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CP4-ES-0069 **FRev. 1**	**TITLE**: Monitoring Well and Associated Infrastructure Installation	Page 1 of 24

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FUNCTIONAL AREA: Characterization **SUBJECT MATTER AREA:** Monitoring Well Installation	**SUBJECT MATTER EXPERT**: Barry Kinsall, Environmental Scientist
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TABLE OF CONTENTS

1.0 PURPOSE AND SCOPE 3
1.1 Purpose 3
1.2 Scope 3
2.0 REFERENCES 3
2.1 Use References 3
2.2 Source References 4
3.0 COMMITMENTS 5
4.0 PRECAUTIONS AND LIMITATIONS 5
4.1 Precautions 5
4.2 Limitations 5
5.0 PREREQUISITES 5
6.0 INSTRUCTIONS 7
6.1 Pre-Performance Activities 7
6.2 Well Installation 8
6.3 Well Development 11
6.4 Well Pad Construction 12
6.5 Bollard Installation 13
6.6 Well Infrastructure Finishing 14
6.7 Installation of Sampling Access Road/Pad 14
6.8 Well Installation Closeout 16
7.0 RECORDS 17
7.1 Records Generated 17
7.2 Records Disposition 18
Appendix A – Acronyms/Definitions 19
Appendix B – Well Development Documentation Data 21
Appendix C – Ground Water Monitoring Wells Typical Well Details (C7DCWELLSA002) 22
Appendix D – Ground Water Monitoring Wells Typical Well Details (C7DCWELLSA003) 23
Appendix E – Ground Water Piezometer Wells Installation Details (C5EFA1950A12) 24

1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure defines the methods and requirements for the installation of groundwater (GW) monitoring wells (MW). The procedure steps and requirements provide guidance according to U.S. Environmental Protection Agency (EPA) directives and Kentucky Administrative Regulations (KAR).

- The Environmental Monitoring Project Manager is responsible for accepting any new monitoring wells to be installed and ensuring that the wells meet the following standards:401 KAR 6:350
- Construction requirements, as outlined in the project scope of work, field sampling plan (FSP), engineering drawings, or work plan
- Acceptance criteria for well development, as outlined in the U.S. Department of Energy's (DOE) prime contractor procedures
- Proper function of the well with no deficiencies

Monitoring wells that do **NOT** meet these requirements will **NOT** be accepted by the Environmental Monitoring Project Manager until all deficiencies have been corrected.

1.2 Scope

This procedure applies to all Paducah Gaseous Diffusion Plant (PGDP) Deactivation and Remediation (D&R) employees and/or subcontractors installing monitoring wells and associated infrastructure components at the U.S. DOE Paducah site.

The Environmental Monitoring organization has organizational ownership and maintenance responsibility for this procedure. The approval authority for this document is the Environmental Monitoring Project Manager.

The Engineering & Technical Services (E&TS) organization has organization ownership and approval authority of monitoring well design and any associated technical specifications.

2.0 REFERENCES

2.1 Use References

- 401 KAR 6:310, Section 11, *Well Abandonment*
- 401 *KAR* 6:320, *Certification of Water Well Driller*
- 401 *KAR* 6:350, *Monitoring Well Construction Practices and Standards*
- Drawing C7DCWELLSA002, *Typical Well Detail*
- Drawing C7DCWELLSA003, *Groundwater Monitoring Wells Installation Details*
- Drawing C5EFA1950A12, *Groundwater Piezometer Wells Installation Details*
- CP2-ES-0006, *Environmental Monitoring Plan*

- CP2-ES-0024, *Monitoring Well Maintenance Implementation Plan*
- CP2-ES-0025, *Paducah Environmental Monitoring Waste Management Plan*
- CP2-SM-0024, *Hoisting and Rigging Program*
- CP2-WM-0661, *Transportation Safety Document for On-Site Transportation within the PGDP*
- CP3-EN-0227, *Trenching, Excavation, and Penetration Permit*
- CP3-ES-0003, *Environmental Incident Reporting*
- CP3-FP-2005, *Welding, Burning, and Hotwork*
- CP3-OP-0207, *Use of Procedures*
- CP3-OP-0208, *Required Reading Crew Briefing*
- CP3-RD-0010, *Records Management Process*
- CP3-SM-0051, *Hoisting and Rigging*
- CP3-SM-2006, *Construction Equipment Inspection and Maintenance*
- CP3-WM-3030, *Commercial Motor Vehicle Operations*
- CP4-ER-2701, *Large Equipment Decontamination*
- CP4-ES-0077, *Monitoring Well Abandonment*
- CP4-ES-2700, *Logbooks and Data Forms*
- CP4-ES-2702, *Decontamination of Sampling Equipment and Devices*
- CP4-TR-0102, *Conduct of Training*
- PAD-REG-1005, *Spill Prevention, Control and Countermeasure Plan for the U.S. DOE, Paducah Site, McCracken County, Kentucky*
- PAD-REG-1006, *Best Management Practices Plan*
- SSPC-SP6, *Surface Preparation Standard from the Society for Protective Coatings; Commercial Blast Cleaning*.

2.2 Source References

- CP2-SM-0020, *Administrative Controls for Powered Industrial Trucks*
- CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*
- CP3-WM-3015, *Waste Packaging*
- EPA Technology Innovation Office 1992, *Ground Water Forum, Monitoring Well Development Guidelines for Superfund Project Managers*, Washington, D.C.

3.0 COMMITMENTS

None

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Precautions

4.1.1 **If** left unattended, **then** open borings shall be sufficiently barricaded/marked to prevent unauthorized entry or injury.

4.1.2 Obtain approval for use of potable water prior to drilling.

4.2 Limitations

Use of glue or solvents is not permitted to connect the well screen or riser casing sections.

5.0 PREREQUISITES

5.1 Prior to daily use, verify that the procedure is current.

5.2 Prior to performing any action steps identified in this procedure for the first time, review this document based upon its level of use according to CP3-OP-0207, *Use of Procedures.*

5.3 Prior to performing any action steps identified in this procedure, complete any required applicable training identified for the position according to CP4-TR-0102, *Conduct of Training*, and CP3-OP-0208, *Required Reading Crew Briefing*.

5.4 Employ best management practices according to PAD-REG-1006, *Best Management Practices Plan*, to prevent spills and releases.

5.5 Clean-up **and** report spills and/or releases according to CP3-ES-0003, *Environmental Incident Reporting*, and PAD-REG-1005, *Spill Prevention, Control and Countermeasure Plan for the DOE Paducah Site, McCracken County, Kentucky*.

5.6 Perform well installations under the supervision of a Kentucky Certified Well Driller according to 401 KAR 6:320, *Certification of Water Well Drillers*.

5.7 Prior to installing or repairing monitoring wells at each location, obtain approval from Regulatory Compliance.

5.8 **If** excavating or penetrating ground surface greater than 6 inches, **then** obtain required Excavation/Penetration Permit according to CP3-EN-0227, *Trenching, Excavation, and Penetration Permit.*

5.9 Complete well installations according to 401 *KAR* 6:350, *Monitoring Well Construction Practices and Standards*.

5.10 **If** an obstruction is encountered during drilling/digging at the planned location, cease operations and **then** contact Project Manager for further direction.

5.11 Prior to installing monitoring wells, obtain written approval from Environmental Monitoring Manager and assigned Well IDs.

5.12 **If** inside a radiological area, **then** prior to installing monitoring wells for each location, obtain written approval from Industrial Safety and Radiological Control (RADCON).

5.13 Obtain guidance from Waste Disposition to properly containerize/manage waste in accordance with CP3-WM-1037, Generation and Temporary Storage of Waste Materials.

5.14 Perform all hot work (generation of flames, high heat or hot particles/sparks) according to CP3-FP-2005, *Welding, Burning, and Hotwork*.

5.15 Obtain required materials for well construction from the Project Manager.

5.16 Prior to the initiation of well construction, submit manufacturer's technical specifications and data sheets for well materials to the Project Manager and Geologist for approval.

5.17 Prior to the initiation of well construction, submit documentation of cleanliness for pre-cleaned material to the Project Manager and Geologist for approval.

5.18 Document conditions of well materials in a project logbook according to CP4-ES-2700, *Logbooks and Data Forms*.

5.19 Prior to initiation of well construction by the certified well driller, provide bentonite pellet manufacturer's recommendations for hydration to the project manager. Ensure well site is in a location to allow for water drainage away from the well.

5.20 Inspect power equipment according to CP3-SM-2006, *Construction Equipment Inspection and Maintenance*.

5.21 **If** any of the below conditions exist, **then** decontaminate drill rigs and/or associated tooling according to CP4-ES-2702, *Decontamination of Sampling Equipment and Devices*, and CP4-ER-2701, *Large Equipment Decontamination*.

- Upon arrival on-site at the PGDP unless accepted as clean by Geologist
- Upon completion of each well or boring (downhole tooling only)
- Upon a Project Manager/RADCON determination based on the presence of dirt or mud or based on field screening data
- Prior to radiological scan out and demobilization from the site

5.22 Handle waste generated according to CP2-ES-0025, *Paducah Environmental Monitoring Waste Management Plan*, or a waste management approved alternative.

5.23 Conduct transportation activities according to CP2-WM-0661, *Transportation Safety Document for On-Site Transport within the PGDP*.

5.24 Use commercial motor vehicles according to CP3-WM-3030, *Commercial Motor Vehicle Operations*.

6.0 INSTRUCTIONS

6.1 Pre-Performance Activities

Project Manager

6.1.1 Obtain approval of scope and cost of scope prior to installation of the well from Environmental Monitoring Project Manager.

6.1.2 **If** well is **NOT** to be used after completion of field project, **then** well must be abandoned according to 401 KAR 6:310, Section 11, *Well Abandonment*, and CP4-ES-0077, *Monitoring Well Abandonment*.

6.1.3 Obtain Excavation/Penetration permit for each location where the surface will need to be disturbed to a depth of 6 inches or more.

Environmental Monitoring Project Manager

6.1.4 Prior to approval of installation of the well, ensure funding is in place to sample and maintain well(s) according to the current version of CP2-ES-0006, *Environmental Monitoring Plan* and CP2-ES-0024, *Monitoring Well Maintenance Implementation Plan*.

Scientist/Employee

6.1.5 **Prior** to installing a well in an area identified as a wetland, obtain approval from Regulatory Compliance.

6.1.6 **Prior** to beginning site preparation, inspect for the presence of wetland conditions.

6.1.7 Consult historic wetland surveys as appropriate in evaluating possible wetlands.

6.1.8 In the event wetland conditions are encountered, consult Regulatory Compliance for guidance on how to proceed.

6.1.9 **If** no wetlands are found, **then** proceed to **6.1.10**.

6.1.10 **Prior** to beginning site preparation, inspect the area for the presence of active bird nests.

6.1.11 **If** a nest is found, **then** contact the Project Manager for direction before proceeding with any work activities.

6.1.12 After issues involving the presence of nest have been resolved **then** request overgrowth/grass, overhanging limbs/objects, and weeds to be cleared from the vicinity of the installation locations, as needed, in order to ensure worker safety and minimize trip/fall hazards.

6.2 Well Installation

NOTES:

The Project Manager and Geologist will approve and select the appropriate drilling method, depending on site conditions, equipment limitations, and the depth and purpose of the monitoring well. In all instances, the ultimate installation methods employed shall be documented by the Geologist in accordance with CP4-ES-2700, *Logbooks and Data Forms*.

NOTE:

Changes to the plan can be made and documented by the Field Geologist based on as found data and conditions in the field.

Project Manager

6.2.1 **If** there are changes to the installation/construction of the well, **then** contact engineering **and** ensure that as-built drawings are submitted.

Certified Well Driller

6.2.2 Obtain the AKGWA numbers/registration for all permanently installed wells **and** provide to the Project Manager.

6.2.3 Install well according to 401 KAR 6:350; Monitoring Well Construction Practices and Standards and Drawings C7DCWELLSA002, *Typical Well Detail*; C7DCWELLSA003, *Groundwater Monitoring Wells Installation Details*; and C5EFA1950-A12, *Groundwater Piezometer Wells Installation Details*.

6.2.4 Prior to drilling, cutting, or pouring dry concrete, sand, or bentonite, contact Industrial Hygiene for respiratory protection and PPE requirements.

6.2.5 Use a containment device to retain drilling wastes such as fluids and drill cuttings that is compatible to the drilling method selected. Transfer expended drilling fluids/cuttings to a tank or approved container for storage and later treatment.

6.2.6 Measure **and** report to the Geologist the amount of water that was used during construction of each well for documentation purposes.

6.2.7 Well development activities must remove at least three times the amount of water that was added during the installation of the well or as stipulated in project work documentation.

NOTES: Borehole - (Drawing C7DCWELLSA003)

- Requires an 8 ½ inch minimum borehole.

Well casing - (Drawing C7DCWELLSA003)

- Requires 4 inch diameter, NSF schedule 40 Polyvinyl Chloride (PVC) well casing sump, 18-24 inches long, with a PVC schedule 40, threaded, flush joint cap.
- Requires 4 inch diameter, NSF schedule 40 PVC well casing.
- Requires use of a stainless steel centralizer, placed on the well sump.
- Requires 4 inch diameter, NSF schedule 40 PVC screen with 0.01 inch slot size.

Isolation casing - (Drawing C7DCWELLSA003)

- Requires 10 inch diameter – minimum – schedule 10 steel isolation casing or 10 inch diameter schedule 40 PVC isolation casing.
- Requires steel guide shoes on the outside of the steel isolation casing.
- Requires isolation casing to extend upwards to 6 inches below grade.
- Requires the isolation casing to be installed in the confining layer above the Regional Gravel Aquifer.

6.2.8 Take measurements continuously using the stainless steel-weighted tagline, when adding the bentonite pellets and sand pack.

NOTES:

Coated bentonite pellets are acceptable, if approved by the Project Manager and Geologist.

Bentonite Grouts - (Drawing C7DCWELLSA003)

- Requires use of cement bentonite grout – 90:10 – or 30% solids bentonite grout for installation of the isolation casing.
- Requires a bentonite pellet seal with a minimum thickness of 2 feet.
- Requires a 30% solids bentonite grout for the well casing annular seal.

6.2.9 Mix bentonite grout according to project requirements and the manufacturer's recommendation. Note that mixing a grout to a 30% solids slurry may require specialized equipment.

Scientist

6.2.10 Verify **and** document the correct grout/water mix by recording the weight of grout and the volume of water used to make the slurry (according to the manufacturer's specifications) or

by measuring the slurry density with a mud scale before placement.

Field Personnel

WARNING

If left unattended, **then** open borings shall be sufficiently barricaded/marked to prevent unauthorized entry or injury.

NOTES:

Finishing - (Drawing C7DCWELLSA003)

- Requires that the cover be a 8 inch flushmount Sherwood well covering or contractor accepted equal.
- Requires an aluminum locking Well cap and collar, including padlock, for 8-5/8 inch OD casing, Drillers Service Inc., Part #56OLWC412, or contractor accepted equal. Field Install spacers on padlock shackle as required to minimize cap opening access. Padlocks and spacers shall be supplied by the Contractor.

6.2.11 **If** well is to be completed as flush with ground, **then** finish according to Drawing C7DCWELLSA003, C7DCWELLSA002, and 401 *KAR* 6:350 Section 4 (below ground).

Outer casing - (Drawing C7DCWELLSA003)

- Requires a minimum 8 inch diameter, schedule 40 pipe, 5 feet-6 inch long for the outer protective surface casing.
- Requires that the protective casing be cleaned according to SSPC-SP6 and primed with TNEMEC Series 37-77W @ 3-5 mils and finished with TNEMEC Series 82-BW56 @ 2-3 mils, or Engineering accepted equal.
- Requires the outer protective surface casing to extend 4 inch above the installed well cap assembly.
- Requires the protective casing extend 3 feet above grade.
- Requires the protective casing to be installed in concrete to approximately 3 feet below the ground surface.
- Requires the weep holes to be installed above the concrete fill inside the protective casing/above the surface pad.
- Requires minimum of 6 inch of pea gravel fill above the concrete fill inside the protective casing – covering the weep holes.

6.2.12 Upon completion, ensure each monitoring well is sufficiently straight to allow the passage of pumps or sampling devices.

6.3 Well Development

NOTES:

Recommended methods include pumping, overpumping, surging, and bailing across successive intervals of well screen.

The well development process will be considered complete when the well produces water that is visually clear [goal of ≤ 10 nephelometric turbidity units (NTU)] and the other water quality parameters (pH, specific conductance, temperature) have stabilized.

Although turbidity is the most important water quality indicator during well development, development should continue until the other parameters are seen to stabilize within 10% between three consecutive measurements taken at least three minutes apart.

Stabilization of all parameters is indicative of the presence of formation water.

Additional well development criteria and direction is provided in the project FSP.

Documentation requirements are located in Appendix B.

Field Personnel

NOTE:

Development is complete when turbidity of discharge water remains low at the start of successive pumping periods.

6.3.1 Record static water level and total depth.

6.3.2 Set the pump **and** record pumping rate and each water quality parameter.

6.3.3 Pump until turbidity reaches desired level or stabilizes.

6.3.4 **If** turbidity is greater than 10 NTU, **then** discontinue pumping and surge the well.

6.3.5 **If** water quality requirements have been met, **then** measure depth to the bottom of the well.

6.3.6 **If** more than 10% of the screen is occluded by sediment, **then** remove excess sediment by bailing or air lift pumping.

6.3.7 Reset the pump, record pumping rate, turbidity and other water quality parameters.

6.3.8 Pump until turbidity reaches desired level or stabilizes.

6.3.9 Repeat surging and pumping until well yields water of acceptable turbidity (≤ 10 NTU) at the beginning of the pumping cycle and other parameters remain stable.

6.4 Well Pad Construction

Field Personnel

NOTE:

Drawings C7DCWELLSA002, *Typical Well Detail*, and C7DCWELLSA003, *Groundwater Monitoring Wells Installation Details*, provide details and material specifications for the surface completions.

6.4.1 Place outer protective casing according to 401 *KAR* 6:350, Section 8.

NOTES:

Each monitoring well will typically have four bollards installed outside of the corners of the concrete pad to protect the well. Well clusters may require a different number of bollards and shall be installed as directed by the Project Manager or Geologist with approval from the Environmental Monitoring Project Manager.

NOTES:

Absence of bollards for flush mount wells is acceptable; however, absence of bollards in aboveground MWs is not acceptable unless approval is obtained prior to installation by the Environmental Monitoring Project Manager and the Kentucky Division of Water.

NOTES:

In all cases the area around the well shall be left in a manner to allow for surface water runoff away from the well casing. Ponding at the well casing is prohibited.

6.4.2 Dig the foundation for the well pad. Soil removed from the well pad excavation shall be spread evenly around the well site and sloped away from the well pad only if permitted by project work documentation.

6.4.3 **If** excavated soil is **NOT** allowed to remain at the site, **then** the material must be managed as waste.

NOTE:

Soil or gravel may be used to establish a uniform grade across the form.

6.4.4 Construct a form around the well.

6.4.5 Fabricate the form so the concrete pad will be a minimum of 2 inches above the surrounding grade.

NOTES:

An edger shall be used around the form to round the edges to limit chipping of the concrete. For large jobs of multiple locations, the use of a power trowel may be necessary.

6.4.6 Mix concrete materials according to manufacturer's instructions.

6.4.7 Slope the concrete away from the casing to facilitate runoff so that no water will collect around the well casing.

NOTES:

Require Subcontractor to stamp well number – minimum of ½ inch size letters – in brass plate. Brass plate shall be domed survey marker, 3 inch diameter, Lietz Number 8134-18 or Contractor accepted equal.

6.4.8 Before the concrete cures, install two brass marker plates, each 3 inches in diameter, on the front side of each monitoring well.

6.4.9 After concrete has cured, remove fabricated form, stamp brass markers with monitoring well number, AKGWA number, elevation, and coordinates.

6.5 Bollard Installation

Field Personnel

NOTES:

Appropriate machinery such as a bobcat with auger attachments or hand tools can be used as required to create a boring for installing the bollards.

Bollards - Drawing C7DCWELLSA002

- Requires schedule 40 steel pipes with a minimum of 4 inches in diameter and a minimum of 6 feet in length.
- Requires the guards be installed to a depth of 3 feet – in a hole that is a minimum of 1 feet-4 inch in diameter.
- Requires that the bollard be cleaned according to SSPC-SP6 and primed with TNEMEC Series 37-77W @ 3-5 mills . If bollard sleeves are not used, then finish bollard with TNEMEC Series 82-BW56 @ 2-3 mils. or contractor accepted equal.
- Requires a specified location for the bumper guards – 3 feet-2inch off the center of the well/ the guards are 6 feet-4 inch apart.
- Requires that the concrete be 3,000 psi @ 28 days.

6.5.1 **If** permitted by project work documentation, **then** spread soil removed from the boring evenly around the well site **and** slope away from the well and bollards.

6.5.2 Install bollards at locations outside of the concrete well pad as shown on drawing C7DCWELLSA002 or an Engineering approved equivalent.

NOTE:

If bollard sleeves are used, **then** PVC caps are **NOT** required for the top of the bollards.

6.5.3 Use bollard sleeves, as necessary, to provide additional protection for the painted steel bollard.

6.5.4 See project waste management plan for guidance on waste soil handling.

6.5.5 Mix concrete **and** completely fill bollard boring.

6.5.6 Fill concrete in the boring above the top of the ground surface **and** slope the concrete base away from the bollard, as necessary, to prevent water pooling around the bollard.

6.5.7 Place PVC cap over top of bollard as applicable.

6.5.8 Keep bollard vertical with bracing as needed until concrete has set up sufficiently to support the pipe.

6.6 Well Infrastructure Finishing

Field Personnel

NOTES:

Drawing C7DCWELLSA002 and C7DCWELLSA003 provides specifications for paint.

Finishing/labeling - (Drawing C7DCWELLSA003)

Requires the protective casing to be labeled with black letters. Label shall include the prefix “MW” for monitoring wells, the prefix “PZ” for piezometers, and the number assigned by the Contractor. Letters shall be a minimum of 3 inches high.

6.6.1 Paint well outer casing.

6.6.2 Once paint has been allowed to dry, inspect **and** touch up paint as necessary.

6.6.3 Stencil well number on outside of outer casing. (e.g., MW-123)

6.6.4 Place AKGWA tag on inside of well lid.

6.6.5 Obtain approved lock from DOE Infrastructure Prime Contractor **and** lock well.

6.7 Installation of Sampling Access Road/Pad

6.7.1 Clear grass, brush, and overgrowth as needed. **If** required to install road along planned route, **then** remove small trees (< 5 inch diameter).

NOTE:

Fence, sign posts, and signs can be removed via hand tools and power tools, or the use of hydraulic equipment may be required to safely remove the post.

6.7.2 **If** necessary, **then** remove signs, postings, fencing and other infrastructure that are **NOT** required in the area that may obstruct the road.

6.7.3 **If** hoisting and rigging equipment are needed to remove posts, **then** follow CP2-SM-0024, *Hoisting and Rigging Program* and CP3-SM-0051, *Hoisting and Rigging*.

NOTES:

Geotextile is recommended for use in radiation areas, but may be appropriate for use at any location based on the Project Manager's observations. Project Manager may consult with RADCON to determine if geotextile is necessary.

6.7.4 Grade/scrape ground surface as needed to provide a smooth flat surface prior to placement of geotextile.

6.7.5 Lay geotextile fabric down where necessary to cover any new road bed or planned locations.

6.7.6 Spread dense grade aggregate (DGA) or an approved replacement (See Project Manager) at the planned road way. The Project Manager will be responsible for estimates on the amount of gravel to fill each area.

6.7.7 Use a bobcat, or other appropriate heavy equipment (e.g., trackhoe, backhoe, etc.) to spread the gravel evenly, and to fill in low spots and compact as necessary. Refer to CP3-SM-2006, *Construction Equipment Inspection and Maintenance*, for bobcat/trackhoe/backhoe inspection.

6.7.8 Use of hand tools, as necessary, to spread gravel.

6.7.9 **If** culvert installation is needed, **then** select a location that is free of trees, brush, stones and stumps to provide a relatively smooth surface area **and** follow Steps **6.7.10** through **6.7.17**. **If** culvert installation is **NOT** needed, then skip to Step **6.7.18**.

6.7.10 Excavate as needed to shape ditch **and** allow room for proper installation.

6.7.11 **If** necessary, **then** remove existing culvert **and** replace with a new one.

6.7.12 Place non-woven geotextile fabric in the footprint of the culvert.

6.7.13 Install 6 inches of gravel in the bottom of the ditch to provide an even surface and proper slope to promote drainage.

6.7.14 Roll corrugated metal pipe section into ditch.

6.7.15 Using the bucket of a front end loader, place small quantities of limestone or approved equivalent, along the sides between the culvert and the ditch banks up to the top of the culvert**.** Refer to CP3-SM-2006, *Construction Equipment Inspection and Maintenance,* for front end loader inspection.

6.7.16 **If** there is space, **then** tamp the stone to promote compaction.

6.7.17 Place limestone/approved equivalent on top of the culvert, in approximately a six-inch lift, by grading with the bucket of a front end loader or the blade of a small bull dozer**.** Refer to CP3-SM-2006, *Construction Equipment Inspection and Maintenance,* for front end loader/small bull dozer inspection.

6.7.18 Compact the lift with multiple passes of a vibratory drum roller (If necessary as determined by the Project Manager).

6.7.19 Once the access road has been completed, restore the surrounding disturbed area and all appropriate signs and postings, if removed.

NOTES:

Posts should be driven to a depth that ensures the sign is stable and is **NOT** easily removed. The posts should **NOT** exceed the depth maximum given by the excavation/penetration permit.

6.7.20 Use hand tools and power tools, as needed, to install the posts in the ground.

6.8 Well Installation Closeout

Field Personnel

6.8.1 Restore the work site to original conditions upon completion of installation activities **and** remove all construction debris.

6.8.2 Submit draft of Uniform Kentucky Well Construction Record form to Scientist.

Scientist

6.8.3 Coordinate with Environmental Monitoring personnel to identify the water level reference point for the well.

6.8.4 Obtain **and** submit the following as-built conditions to Sample Management Office(SMO):

- Coordinates of well
- Depth of well
- Elevation of Top of outer well casing
- Elevation of Top of inner well casing
- AKGWA number

- Well Construction Diagrams
- Uniform Kentucky Well Construction Record form
- Screened Zone
- Elevation of water level reference point
- Measure water level from the marked measuring point on the top of the casing within 24 hours of development.

6.8.5 Submit copy of Appendix B - Well Development Documentation Data to Environmental Monitoring.

6.8.6 Contact Environmental Monitoring to schedule inspection for acceptance of well.

Environmental Monitoring Personnel

6.8.7 Conduct inspection to ensure well meets requirements.

6.8.8 Fill out CP4-ES-0069-F01, *New Well Inspection Form*, with inspection findings.

6.8.9 Submit completed CP4-ES-0069-F01, *New Well Inspection Form*, to Scientist, Installation Project Manager, and Environmental Monitoring Project Manager.

Field Personnel

6.8.10 Complete any deficiencies noted by environmental monitoring inspection.

6.8.11 Contact Environmental Monitoring Personnel to re-inspect well until all requirements have been met.

Environmental Monitoring Project Manager

6.8.12 Contact SMO to ensure items listed in Step **6.8.4** have been submitted.

6.8.13 Review inspection findings to ensure all requirements have been met.

6.8.14 Accept ownership of well from Well Installation Project Manager.

6.8.15 Accept keys for the locked well.

6.8.16 Add well to well inventory for inclusion into the current version of CP2-ES-0006, *Environmental Monitoring Plan*.

7.0 RECORDS

7.1 Records Generated

The following records may be generated by this procedure:

- Field Logbook
- CP4-ES-0069-F01, New Well Inspection Form

7.2 Records Disposition

The records are to be maintained in accordance with CP3-RD-0010, *Records Management Process*.

Appendix A – Acronyms/Definitions

ACRONYMS

AKGWA – Assembled Kentucky Ground Water Database

D&R –Deactivation and Remediation

DGA – Dense Grade Aggregate

DOE – U.S. Department of Energy

E&TS – Engineering & Technical Services

EPA – U.S. Environmental Protection Agency

FSP – field sampling plan

GW – groundwater

KAR – Kentucky Administrative Regulations

MW – monitoring well

PGDP – Paducah Gaseous Diffusion Plant

PZ – piezometers

RADCON – radiological control

SMO – sample management office

DEFINITIONS

Certified Well Driller – Driller who has completed the requirements and obtained a certificate per 401 KAR 6:320. Certification of Water Well Drillers.

Monitoring Well – Any well intended to be used either to collect water samples for purposes of water quality testing, or to measure groundwater levels. Some monitoring wells may be dry and no water samples can be obtained. Piezometer is a type of monitoring well which measures the pressure (more precisely, the piezometric head) of groundwater at a specific point.

Overpumping – Pumping at rates generally greater than those used during sampling or well purging. Commonly combined with surging of the well.

Surge Block – A plunger-like tool, consisting of leather or rubber discs sandwiched between steel or wooden disks that may be solid or valved, that is used in well development.

Surging – A well development technique where the surge block is alternately lifted and dropped within the borehole above or adjacent to the screen to create a strong inward and outward movement of the water through the well intake.

Appendix A – Acronyms/Definitions (Continued)

Tremie Pipe – A device that allows sand, bentonite pellets or grout to be placed in a borehole from the bottom up to avoid “sandlocking” or “bridging” of the material, ensuring uniform placement. The tremie may be either a pipe placed at the bottom of the interval or the drill stem pipe/auger.

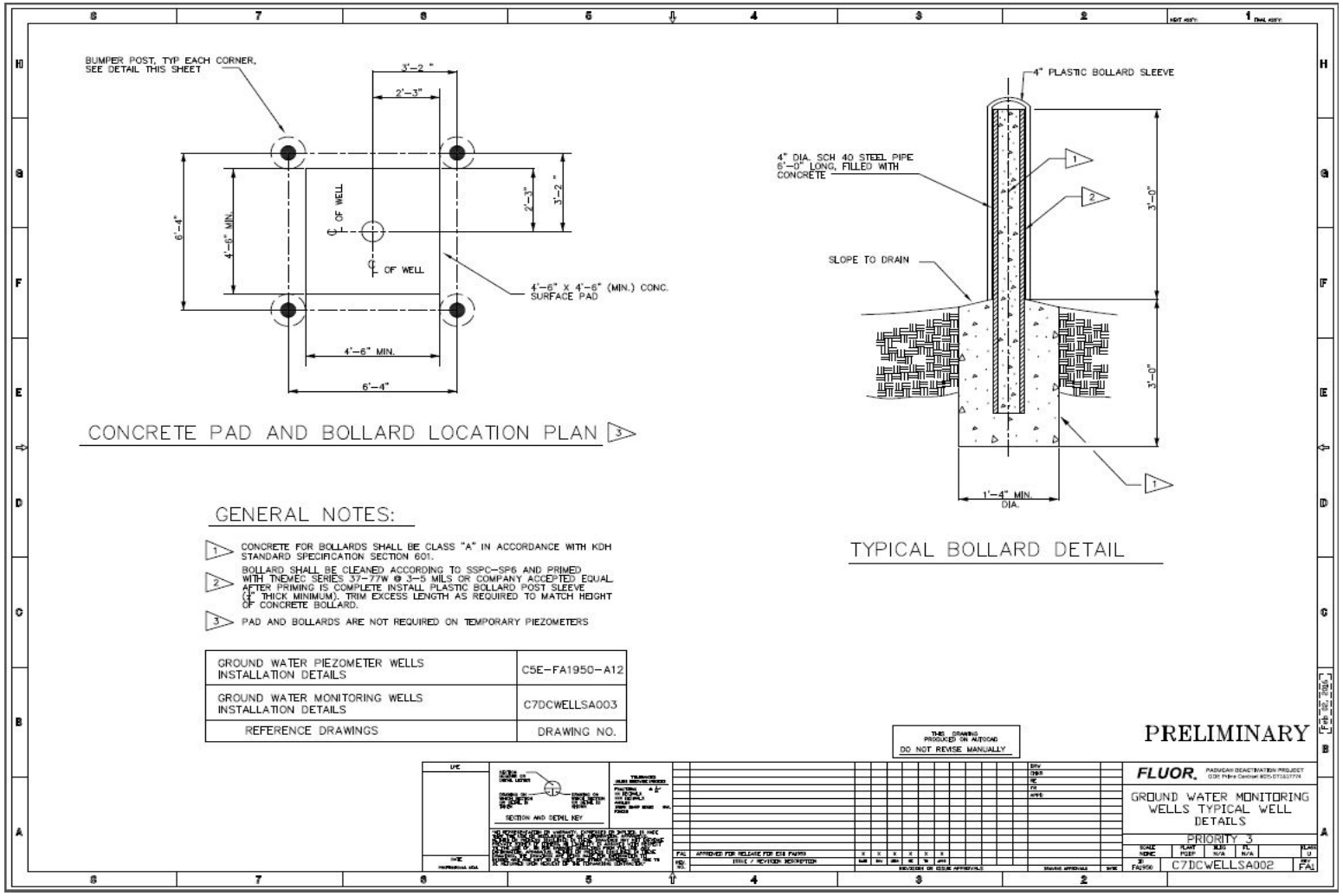
Turbidity – Solids and organic matter suspended in water.

Appendix B – Well Development Documentation Data

1. Date and duration of development
2. Measured water level from the marked measuring point on the top of the casing within 24 hours of development.
3. Depth from top of well casing to the top of any sediment present in the well, before, during, and after development
4. Types and quantity of drilling fluids introduced during drilling/development
5. Water quality measurements taken before, during, and after development
6. Volume and physical characteristics of developed water (e.g., odor, color, clarity, particulate matter)
7. Type and capacity of pump and/or bailer used and pumping rates
8. Detailed description of all development methods employed

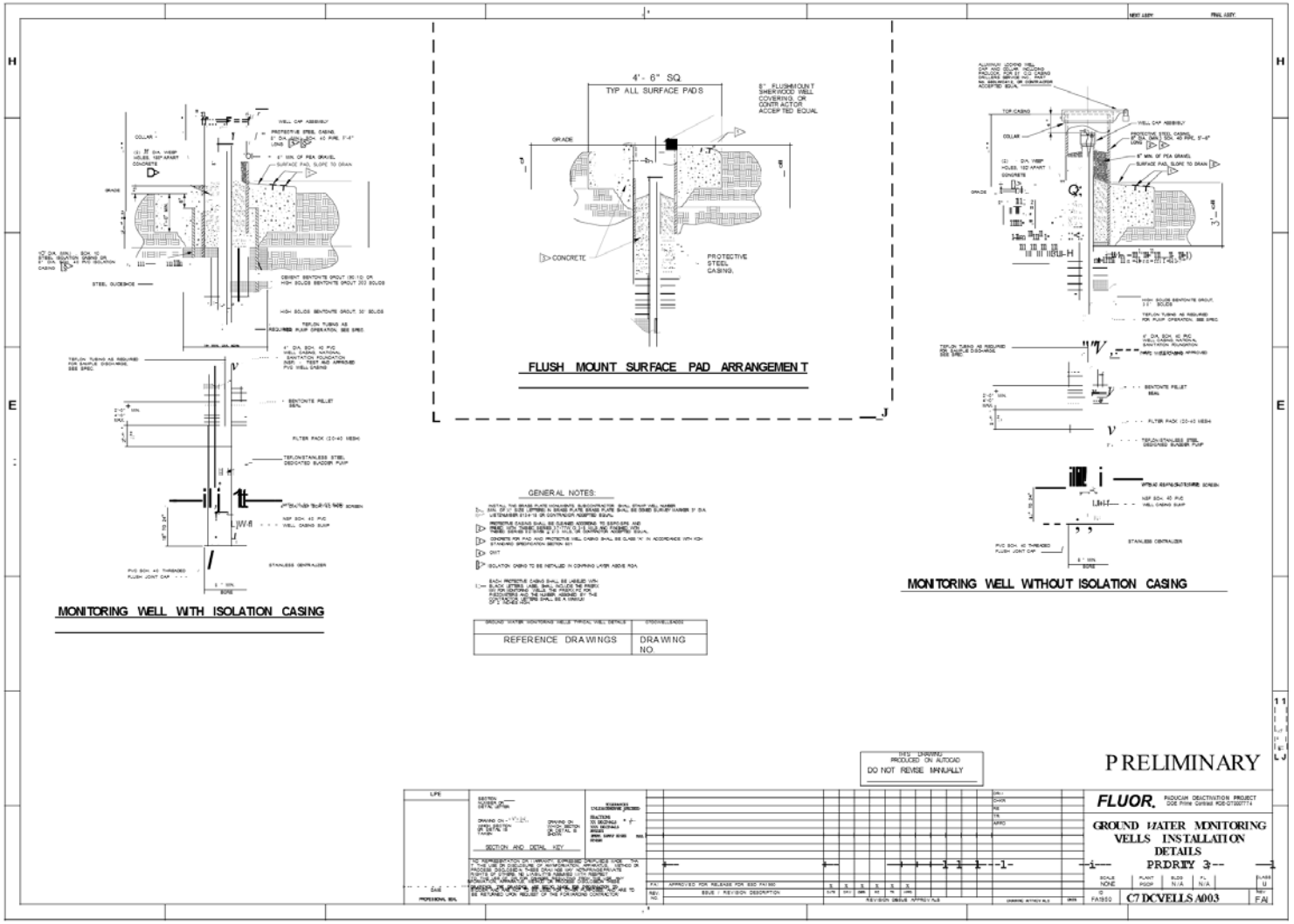
Appendix C – Ground Water Monitoring Wells Typical Well Details (C7DCWELLSA002)

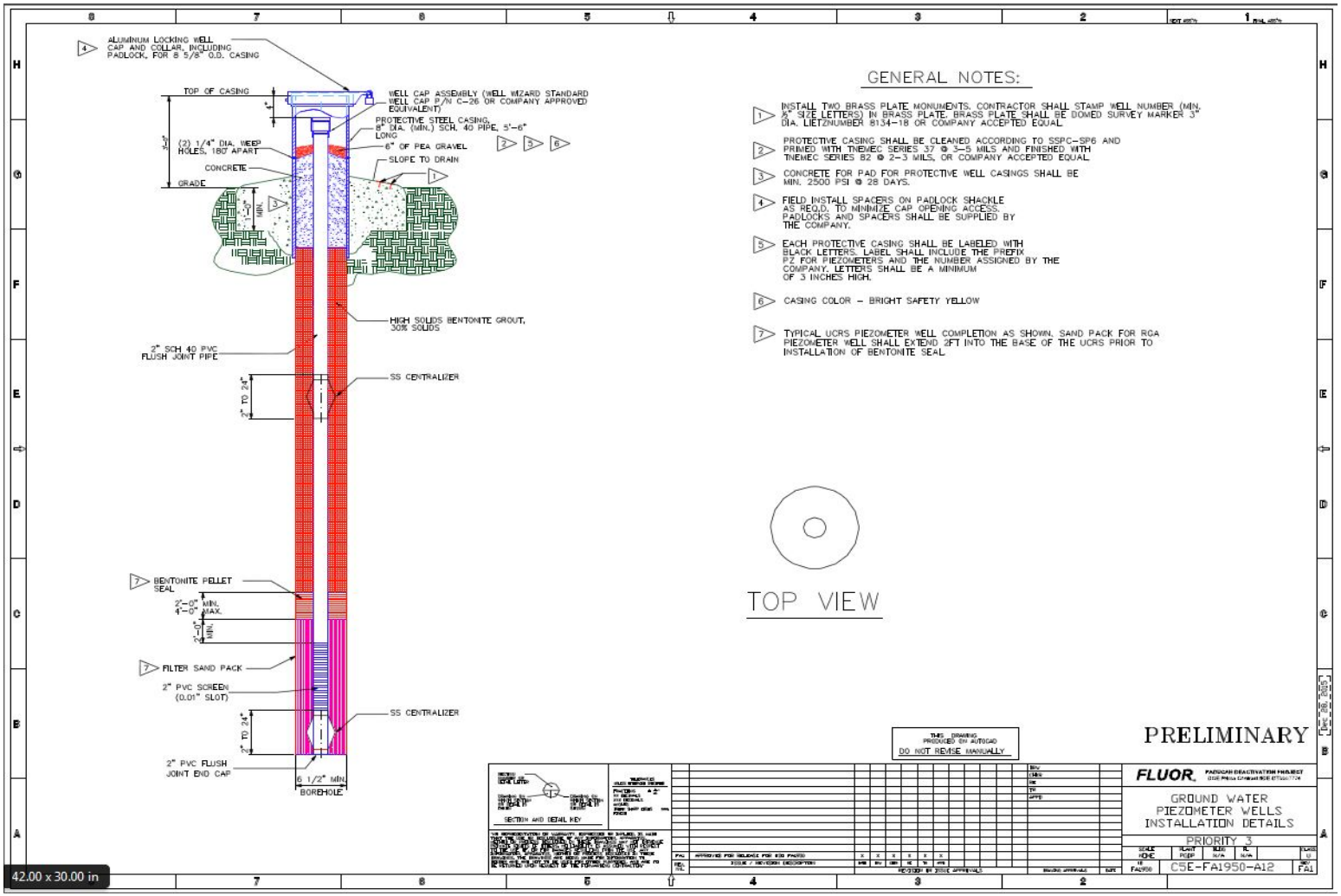
This is an example of the details. For useable approved details, please contact Engineering.



Appendix D – Ground Water Monitoring Wells Typical Well Details (C7DCWELLSA003)

This is an example of the details. For useable approved details, please contact Engineering.



Appendix E – Ground Water Piezometer Wells Installation Details (C5EFA1950A12)

This is an example of the details. For useable approved details, please contact Engineering.