tamper prevention
  - Secured storage (i.e., lock and key)
4. Maintain positive control of samples and forms from collection until transfer to another custodian.
  5. Apply custody seals, if applicable, to each container in a manner such that it can be visibly observed if tampering has occurred.
  6. Sign the form as “relinquished by” **AND** enter the date and time.
  7. Transfer the samples and the chain-of-custody forms to another custodian or to the laboratory.
  8. Sign the form as “received by” **AND** enter the date and time.
  9. Maintain positive control of samples and forms from collection until transfer to another custodian.

#### **Initiation and Completion of Sample Labels**

Sample labels are required for analytical samples to provide identification of samples collected.

All entries on sample labels shall be made using black indelible ink.

Sample labels are generated from Paducah PEMS. In the event Paducah PEMS is not accessible and sampling is required, a Paducah PEMS-equivalent sample label shall be used.

1. Prepare the sample labels prior to sampling with the appropriate information to uniquely identify sample.
2. Enter the following information (prior to sampling event, if possible):
  - Matrix of sample
  - Project number
  - Unique sample identification number
  - Sampling description
  - Location
  - Storage and preservation requirements
  - Sample team member
  - Name of the laboratory
3. Complete the label information at the time of the sampling event by recording the following information at this time:
  - Date and time sampled (military time)

## **1.2 TEMPERATURE CONTROL FOR SAMPLE STORAGE**

### **Preperformance Activities**

1. Refrigeration areas will be inspected on normal working days to assure temperature requirements are met.
2. Compliance will be assumed for non-working days if the days immediately preceding and following the non-working days are in compliance.

### **Documentation of the Temperature for Refrigerators with Automatic Temperature Recorders**

1. Place the thermometer in water or glycerin in the refrigerator when the refrigerator is installed for sample storage.
2. Position the thermometer in an area representative of the overall temperature of the refrigerator.
3. Remove the recording disc on the refrigerator according to manufacturer's instructions.
4. Note the date and time the disc was removed on the sheet and initial it.
5. File the recording disc with the project records.
6. Note date, time, and initials on a fresh disc and insert it into the recorder according to the manufacturer's instructions.
7. In the event that the temperature leaves the  $\leq 6^{\circ}\text{C}$  range, the temperature will be adjusted according to the manufacturer's instructions or the samples shall be moved to another refrigeration unit.

### **Documentation of the Temperature for Refrigerators without Automatic Temperature Records**

1. Place a thermometer inside the refrigerator, position it in an area representative of the overall temperature of the refrigerator.
2. Verify proper temperature control per CP4-ES-0043, *Temperature Control for Sample Storage*, or most current version.

## **1.3 WATER LEVEL MEASUREMENTS**

### **Preperformance Activities**

1. Ensure the water level meter has been decontaminated per Section 3, Equipment Cleaning and Decontamination, prior to use.
2. Check water level verification date located on the side of the water level indicator.
3. To ensure water level measurement accuracy, a steel measuring tape will be used to check each electrical measuring device (depth indicators). This test will be performed at least once per year. The steel tape end is placed at the end of the water-sensitive electrode. Compare 100 ft of steel tape alongside 100 ft of depth indicator cable. Measurements should be within  $\pm 0.01$  ft. Remove depth indicators from field service that do not meet designated tolerance. Replace old cable with new cable and repeat for accuracy.

4. The reference mark should be tied in with a vertical control point and only this reference mark should be used.
5. **IF** no reference mark is present, **THEN** establish a reference by filing a “V” notch on the north side of the well casing, being careful that cuttings do not fall into the well, **AND** note the use of this location **AND** notify the supervisor.

### **Taking Measurements with Electronic Water Level Indicator**

Water level measurements are routinely collected by the same environmental monitoring specialist using the same equipment in groups of wells that are close in proximity.

Electric tapes are normally coiled on a hand-cranked reel unit containing batteries and a device which signals when the circuit is closed as the probe contacts water. Electrical methods are preferred over other methods, such as steel measuring tape.

An electric tape may not respond to an oil surface, causing the fluid level determined to be different from one determined using a steel tape. The difference between the two measurements depends on the amount of oil floating on the water.

Independent electric tape measurements of static water levels using the tape should agree to within  $\pm 0.01$  ft for depths of less than about 200 ft. At greater depths, independent measurements may not be as accurate. For a depth of about 500 ft, the maximum difference of independent measurement using the same tape should be within  $\pm 0.1$  ft. A steel measuring tape will be used annually (at least) to check the accuracy of the electrical measuring device.

1. **IF** the water level measurement can be made without the complicating situations described in Steps 2, 3, and 4, **THEN** proceed with Step 5. **IF NOT, THEN** proceed with Steps 2, 3, or 4, as applicable.
2. **IF** water is dripping rapidly or flowing into a well, which makes an accurate reading difficult or impossible to obtain, **THEN** add a rubber or plastic boot above or around the water level indicator probe **AND** ensure that the boot is positioned so that air entrapped by the boot will not prevent the probe from making contact with the water at the water table.
3. **IF** a well has a layer of oil floating on the water, **THEN** use an oil-water interface probe to permit detection of the surface of the uppermost fluid as well as the water level.
4. **IF** a well contains immiscible contaminants, **THEN** use special procedures for the measurement of fluid levels.
5. Check the response of the audible or visible alarm by dipping the probe in potable water to ensure that the signaling device responds to probe submergence **OR** check the alarm using a test button/switch on instruments equipped with this feature.
6. Slowly lower the electronic water level indicator probe into the well.
7. Stop lowering the probe when the alarm sounds and/or the red light illuminates.
8. Pull up on the probe until the alarm no longer sounds.
9. Stop at the instant the alarm sounds and/or the light comes on and stays on.

10. Grasp the cord with thumb and forefinger where it touches the reference mark.
11. Repeat Steps 6 through 10 until a consistent reading is obtained for at least three consecutive water level measurements. If three consistent readings cannot be obtained, then contact the field operations manager for further instruction.
12. Record the measurement from the electric tape to the nearest 0.01 ft as the depth of water level in that well.
13. Remove the measuring tape from the well.
14. Close **AND** lock the well cap.

### **Postperformance Activities**

1. Decontaminate the electric tape between each water level event (i.e., between each well) according to Section 3, Equipment Cleaning and Decontamination.
2. Contact radiation protection to monitor all equipment for radioactivity that has been used in a contamination control zone before being released from the Paducah Site. This monitoring includes any equipment leaving the Paducah Site for maintenance or repairs. Radiation screening will be maintained by continuous field screening and through periodic wipe sampling. Additional details are provided in the site-specific health and safety plan.

## **1.4 GROUNDWATER SAMPLING**

### **Preperformance Activities**

1. Calibrate water quality meters for water quality parameters.
2. Prepare the necessary sample containers.
3. Prepare field quality control samples.

### **Methods of Sampling**

The following methods of sampling are described in this section.

- Groundwater Sampling Using Bladder Pumps
- Groundwater Sampling of Electric Well Pumps (Residential Wells)
- Groundwater Sampling Using a Bailer

For operation of the pump cycle control box, refer to the operator manual as necessary.

The discharge of the water quality meter should be positioned so it drains into a beaker or an equivalent container.

Stabilization criteria are as follows: water quality parameters have stabilized within approximately 10% over the last two consecutive measurements that are three minutes apart. (Turbidity is considered stabilized if subsequent measurements agree within 10% or the measurements are less than 10 NTUs.) Collection of samples will begin only after stabilization of water quality parameters is obtained.

## **Groundwater Sampling Using Bladder Pumps**

1. Upon arriving at the sampling site, visually inspect well before any sampling activities begin.
2. Note any damage or unusual circumstances (evidence of tampering, vandalism, etc.) on the MW Groundwater Data Form, and contact the project manager if damage or unusual circumstances are present.
3. Open the well cap or lid and note the condition of the casing and fitting.
4. Don a clean pair of latex or nitrile type gloves, retrieve the discharge tubing from the well, and connect to the wellhead.
5. If tubing comes in contact with the ground, it must be decontaminated before being put back into the well.
6. Connect discharge tubing from the wellhead to the sampling board.
7. Place insulation on the discharge tube.
8. Determine the static water level using a water level meter according to Section 1.3.
9. Record this information on the MW Groundwater Data Form.
10. Set up the pump cycle control box.
11. Connect the pump cycle control box air hose to well head air fittings.
12. Uncap the nitrogen cylinder tank or prepare the air compressor and attach the regulator; attach the air hose to the control box.
13. Position the water quality meter on the portable sampling board.
14. When micropurging, purge only the volume of water in the pump and discharge line, which is 450 mL for the pump and:
  - 40 mL for every foot of 1/2 inch discharge line, or
  - 22 mL for every foot of 3/8 inch discharge line
15. When sampling with a packer, calculate the purge volume using the following formula:  
  
Well depth minus packer depth = the zone of isolation (sampling zone)  
Zone of isolation times casing factor = purge volume  
Purge volume times 3 = total purge volume  
Casing factor for a 2-inch well = 0.163  
Casing factor for a 4-inch well = 0.653
16. Inflate the packer, according to the operator's manual, for the three well volumes method of purging.
17. When sampling without a packer (not micropurge), calculate the purge volume using the following formula:

Well depth minus static water level = the standing water column

Standing water column times casing factor = purge volume

Purge volume times 3 = total purge volume

Casing factor for a 2" well = 0.163

Casing factor for a 4" well = 0.653

18. Record the purge volume on the MW Groundwater Data Form.
19. Open the regulator on the air compressor or nitrogen tank, turn on the pump cycle control box, and adjust the flow rate to the desired pressure output, which is 1/2 psi per foot of lift.
20. Open the valve on the sampling board so the flow is directed to the sample port.
21. Adjust the flow meter to a flow rate of 300 mL/min or less and allow 300 mL or more to flow through the sampling port.
22. Allow the purge water to run through the water quality meter flow-through cell and check for any trapped air pockets.
23. Record all necessary data on the MW Groundwater Data Form.
24. Allow the water quality meter readings to stabilize.
25. Record the initial water quality parameter readings on the MW Groundwater Data Form when the purge volume has been reached.
26. Including the initial reading, record a minimum of three measurements in three-minute intervals until stability has been achieved.
27. Before collecting the samples, label sample bottles with date, time, and sampler's initials.
28. Maintain the flow rate at 300 mL/min or less during sampling except for sampling of volatile organics which should be at a flow of 100 mL/min or less.
29. Collect samples for the required analytes in the appropriate order as specified in SW-846, *Test Methods for Evaluating Solid Waste*.
30. Collect all field quality control samples.
31. **IF** a well is purged to dryness, **THEN** return within 24 hours of initial sampling time **AND** collect one round of water quality parameters and then collect the required sample parameters. If a well goes dry during a sampling event, abandon remaining parameters and consider the well dry.

### **Postperformance Activities**

1. Turn off all sampling equipment and water quality meters.
2. Complete the chain-of-custody forms.
3. Document the sampling events by recording the information on the MW Groundwater Data Form.
4. As generated, place all samples requiring a temperature of 4°C in a cooler with blue ice/ice.

5. Submit samples and the appropriate chain-of-custody forms to the laboratory.
6. Drain all purge water from the water quality meter, sampling board, and discharge tubing into purge water collection container. Record the amount on the MW Groundwater Data Form.
7. Decontamination of the sampling board requires 300 mL or more of analyte-free water.
8. Thoroughly decontaminate the sampling board and water level indicator **AND** record the decontamination event and time on the MW Groundwater Data Form.
9. Disconnect the pump cycle controller from the well head, replace the discharge tubing into the well, and lock the well cap.
10. Record the total amount of purge water for disposal.
11. Disposition purge water and personal protective equipment appropriately.

### **Order of Collection for Groundwater Samples**

The preferred collection order for some of the more common groundwater analytes is as follows:

1. Volatile organics [volatile organic analytes (VOAs) or volatile organic compounds (VOCs)];
2. Dissolved gases and total organic carbon;
3. Metals and cyanide;
4. Semivolatile organics;
5. Major water quality cations and anions; and
6. Radionuclides.

The above information was modified from an updated draft version of the Technical Enforcement Guidance Document, dated November 1992. SW-846, *Test Methods for Evaluating Solid Waste*, Chapter 11, Section 11.2 refers to one preeminent Resource Conservation and Recovery Act document on groundwater monitoring activities, the *Technical Enforcement Guidance Document*, Environmental Protection Agency/530-R-93-001, finalized in September 1986, available from the Environmental Protection Agency Office of Solid Waste.

If samples are being collected at a location where it is anticipated that enough sample volume is not available, then the order of collection will be VOAs/VOCs, total metals, and then radionuclides, due to those parameters being contaminants of concern at PGDP.

## **1.5 FIELD QUALITY CONTROL**

Follow these general steps when collecting field quality control samples.

Trip blanks and field blanks are prepared in the field laboratory or sample staging area by adding the appropriate preservative (unless pre-preserved) to the appropriate bottle and filling the bottle with organic/analyte-free water. Equipment blanks are, likewise, prepared in the field laboratory or sample staging area using organic/analyte-free water. Field duplicates and filter blanks are prepared by adding the appropriate preservative (unless pre-preserved) to the appropriate bottle, and, with the exception of duplicates, filling the bottle with analyte-free water in the field after the sample is collected.

### **Trip Blanks**

1. Trip blanks are used to determine if contamination by VOCs has occurred during sample shipping and handling.
2. Unless specified otherwise in the site-specific sampling plan, aqueous trip blanks are used for water samples.
3. For routine monitoring activities where contamination has been proven to not be a concern, trip blanks should be collected at the frequency specified in the approved sampling and analysis plan.
4. **IF** VOCs are being analyzed, **THEN** obtain a trip blank from the field laboratory or sample staging area.
5. Place one trip blank (2-3 pre-prepared sample vials of organic-free water) in a cooler that will contain VOC samples.
6. Transport to the sampling site.
7. Request analysis for VOCs only for the trip blank. Collect other VOA samples as requested by the project and place them in the same cooler as the trip blank.
8. Analyze the trip blank for VOCs.

### **Field Duplicates**

Field duplicates consist of two aliquots of a sample (i.e., the original sample and its duplicate) that are collected at the same time, using the same procedures, the same type of equipment, and in the same types of sample containers as the original samples. Duplicate samples also are preserved in the same manner and submitted for the same analyses as the original samples. Field duplicates are used to determine the total variability (i.e., imprecision) associated with the sampling and analysis effort.

Field duplicates should be collected at a minimum rate of one for each 20 samples.

1. Determine the number of duplicates to be obtained.
2. Collect samples following the appropriate procedure.
3. Collect field duplicates and analyze them for the same parameters as other original samples being collected.

### **Split Samples**

Split samples, also known as field replicate samples, consist of a sample which has been aliquoted into two containers from a single container or sampling mixing container. The sample and its split sample are shipped to different laboratories, such as a field screening laboratory and a fixed-base laboratory. The analytical result generated by the fixed-base laboratory is compared to the result generated by the field screening laboratory to assess the performance of the screening laboratory. Split samples also may be shipped to two fixed-base laboratories, such as a project-support laboratory and a regulatory agency reference laboratory. The result generated by the reference laboratory is used to assess the performance of the project-support laboratory. This comparison can also be used to assess inter-laboratory precision.

The frequency of split samples varies with project objectives.

A split sample is not a composite sample unless the original sample is a composite.

Care should be taken to ensure that the same depth is used when preparing split samples.

1. Determine the number of split samples to be obtained.
2. Collect split samples following the appropriate procedure.
3. Collect split samples and analyze them for the same parameters as other samples being collected unless contaminants of concern have been identified.

### **Field Blanks**

Field blanks are prepared in the field to evaluate the potential for contamination of a sample by ambient site contaminants from a source not associated with the sample collected (e.g., air-borne fugitive dust or organic vapors). Field blanks should be collected only in dusty air-borne environments and/or from areas where VOC contamination is present in the atmosphere and originating from a source other than the source being sampled. Field blanks should be collected at a minimum rate of one for each 20 samples collected.

1. **IF** field blanks are required, **THEN** transport organic/analyte-free water to the site **OR** prepare a bottle containing organic/analyte-free water and transport to the site to be opened during the sampling event.
2. Open the container in the field and transfer the water into a sample bottle.
3. Analyze the sample for the same parameters associated with the sampling event.

### **Equipment Blanks**

Equipment blanks are used to determine if contaminants have been introduced by contact of the sample medium with contaminated sampling equipment.

Equipment blanks provide a QC check on the equipment decontamination procedure. Equipment blanks are required only when nondisposable or nondedicated sampling equipment is being used.

Equipment blanks should be collected at a minimum rate of one for each 20 samples collected.

1. **IF** equipment blanks are required, **THEN** obtain organic/analyte-free water to be used.
2. Pass the organic/analyte-free water over the decontaminated sampling equipment **AND** catch the water in a sample bottle, **OR** collect the water in a bowl that was decontaminated per the same procedure as the equipment and transfer to a sample bottle.
3. Analyze the sample for the same parameters as the sample collected with the equipment.

## Definitions

**Duplicate Samples**—Two aliquots of a sample (i.e., the original sample and its duplicate) that are collected at the same time, using the same procedures, the same type of equipment, and in the same types of sample containers as the original samples. Duplicate samples also are preserved in the same manner and submitted for the same analyses as the original samples. Field duplicates are used to determine the total variability (i.e., imprecision) associated with the sampling and analysis effort.

**Split Samples**—Two or more separate samples taken from the same source during the same sampling event and sent to two or more different laboratories for analysis, usually a field screening laboratory and a fixed-base laboratory. Data generated by split samples can be used to judge the field screening laboratory's performance and to assess inter-laboratory precision.

**Equipment Blank**—A sample of analyte-free water passed through decontaminated sampling equipment. Equipment blanks are used as a measure of decontamination process effectiveness and are analyzed for the same parameters as the sample collected with the equipment. Equipment blanks also may be used as a reagent blank, as needed. Equipment blanks are required only when nondisposable or nondedicated equipment is being used.

**Field Blank**—A sample that serves as a check on ambient environmental contamination at the sample site. Organic/analyte-free water is transported to the site, opened in the field, transferred into each type of sample bottle, and returned to the laboratory for analysis of all parameters associated with that sampling event. It is also acceptable for field blanks to be filled in a field laboratory or sample staging area, transported to the field, and then opened. Field blanks may be used as a reagent blank, as needed.

**Trip Blank**—Sample used to detect contamination by VOCs during sample shipping and handling. Trip blanks are 40 mL VOA vials of analyte-free water that are filled in the laboratory, transported to the sampling site, and returned to the laboratory with VOA samples. Trip blanks are not opened in the field. One trip blank is to accompany each cooler containing VOA samples. Each trip blank is to be stored at the laboratory with associated samples and analyzed with those samples. Trip blanks are only analyzed for VOCs.

## 1.6 SAMPLE TRACKING AND HANDLING GUIDANCE

Sample containers are chosen, preserved, and collected as specified in Appendix E3, Table 1.

Appendix E3, Table 1. Sample Container Information

| Parameter                                | Matrix | Holding Time From Collection | Sample Container <sup>a</sup>                       | Preservation                                     |
|------------------------------------------|--------|------------------------------|-----------------------------------------------------|--------------------------------------------------|
| Volatile Organics                        | Water  | 14 days                      | Three 40-mL glass vials with Teflon-lined septum    | HCl to pH < 2<br>Cool to ≤ 6°C<br>zero headspace |
| Metals (other than mercury) <sup>b</sup> | Water  | 180 days                     | 1 liter polyethylene with polyethylene closure      | HNO <sub>3</sub> to pH < 2,<br>Cool to ≤ 6°C     |
| Mercury <sup>b</sup>                     | Water  | 28 days                      | 1 liter polyethylene with polyethylene closure      | HNO <sub>3</sub> to pH < 2,<br>Cool to ≤ 6°C     |
| Uranium Isotopes                         | Water  | 180 days                     | 2 ea 1 liter polyethylene with polyethylene closure | HNO <sub>3</sub> to pH < 2,<br>Cool to ≤ 6°C     |
| Tc-99                                    | Water  | 180 days                     | 1 liter polyethylene with polyethylene closure      | HNO <sub>3</sub> to pH < 2,<br>Cool to ≤ 6°C     |

<sup>a</sup> Additional volume may be needed for matrix spike/matrix spike duplicate samples. Laboratory will notify project on quantity needed for MS/MSD per batch. As a result, different containers may be used, as appropriate.

<sup>b</sup> Samples for these parameters can occupy the same sample containers.

## **2. WELL ABANDONMENT**

Well plugging and abandonment is carried out in wells for which there is no further use, on wells that are damaged or otherwise unusable, or on wells that must be destroyed because of missing well construction or well inspection and maintenance reports.

The criteria used to determine if a well or piezometer is a candidate for abandonment are as follows:

- There are inadequate construction or lithologic data available for the well or piezometer.
- The well or piezometer is constructed to standards that are not currently acceptable for its intended use.
- The integrity of the well or piezometer has deteriorated to a point that is no longer suitable for its intended purpose.
- The well or piezometer is suspected of yielding anomalous data indicative of a poor completion or development (i.e., abnormally high pH, unusual fluctuation in water levels, etc.).
- The well was never developed successfully and serves no useful purpose.

### **2.1 PROCEDURES FOR WELL ABANDONMENT**

All pumps and other equipment shall be removed from inside and around the well or piezometer prior to commencing drilling operations. The well casing shall be removed by using an overshot milling tool or other suitable bit of sufficient diameter to fit over the existing well casing and its couplings. Drilling shall continue to the bottom of existing well casing and screen, or to a sufficient depth, which allows extraction of the full length of casing and screen.

After reaming operations have been completed and the well casing and screen have been removed, the hole should be filled. It is permissible to fill the RGA interval of the hole with sand. The remaining hole should be grouted using a tremie pipe. The tremie pipe shall be lowered to the bottom of the remaining hole and raised slowly as the high-solids bentonite grout is introduced. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure.

Should loss of grout occur, holes should be refilled until they remain full. Twenty-four hours after grouting, the subcontractor shall place any additional grout necessary to bring the grout to within one foot of existing grade.

Deviation from these procedures may be necessary where field conditions dictate the use of an alternate or more effective method of abandonment. All deviations from this procedure shall be approved. Documentation shall include rationale for deviation for the above procedure.

The technical subcontractor is responsible for generating abandonment documentation. Field activities will be documented in the field logbook. A Record of Plugging and Abandonment Form will be completed. At the conclusion of field activities, a written report will be prepared summarizing those activities, providing a copy of the completed Record of Plugging and Abandonment Form, and containing before and after “as-built” well construction diagrams.

## **2.2 BENTONITE**

The bentonite shall be free flowing, high swelling, sodium-based, Wyoming-type bentonite. Both powdered and pellet forms may be required.

## **2.3 BENTONITE SLURRY**

Bentonite slurry shall be a mixture of powdered bentonite and water. The slurry shall be mixed in a grout mixer with paddle vanes and/or a recirculating pump such that lumps are minimized. The bentonite slurry will contain a minimum of 30% solids.

# **3. EQUIPMENT CLEANING AND DECONTAMINATION**

The following sections outline steps associated with the cleaning and decontamination of equipment used in sampling groundwater monitoring wells.

If field cleaning for immediate reuse, the equipment does not have to be air-dried as described in the following procedures.

### **Well Sounders, Tapes, and Depth Indicators**

1. Wash with soap and tap water.
2. If possible, rinse with tap water.
3. Rinse with analyte-free water.
4. Allow to air dry overnight.
5. If sampling equipment is used in a Radiological Area, Contamination Area, Soil Contamination Area, or Radiological Buffer Area, then contact a radiological controls technician to survey the equipment.
6. Seal equipment in plastic, and date.

### **Ice Chest and Shipping Containers**

If the container is severely contaminated, it shall be cleaned as thoroughly as possible, rendered unusable, and properly disposed.

1. Wash interior and exterior with soap and water.
2. Rinse with clean tap water.
3. Air dry before storage.

**THIS PAGE INTENTIONALLY LEFT BLANK**

## **APPENDIX E4**

### **SOLID WASTE MANAGEMENT UNIT/AREA OF CONCERN SUMMARY**

**THIS PAGE INTENTIONALLY LEFT BLANK**

**Table E4.1. Current Solid Waste Management Unit/Area of Concern**

| <b>SWMU/AOC Number</b> | <b>Description</b>                                                   |
|------------------------|----------------------------------------------------------------------|
| 1                      | C-747-C Oil Land Farm                                                |
| 2                      | C-749 Uranium Burial Ground                                          |
| 3                      | C-404 Low-Level Radioactive Waste Burial Ground                      |
| 4                      | C-747 Contaminated Burial Ground                                     |
| 5                      | C-746-F Classified Burial Ground                                     |
| 6                      | C-747-B Burial Area                                                  |
| 7                      | C-747-A Burial Ground                                                |
| 8                      | C-746-K Inactive Sanitary Landfill                                   |
| 9                      | C-746-S Residential Landfill                                         |
| 10                     | C-746-T Inert Landfill                                               |
| 11                     | C-400 TCE Leak Site                                                  |
| 12                     | C-747-A UF <sub>4</sub> Drum Yard                                    |
| 13                     | C-746-P Clean Scrap Yard                                             |
| 14                     | C-746-E Contaminated Scrap Yard                                      |
| 15                     | C-746-C Scrap Yard                                                   |
| 16                     | C-746-D Classified Scrap Yard                                        |
| 17                     | C-616-E Sludge Lagoon [Active]                                       |
| 18                     | C-616-F Full-Flow Lagoon [Active]                                    |
| 19                     | C-410-B HF Neutralization Lagoon                                     |
| 20                     | C-410-E HF Emergency Holding Pond slab and underlying soils          |
| 21                     | C-611-W Sludge Lagoon [Active]                                       |
| 22                     | C-611-Y Overflow Lagoon (includes KPDES 006) [Active]                |
| 23                     | C-611-V Lagoon (includes KPDES 005) [Active]                         |
| 24                     | C-750-D UST                                                          |
| 25                     | C-750 1,000-gal Waste Oil Tank (UST)                                 |
| 26                     | C-400 to C-404 Underground Transfer Line                             |
| 27                     | C-722 Acid Neutralization Tank [Active]                              |
| 28                     | C-712 Laboratory Equalization Tank slab and underlying soils         |
| 29                     | C-746-B TRU Storage Area                                             |
| 30                     | C-747-A Burn Area                                                    |
| 31                     | C-720 Compressor Pit Water Storage Tank slab and underlying soils    |
| 32                     | C-728 Clean Waste Oil Tanks slab and underlying soils [Active]       |
| 33                     | C-728 Motor Cleaning Facility slab and underlying soils [Active]     |
| 34                     | C-746-M PCB Waste Storage Area                                       |
| 35                     | C-337 PCB Waste Storage Area                                         |
| 36                     | C-337 PCB Waste Staging Area                                         |
| 37                     | C-333 PCB Waste Staging Area                                         |
| 38                     | C-615 Sewage Treatment Plant slab and underlying soils [Active]      |
| 39                     | C-746-B PCB Waste Storage Area                                       |
| 40                     | C-403 Neutralization Tank slab and underlying soils                  |
| 41                     | C-410-C Neutralization Tank slab and underlying soils                |
| 42                     | C-616 Chromate Reduction Facility slab and underlying soils [Active] |
| 43                     | C-746-B Waste Chemical Storage Area                                  |
| 44                     | C-733 Hazardous Waste Storage Area                                   |
| 45                     | C-746-R Waste Solvent Storage Area                                   |
| 46                     | C-409 Hazardous Waste Pilot Plant                                    |
| 46A                    | C-746-Q Hazardous and Low-Level Mixed Waste Storage Facility         |
| 47                     | C-400 Technetium Storage Tank Area                                   |
| 48                     | Gold Dissolver Storage Tank (DMSA C400-03)                           |
| 49                     | C-400-B Waste Solution Storage Tank                                  |
| 50                     | C-400-C Nickel Stripper Evaporation Tank                             |
| 51                     | C-400-D Lime Precipitation Tank                                      |
| 52                     | C-400 Waste Decontamination Solution Storage Tanks                   |
| 53                     | C-400 NaOH Precipitation Unit                                        |
| 54                     | C-400 Degreaser Solvent Recovery Unit                                |
| 55                     | C-405 Incinerator building slab and underlying soils                 |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>                                                             |
|------------------------|--------------------------------------------------------------------------------|
| 56                     | C-540-A PCB Waste Staging Area                                                 |
| 57                     | C-541-A PCB Waste Staging Area                                                 |
| 58                     | North-South Diversion Ditch (NSDD) (Outside) (includes KPDES 003)              |
| 59                     | NSDD (Inside)                                                                  |
| 60                     | C-375-E2 Effluent Ditch (KPDES 002) [Active]                                   |
| 61                     | C-375-E5 Effluent Ditch (KPDES 013) [Active]                                   |
| 62                     | C-375-S6 SW Ditch (KPDES 009) [Active]                                         |
| 63                     | C-375-W7 Oil Skimmer Ditch (KPDES 008 and KPDES 004) [Active]                  |
| 64                     | Little Bayou Creek                                                             |
| 65                     | Bayou Creek                                                                    |
| 66                     | C-375-E3 Effluent Ditch (KPDES 010) [Active]                                   |
| 67                     | C-375-E4 Effluent Ditch (C-340 Ditch) (KPDES 011) [Active]                     |
| 68                     | C-375-W8 Effluent Ditch (KPDES 015) [Active]                                   |
| 69                     | C-375-W9 Effluent Ditch (KPDES 001) [Active]                                   |
| 70                     | C-333-A Vaporizer slab and underlying soils [Active]                           |
| 71                     | C-337-A Vaporizer slab and underlying soils [Active]                           |
| 72                     | C-200 Underground Gasoline Tanks                                               |
| 73                     | C-710 Underground Gasoline Tanks                                               |
| 74                     | C-340 PCB Transformer Spill Site                                               |
| 75                     | C-633 PCB Spill Site                                                           |
| 76                     | C-632-B Sulfuric Acid Storage Tank                                             |
| 77                     | C-634-B Sulfuric Acid Storage Tank                                             |
| 78                     | C-420 PCB Spill Site                                                           |
| 79                     | C-611 PCB Spill Site                                                           |
| 80                     | C-540-A PCB Spill Site                                                         |
| 81                     | C-541-A PCB Spill Site                                                         |
| 82                     | C-531 Switchyard slab and underlying soils [Active]                            |
| 83                     | C-533 Switchyard slab and underlying soils [Active]                            |
| 84                     | C-535 Switchyard slab and underlying soils [Active]                            |
| 85                     | C-537 Switchyard slab and underlying soils [Active]                            |
| 86                     | C-631 Pumphouse and Cooling Tower Slabs and Associated Soils                   |
| 87                     | C-633 Pumphouse and Cooling Tower Slabs and Associated Soils                   |
| 88                     | C-635 Pumphouse and Cooling Tower Slabs and Associated Soils                   |
| 89                     | C-637 Pumphouse and Cooling Tower slab and underlying soils                    |
| 90                     | C-728 Petroleum Naphtha Pipe                                                   |
| 91                     | UF <sub>6</sub> Cylinder Drop Test Area                                        |
| 92                     | Fill Area for Dirt from the C-420 PCB Spill Site                               |
| 93                     | Concrete Disposal Area East of Plant Security Area                             |
| 94                     | KOW Trickling Filter and Leach Field                                           |
| 95                     | KOW Burn Area                                                                  |
| 96                     | C-333 Cooling Tower Scrap Wood Pile                                            |
| 97                     | C-601 Diesel Spill                                                             |
| 98                     | C-400 Basement Sump                                                            |
| 99A                    | C-745 Kellogg Building Site—Cylinder Yard                                      |
| 99B                    | C-745 Kellogg Building Site—Septic Tank/Leach Field                            |
| 100                    | Fire Training Area                                                             |
| 101                    | C-340 Hydraulic System                                                         |
| 102A                   | Plant Storm Sewer—between the south side of the C-400 Building and Outfall 008 |
| 102B                   | Plant Storm Sewer associated with C-333-A, C-337-A, C-340, C-535, and C-537    |
| 105                    | Concrete Rubble Pile (3)                                                       |
| 106                    | Concrete Rubble Pile (4)                                                       |
| 107                    | Concrete Rubble Pile (5)                                                       |
| 108                    | Concrete Rubble Pile (6)                                                       |
| 109                    | Concrete Rubble Pile (7)                                                       |
| 110                    | Concrete Rubble Pile (8)                                                       |
| 111                    | Concrete Rubble Pile (9)                                                       |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>                                            |
|------------------------|---------------------------------------------------------------|
| 112                    | Concrete Rubble Pile (10)                                     |
| 113                    | Concrete Rubble Pile (11)                                     |
| 114                    | Concrete Rubble Pile (12)                                     |
| 115                    | Concrete Rubble Pile (13)                                     |
| 116                    | Concrete Rubble Pile (14)                                     |
| 117                    | Concrete Rubble Pile (15)                                     |
| 118                    | Concrete Rubble Pile (16)                                     |
| 119                    | Concrete Rubble Pile (17)                                     |
| 120                    | Concrete Rubble Pile (18)                                     |
| 121                    | Concrete Rubble Pile (19)                                     |
| 122                    | Concrete Rubble Pile (20)                                     |
| 123                    | Concrete Rubble Pile (21)                                     |
| 124                    | Concrete Rubble Pile (22)                                     |
| 125                    | Concrete Rubble Pile (23)                                     |
| 126                    | Concrete Rubble Pile (24)                                     |
| 127                    | Concrete Rubble Pile (25)                                     |
| 128                    | Concrete Rubble Pile (26)                                     |
| 129                    | Concrete Rubble Pile (27)                                     |
| 130                    | C-611 550-gal Gasoline UST                                    |
| 131                    | C-611 50-gal Gasoline UST                                     |
| 132                    | C-611 2,000-gal Oil UST                                       |
| 133                    | C-611 (unknown size) Grouted UST                              |
| 134                    | C-611 1,000-gal Diesel/Gasoline Tank                          |
| 135                    | C-333 PCB Soil Contamination (North Side)                     |
| 136                    | C-740 TCE Spill Site                                          |
| 137                    | C-746-A Inactive PCB Transformer Sump Area                    |
| 138                    | C-100 Southside Berms                                         |
| 139                    | C-746-A1 UST                                                  |
| 140                    | C-746-A2 UST                                                  |
| 141                    | C-720 Inactive TCE Degreaser                                  |
| 142                    | C-750-A 10,000-gal Gasoline Tank (UST)                        |
| 143                    | C-750-B 10,000-gal Diesel Tank (UST)                          |
| 144                    | C-746-A Hazardous and Mixed Waste Storage Facility            |
| 145                    | Residential/Inert Landfill Borrow Area (P-Landfill)           |
| 146                    | Concrete Rubble Pile (40)                                     |
| 147                    | Concrete Rubble Pile (41)                                     |
| 148                    | Concrete Rubble Pile (42)                                     |
| 149                    | Concrete Rubble Pile (43)                                     |
| 150                    | Concrete Rubble Pile (44)                                     |
| 151                    | Concrete Rubble Pile (45)                                     |
| 152                    | Concrete Rubble Pile (46)                                     |
| 153                    | C-331 PCB Soil Contamination (West)                           |
| 154                    | C-331 PCB Soil Contamination (Southeast)                      |
| 155                    | C-333 PCB Soil Contamination (West)                           |
| 156                    | C-310 PCB Soil Contamination (West Side)                      |
| 157                    | KOW Toluene Spill Area                                        |
| 158                    | Chilled-Water System Leak Site                                |
| 159                    | C-746-H3 Storage Pad slab and underlying soils [Active]       |
| 160                    | C-745 Cylinder Yard Spoils (PCB Soils)                        |
| 161                    | C-743-T-01 Trailer Site (Soil Backfill) [Active]              |
| 162                    | C-617-A Sanitary Water Line (Soil Backfill) [Active]          |
| 163                    | C-304 Building/HVAC Piping System (Soil Backfill)             |
| 164                    | KPDES Outfall Ditch 017 Flume—Soil Backfill                   |
| 165                    | C-616-L Pipeline & Vault Soil Contamination [Active]          |
| 166                    | C-100 Trailer Complex Soil Contamination (East Side) [Active] |
| 167                    | C-720 White Room Sump slab and underlying soils               |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>                                                                 |
|------------------------|------------------------------------------------------------------------------------|
| 168                    | KPDES Outfall Ditch 012 [Active]                                                   |
| 169                    | C-410-E HF Vent Surge Protection Tank                                              |
| 170                    | C-729 Acetylene Building Drain Pits                                                |
| 171                    | C-617-B Lagoon [Active]                                                            |
| 172                    | C-726 Sandblasting Facility slab and underlying soils [Active]                     |
| 173                    | C-746-A Trash Sorting Facility                                                     |
| 174                    | C-745-K Low-Level Storage Area                                                     |
| 175                    | Concrete Rubble Pile (28)                                                          |
| 176                    | C-331 RCW Leak Northwest Side                                                      |
| 177                    | C-331 RCW Leak East Side                                                           |
| 178                    | C-724-A Paint Spray Booth slab and underlying soils                                |
| 179                    | Plant Sanitary Sewer System [Active]                                               |
| 180                    | Outdoor Firing Range (WKWMA) [Active]                                              |
| 181                    | Outdoor Firing Range (PGDP) [Active]                                               |
| 182                    | Western Portion of Yellow Water Line                                               |
| 183                    | McGraw UST                                                                         |
| 184                    | Concrete Rubble Pile (29)                                                          |
| 185                    | C-611-4 Horseshoe Lagoon (includes KPDES 014)                                      |
| 186                    | C-751 Fuel Facility                                                                |
| 187                    | C-611 Septic System                                                                |
| 188                    | C-633 Septic System                                                                |
| 189                    | C-637 Septic System                                                                |
| 190                    | C-337A Sewage Treatment Aeration Tank                                              |
| 191                    | C-333-A Sewage Treatment Aeration Tank                                             |
| 192                    | C-710 Acid Interceptor Pit slab and underlying soils                               |
| 193                    | McGraw Construction Facilities (South Side Cylinder Yard Area, East of Hobbs Road) |
| 194                    | McGraw Construction Facilities (South Side Leach Field Area)                       |
| 195                    | Curlee Road Contaminated Soil Mounds                                               |
| 196                    | C-746-A Septic System                                                              |
| 197                    | Concrete Rubble Pile (30)                                                          |
| 198                    | C-410-D Area Soil Contamination slab and underlying soils                          |
| 199                    | Big Bayou Creek Monitoring Station                                                 |
| 200                    | Soil Contamination South of TSCA Waste Storage Facility                            |
| 201                    | Northwest Groundwater Plume                                                        |
| 202                    | Northeast Groundwater Plume                                                        |
| 203                    | C-400 Discard Waste System slab and underlying soils                               |
| 204                    | Dykes Road Historical Staging Area                                                 |
| 205                    | Eastern Portion of Yellow Water Line                                               |
| 206                    | C-753-A Toxic Substances Control Act Waste Storage Building                        |
| 207                    | C-752-A ER Waste Storage Building                                                  |
| 208                    | C-746-U Solid Waste Contained Landfill                                             |
| 209                    | C-720 Compressor Shop Pit Sump slab and underlying soils                           |
| 210                    | Southwest Groundwater Plume                                                        |
| 211A                   | C-720 TCE Spill Site Northeast                                                     |
| 211B                   | C-720 TCE Spill Site Southeast                                                     |
| 212                    | C-745-A Radiological Contamination Area                                            |
| 213                    | OS-02                                                                              |
| 214                    | OS-03                                                                              |
| 215                    | OS-04                                                                              |
| 216                    | OS-05                                                                              |
| 217                    | OS-06                                                                              |
| 218                    | OS-07 slab and underlying soils                                                    |
| 219                    | OS-08                                                                              |
| 220                    | OS-09 slab and underlying soils                                                    |
| 221                    | OS-10                                                                              |
| 222                    | OS-11                                                                              |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>                             |
|------------------------|------------------------------------------------|
| 223                    | OS-12 slab and underlying soils                |
| 224                    | OS-13                                          |
| 225A                   | OS-14                                          |
| 225B                   | Contaminated Soil Area Near C-533-1 DMSA OS-14 |
| 226                    | OS-15                                          |
| 227                    | OS-16                                          |
| 228                    | OS-17                                          |
| 229                    | OS-18                                          |
| 230                    | C-310-A-01                                     |
| 231                    | C-310-02                                       |
| 232                    | C-310-03                                       |
| 233                    | C-310-04                                       |
| 234                    | C-310-05                                       |
| 235                    | C-331-01                                       |
| 236                    | C-331-02                                       |
| 237                    | C-331-03                                       |
| 238                    | C-331-04                                       |
| 239                    | C-331-05                                       |
| 240                    | C-331-06                                       |
| 241                    | C-331-07                                       |
| 242                    | C-331-08                                       |
| 243                    | C-331-09                                       |
| 244                    | C-331-10                                       |
| 245                    | C-331-11                                       |
| 246                    | C-331-12                                       |
| 247                    | C-331-13                                       |
| 248                    | C-331-14                                       |
| 249                    | C-331-15                                       |
| 250                    | C-331-16                                       |
| 251                    | C-331-19                                       |
| 252                    | C-331-20                                       |
| 253                    | C-331-22                                       |
| 254                    | C-331-23                                       |
| 255                    | C-331-24                                       |
| 256                    | C-333-01                                       |
| 257                    | C-333-02                                       |
| 258                    | C-333-03                                       |
| 259                    | C-333-04                                       |
| 260                    | C-333-05                                       |
| 261                    | C-333-06                                       |
| 262                    | C-333-07                                       |
| 263                    | C-333-08                                       |
| 264                    | C-333-09                                       |
| 265                    | C-333-10                                       |
| 266                    | C-333-11                                       |
| 267                    | C-333-12                                       |
| 268                    | C-333-13                                       |
| 269                    | C-333-14                                       |
| 270                    | C-333-15                                       |
| 271                    | C-333-16 (West)                                |
| 272                    | C-333-16 (East)                                |
| 273                    | C-333-17                                       |
| 274                    | C-333-18                                       |
| 275                    | C-333-19                                       |
| 276                    | C-333-20                                       |
| 277                    | C-333-21                                       |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b> |
|------------------------|--------------------|
| 278                    | C-333-22           |
| 279                    | C-333-23           |
| 280                    | C-333-24           |
| 281                    | C-333-25           |
| 282                    | C-333-26           |
| 283                    | C-333-27           |
| 284                    | C-333-28           |
| 285                    | C-333-29           |
| 286                    | C-333-30           |
| 287                    | C-333-31           |
| 288                    | C-333-34           |
| 289                    | C-333-35           |
| 290                    | C-333-37           |
| 291                    | C-333-38           |
| 292                    | C-333-39           |
| 293                    | C-333-40           |
| 294                    | C-333-41           |
| 295                    | C-333-42           |
| 296                    | C-333-43           |
| 297                    | C-335-01           |
| 298                    | C-335-02           |
| 299                    | C-335-03           |
| 300                    | C-335-04           |
| 301                    | C-335-05           |
| 302                    | C-335-06           |
| 303                    | C-335-07           |
| 304                    | C-335-08           |
| 305                    | C-335-09           |
| 306                    | C-335-11           |
| 307                    | C-335-12           |
| 308                    | C-337-01           |
| 309                    | C-337-02           |
| 310                    | C-337-03           |
| 311                    | C-337-04           |
| 312                    | C-337-05           |
| 313                    | C-337-06           |
| 314                    | C-337-07           |
| 315                    | C-337-08           |
| 316                    | C-337-09           |
| 317                    | C-337-10           |
| 318                    | C-337-11           |
| 319                    | C-337-12           |
| 320                    | C-337-13           |
| 321                    | C-337-14           |
| 322                    | C-337-15           |
| 323                    | C-337-16           |
| 324                    | C-337-17           |
| 325                    | C-337-18           |
| 326                    | C-337-19           |
| 327                    | C-337-20           |
| 328                    | C-337-21           |
| 329                    | C-337-23           |
| 330                    | C-337-25           |
| 331                    | C-337-27           |
| 332                    | C-337-29           |
| 333                    | C-337-30           |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>        |
|------------------------|---------------------------|
| 334                    | C-337-31                  |
| 335                    | C-337-32                  |
| 336                    | C-337-33                  |
| 337                    | C-337-34                  |
| 338                    | C-337-35                  |
| 339                    | C-337-36                  |
| 340                    | C-337-37                  |
| 341                    | C-337-38                  |
| 342                    | C-337-39                  |
| 343                    | C-337-40                  |
| 344                    | C-337-41                  |
| 345                    | C-337-42                  |
| 346                    | C-337-43                  |
| 347                    | C-337-44                  |
| 348                    | C-337-45                  |
| 349                    | C-400-01                  |
| 350                    | C-400-04                  |
| 351                    | C-400-05                  |
| 352                    | C-400-06                  |
| 353                    | C-400-07                  |
| 354                    | C-409-01                  |
| 355                    | C-409-02                  |
| 356                    | C-720-01                  |
| 357                    | C-720-02                  |
| 358                    | C-720-03                  |
| 359                    | C-720-04                  |
| 360                    | C-535                     |
| 361                    | C-727-90 day              |
| 362                    | G-310-04                  |
| 363                    | G-331-03                  |
| 364                    | G-331-05                  |
| 365                    | G-333-02                  |
| 366                    | G-333-03                  |
| 367                    | G-333-04                  |
| 368                    | G-333-08                  |
| 369                    | G-333-10                  |
| 370                    | G-333-20                  |
| 371                    | G-335-01                  |
| 372                    | G-337-02                  |
| 373                    | G-337-03                  |
| 374                    | G-337-13                  |
| 375                    | G-337-14                  |
| 376                    | G-337-15                  |
| 377                    | G-337-22                  |
| 378                    | G-340-01                  |
| 379                    | G-340-03                  |
| 380                    | G-340-04                  |
| 381                    | G-340-05                  |
| 382                    | G-340-06                  |
| 383                    | G-400-01                  |
| 384                    | G-400-02                  |
| 385                    | G-409-25                  |
| 386                    | G-410-01                  |
| 387                    | G-416-01                  |
| 388                    | C-416 Decontamination Pad |
| 389                    | G-533-01                  |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>                     |
|------------------------|----------------------------------------|
| 390                    | G-535-02                               |
| 391                    | G-537-01                               |
| 392                    | G-540-A-01                             |
| 393                    | G-540-A-1-02                           |
| 394                    | G-541-A-01                             |
| 395                    | G-600-01                               |
| 396                    | G-611-U-01                             |
| 397                    | G-612-01                               |
| 398                    | G-612-02                               |
| 399                    | G-612-A-01                             |
| 400                    | G-635-01                               |
| 401                    | G-710                                  |
| 402                    | G-710-04                               |
| 403                    | G-710-20                               |
| 404                    | G-710-24                               |
| 405                    | G-720-22                               |
| 406                    | G-743-T-17-01                          |
| 407                    | G-743-T-17-02                          |
| 408                    | G-745-B-01                             |
| 410                    | G-746-G-01                             |
| 411                    | G-746-G-1-01                           |
| 412                    | G-746-G-2-01                           |
| 413                    | G-746-G-3-01                           |
| 414                    | G-746-F-01                             |
| 415                    | G-746-S-01                             |
| 416                    | G-746-X-01 (PCBs)                      |
| 417                    | G-746-X-01 (Asbestos)                  |
| 418                    | G-748-B-01                             |
| 419                    | C-752-C Decontamination Facility       |
| 420                    | G-752-C-02                             |
| 421                    | G-754-01                               |
| 422                    | G-755-A-01, G-755-A-02, and G-755-A-03 |
| 423                    | G-755-C-01                             |
| 424                    | G-755-T-07-01                          |
| 425                    | G-755-T-08                             |
| 426                    | G-755-T-2-3-01                         |
| 427                    | G-755-T-3-1-01                         |
| 428                    | G-755-T-3-2-01                         |
| 429                    | S-310-04                               |
| 430                    | S-331-02                               |
| 431                    | S-333-12                               |
| 432                    | S-335-09                               |
| 433                    | S-337-11                               |
| 434                    | S-340-01                               |
| 435                    | S-409-100                              |
| 436                    | S-409-20                               |
| 437                    | S-409-40                               |
| 438                    | S-409-60                               |
| 439                    | S-409-80                               |
| 440                    | S-410-05                               |
| 441                    | S-540-A-2-01                           |
| 442                    | S-612-01                               |
| 443                    | S-709-01                               |
| 444                    | S-709-02                               |
| 445                    | S-710-05                               |
| 446                    | S-710-06                               |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>                                                                  |
|------------------------|-------------------------------------------------------------------------------------|
| 447                    | S-710-09                                                                            |
| 448                    | S-710-16                                                                            |
| 449                    | S-710-18                                                                            |
| 450                    | S-710-32                                                                            |
| 451                    | S-710-41                                                                            |
| 452                    | S-710-44                                                                            |
| 453                    | S-710-46                                                                            |
| 454                    | S-743-T-17-01                                                                       |
| 455                    | S-755-T-16-01                                                                       |
| 456                    | S-755-T-16-02                                                                       |
| 457                    | S-755-T-16-03                                                                       |
| 458                    | S-755-T-2-3-01                                                                      |
| 459                    | S-755-T-3-1-01                                                                      |
| 460                    | S-755-T-3-2-01                                                                      |
| 461                    | S-755-T-3-2-02                                                                      |
| 462                    | S-755-T-3-2-03                                                                      |
| 463                    | C-746-A East End Smelter slab and underlying soils                                  |
| 464                    | C-746-A West End Smelter building slab and underlying soils                         |
| 465                    | Yard Rubble Pile and Crushate Storage Area (G-Yard)                                 |
| 467                    | Concrete Cylinder Holders Storage Area on Western Kentucky Wildlife Management Area |
| 468                    | Area Northwest of Outfall 015                                                       |
| 469                    | C-745-J Yard                                                                        |
| 470                    | C-746-V Yard                                                                        |
| 471                    | Outside C-746-B South Storage Area                                                  |
| 472                    | C-746-B Pad                                                                         |
| 473                    | C-746-B Pad, West                                                                   |
| 474                    | West of Vortec Site                                                                 |
| 475                    | C-745-G5-01 (Paint Enclosure)                                                       |
| 476                    | Concrete Crusher                                                                    |
| 477                    | C-340 Metals Plant building slab and underlying soils                               |
| 478                    | C-410/420 Feed Plant building slab and underlying soils                             |
| 479                    | C-204 Disintegrator Building                                                        |
| 480                    | C-402 Lime House building slab and underlying soils                                 |
| 481                    | C-410-A Hydrogen Holder                                                             |
| 482                    | C-415 Feed Plant Storage Building slab and underlying soils                         |
| 483                    | Nitrogen Generating Facilities slab and underlying soils                            |
| 484                    | C-611-M Storage Tank                                                                |
| 485                    | C-611-N Sanitary Water Storage                                                      |
| 486                    | Rubble Pile WKWMA (approximately 116 ft off roadside)                               |
| 487                    | Rubble Pile WKWMA (approximately 483 ft off roadside)                               |
| 488                    | PCB Contamination Area Near the C-410 Trailer Complex                               |
| 489                    | Septic Tank North of the C-710 Laboratory                                           |
| 490                    | McGraw Fuel Facility Waste Oil Storage Tank                                         |
| 491                    | Mercury Spill at the<br>C-611 Water Treatment Plant Vault                           |
| 492                    | Contaminated Soil Area, Near Outfall 010                                            |
| 493                    | Concrete Rubble Piles near Outfall 001                                              |
| 494                    | Ash Receiver Area in C-410/420                                                      |
| 495                    | C-410-I Ash Receiver Shed                                                           |
| 496                    | C-410 Fluorine/Hydrogen Filters (Northeast Mezzanine)                               |
| 497                    | C-410/420 F <sub>2</sub> Cell Neutralization Room Vats                              |
| 498                    | C-410/420 Sump at Columns D &<br>E-1&2 slab and underlying soils                    |
| 499                    | C-410/420 Sump at Column H-9&10 slab and underlying soils                           |
| 500                    | C-410/420 Sump at Column U-10&11 slab and underlying soils                          |
| 501                    | C-410/420 UF <sub>6</sub> Scale Pit Sumps A&B slab and underlying soils             |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>                                                                     |
|------------------------|----------------------------------------------------------------------------------------|
| 502                    | C-410/420 Sump at Column U-9 slab and underlying soils                                 |
| 503                    | C-410/420 Sump at Column G-1 slab and underlying soils                                 |
| 504                    | C-410/420 Sump at Column L-10 slab and underlying soils                                |
| 505                    | C-410/420 Sump at Column A-3N slab and underlying soils                                |
| 506                    | C-410/420 Sump at Column Wa-9 slab and underlying soils                                |
| 507                    | C-410/420 Condensate Tank Pit slab and underlying soils                                |
| 508                    | C-410/420 Settling Basin slab and underlying soils                                     |
| 509                    | C-410/420 Drain Pit slab and underlying soils                                          |
| 510                    | C-410/420 Sump at Column P&Q-2 slab and underlying soils                               |
| 511                    | C-410/420 Sump at Column Q&R-2 slab and underlying soils                               |
| 512                    | C-410/420 Sump at Column R-2 slab and underlying soils                                 |
| 513                    | C-411 Cell Maintenance Room Sump slab and underlying soils                             |
| 514                    | C-340 Magnesium Fluoride Reject Silo                                                   |
| 515                    | C-340 "Dirty" Dust Collection System                                                   |
| 516                    | C-340 Derby Preparation Area Sludge Collection System                                  |
| 517                    | Rubble and Debris Erosion Control Fill Area                                            |
| 518                    | Field South of C-746-P1 Clean Scrap Yard                                               |
| 519                    | C-410 Sulfuric Acid Tank (C-634-B)                                                     |
| 520                    | Scrap Material West of C-746-A                                                         |
| 521                    | C-340 Saw System Degreaser                                                             |
| 522                    | C-340 Work Pit at Ground Floor Level (B-7—B-9) slab and underlying soils               |
| 523                    | C-340 Metals Plant Pit at Ground Floor (F-6 to F-11) slab and underlying soils         |
| 524                    | C-340 Pickling System Sump (B-10 to B-11) slab and underlying soils                    |
| 525                    | Concrete Water Tower Supports (KOW)                                                    |
| 526                    | Internal Plant Drainage Ditches (includes KPDES 016)                                   |
| 527                    | C-410 GSA/SAA at Column J-6                                                            |
| 528                    | GSA/SAA at the Northwest Corner of C-745-G3 Paint Enclosure                            |
| 529                    | C-340 Powder Plant Sump at Ground Floor Level slab and underlying soils                |
| 531                    | Aluminum Slag Reacting Area (C-746-H4) Near the C-746-A Facility                       |
| 532                    | Photographic Solution Treatment Area in the C-102 Building                             |
| 533                    | TCE Spill Site from TCE Unloading Operations at C-400                                  |
| 534                    | UST #18 within SWMU 193                                                                |
| 535                    | S-755-T08-01 (Satellite Accumulation Area at C-755, Trailer 8)                         |
| 536                    | Concrete Truck Washout Area                                                            |
| 537                    | S-400-001 (SAA Located Outside at the Southeast Corner of the C-400 Building)          |
| 538                    | S-MST-01-01 and S-MST-01-02 (Mobile Trailer 01)                                        |
| 539                    | S-MST-02-01 and S-MST-02-02 (Mobile Trailer 02)                                        |
| 540                    | S-MST-03-01 and S-MST-03-02 (Mobile Trailer 03)                                        |
| 541                    | Contaminated Soil Area South of Outfall 011                                            |
| 542A                   | G-746-B-01, S-746-B-01, S-746-B-02 (GSA/SAAs located outside C-746-A)                  |
| 542B                   | G-746-A-01, S-746-A-01, S-746-A-02 (GSA/SAAs located outside C-746-A)                  |
| 543                    | T-746-S-01 (90-Day Storage Area)                                                       |
| 544                    | T-752-C-01 (90-Day Storage Area)                                                       |
| 545                    | C-755-T-22-01 and G-755-T-22                                                           |
| 546                    | PGDP Post 67 Diesel Fuel Spill Area                                                    |
| 547                    | PGDP Post 38 Diesel Spill Area                                                         |
| 548                    | Staging Area for Concrete Piers, Wood and Rubble North Side of C-745-B Cylinder Yard   |
| 549                    | Dirt/Concrete Rubble Pile near Outfall 008                                             |
| 550                    | Concrete Culvert Sections Located on the West Bank of the Ditch Leading to Outfall 001 |
| 551                    | C-755-GSA-23 Located at C-755 near the East Fence Line                                 |
| 552                    | C-760 90-Day Accumulation Area                                                         |
| 553                    | C-331-17                                                                               |
| 554                    | C-331-18                                                                               |
| 555                    | C-331-21                                                                               |
| 556                    | C-337-22                                                                               |
| 557                    | C-337-24                                                                               |

**Table E4.1. Current Solid Waste Management Unit/Area of Concern (Continued)**

| <b>SWMU/AOC Number</b> | <b>Description</b>                                                                                                            |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 558                    | C-337-26                                                                                                                      |
| 559                    | C-337-28                                                                                                                      |
| 560                    | C-333-16                                                                                                                      |
| 561                    | Soil Pile I                                                                                                                   |
| 562                    | Soil Piles C, D, E, F, G, H, J, K, and P in subunit 1 north of Soil Pile I on the west bank of Little Bayou Creek             |
| 563                    | Soil Piles 20, CC, and BW in subunit 4 north of Outfall 012 west of Little Bayou Creek                                        |
| 564                    | Soil Pile AT in subunit 5 that consists of three soil areas on the east side of the NSDD north of the P-, S-, and T-Landfills |
| 565                    | Rubble Area KY-19 (along Bayou Creek north of C-611 Water Treatment Plant)                                                    |
| 566                    | H-340-01                                                                                                                      |
| 567                    | Soil Pile K013 near Outfall 013, West of Little Bayou Creek                                                                   |
| 568                    | C-340 ST-90 Boxes                                                                                                             |
| 569                    | C-743-T-17 Sample Return Refrigerator                                                                                         |
| 570                    | Sample Return Sealand                                                                                                         |
| 571                    | C-602 Coal Storage Yard                                                                                                       |
| 572                    | C-360 Toll Transfer and Sampling Building Slab and Underlying Soils                                                           |
| 573                    | C-750 Garage Slab and Underlying Soils and Associated Outside Areas                                                           |
| 574                    | C-709-A Acid Neutralization Vault                                                                                             |
| 575                    | C-721 Gas Manifold Storage Slab and Underlying Soils Area                                                                     |

Notes:

1. Shaded cells indicate SWMUs that have been granted No Further Action (NFA) status. These SWMUs were deemed not to present a danger to human health or the environment.
2. Unshaded cells indicate SWMUs that Require Further Investigation.

**Table E4.2. Former Solid Waste Management Unit/Area of Concern Summary**

| <b>SWMU/AOC Number</b> | <b>Description</b>                           | <b>Removal Date</b> | <b>NFA Approval By</b>                                                                                                                                                                                       |
|------------------------|----------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 103                    | Concrete Rubble Pile (1)                     | 2/26/2026 (Mod #1)  | U.S. Environmental Protection Agency (EPA) and Kentucky Division of Waste Management (KDWM) via Waste Area Grouping (WAG) 17 Record of Decision (ROD) 9/29/1997; KDWM concurrence 9/26/1997 (Permit Mod #13) |
| 104                    | Concrete Rubble Pile (2)                     | 2/26/2026 (Mod #1)  | EPA and KDWM via WAG 17 ROD 9/29/1997; KDWM concurrence 9/26/1997 (Permit Mod #13)                                                                                                                           |
| 409                    | G-745-T-01                                   | 2/26/2026 (Mod #1)  | KDWM 2/14/2006                                                                                                                                                                                               |
| 466                    | South of Dyke Road, Pond Area                | 2/26/2026 (Mod #1)  | KDWM 8/17/2009                                                                                                                                                                                               |
| 530                    | Soil and Debris Storage Area by C-745-T Yard | 2/26/2026 (Mod #1)  | KDWM 3/8/2007                                                                                                                                                                                                |

Note: Former NFA SWMUs and Areas of Concern (AOCs) at the Paducah Gaseous Diffusion Plant have been removed from the Permit. These former SWMUs were deemed not to present a danger to human health or the environment.

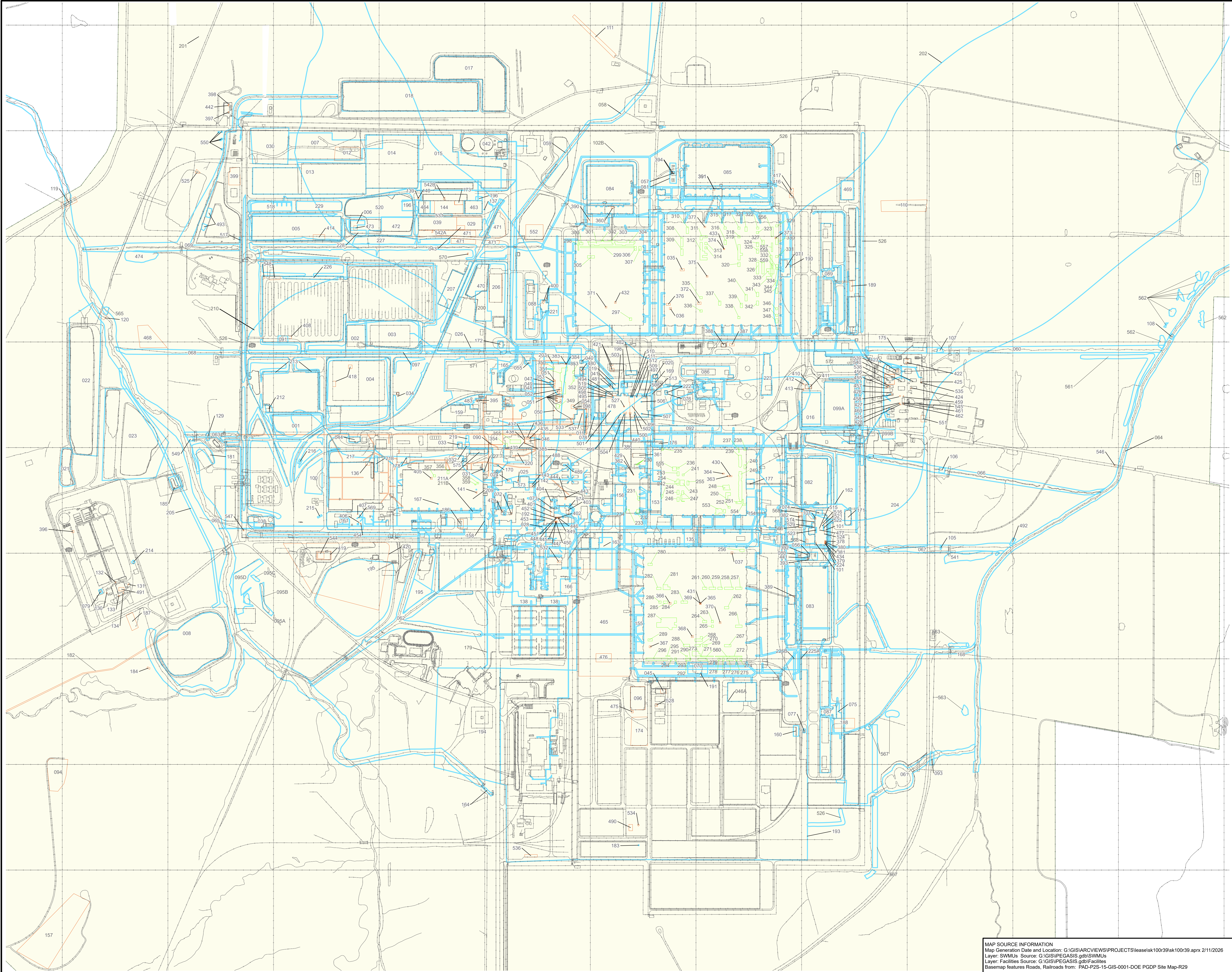
**THIS PAGE IS INTENTIONALLY LEFT BLANK**

## **APPENDIX E5**

### **SOLID WASTE MANAGEMENT UNIT/AREA OF CONCERN MAP**

**THIS PAGE INTENTIONALLY LEFT BLANK**

# Paducah Site Map Showing Current SWMU Locations

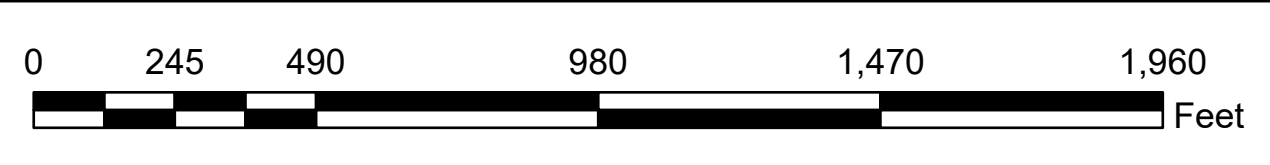
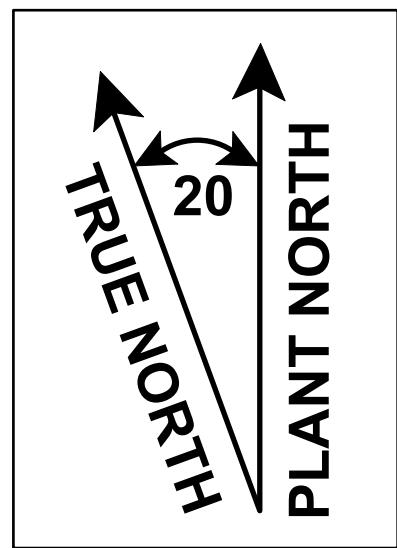


- Active
- No Further Action
- Inside DMSAs (No Further Action):  
SWMUs - 230-359 and 553-560

SWMUs 058, 064, 065 and 182  
extend beyond the map limits

SWMUs not shown:  
009,010,109,112-118,121-128,  
145-152, 180,197,199, 208, 415,  
467, and 484-487, 543, 564  
(outside of map boundary)

SWMUs 201 & 202 extend beyond  
map limits



U.S. DEPARTMENT OF ENERGY  
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE  
PADUCAH GASEOUS DIFFUSION PLANT



MAP SOURCE INFORMATION  
Map Generation Date and Location: G:\GIS\ARC\VIEW\PROJECTS\lease\sk100r39\sk100r39.aprx 2/11/2026  
Layer: SWMUs Source: G:\GIS\PEGASIS\gdb\SWMUs  
Layer: Facilities Source: G:\GIS\PEGASIS\gdb\Facilities  
Basemap features Roads, Railroads from: PAD-P25-15-GIS-0001-DOE PGDP Site Map-R29

FIGURE No. sk100r39.aprx  
DATE 2/11/2026

**THIS PAGE INTENTIONALLY LEFT BLANK**