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FUNCTIONAL AREA: Characterization (Sampling/Lab) **SUBJECT MATTER AREA:** Sampling	**SUBJECT MATTER EXPERT**: Chris Skinner, Characterization Field Lead
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REVISION/CHANGE LOG

Revision/Change Letter	Description of Changes	Pages Affected	Date of Revision/Change
FR0	Initial FRNP release	All	10/20/2017
FR1	Revision	All	12/21/2017
FR1A	Added the word Sampler as the performer under Prerequisites	4	1/2/2019
FR2	General procedure revision including addition of Colloidal Borescope System in section 6.5 and 6.6. Flowed down JHA.	All	2/26/2020
FR2A	Periodic Review has been completed with no changes identified in procedure technical content. Nonintent change to correct approver and dates has been incorporated per CP3-NS-2001. Date for review cycle has been reset.	All	9/7/2021
FR2B	Periodic Review has been completed with no changes identified in procedure technical content. Nonintent change to correct FA, SMA, SME, Approver, and dates has been incorporated per CP3-NS-2001. Date for review cycle has been reset.	All	10/6/2022
FR2C	Intent Change to address multiple comments and update sampling requirements.	3-8, 10, 12, 14	4/17/2023

REVISION/CHANGE LOG			
Revision/Change Letter	Description of Changes	Pages Affected	Date of Revision/Change
FR3	Revision to delete colloidal borescope from procedure. Changes to include pressure transducer manufacturer's manual steps in section 6.3 to close CAPA-004699. And clarify steps to close CAPA-004796.	All	12/4/2024

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure provides instructions for the installation and use of the Electronic Water Level (WL) Indicator and Pressure Transducer/Data Logger System, used to conduct water level measurements, measure well depth, for groundwater in open boreholes, cased wells, or piezometers.

1.2 Scope

This procedure applies to Paducah Gaseous Diffusion Plant (PGDP) Deactivation and Remediation (D&R) Contractor Personnel and Subcontractors involved in obtaining required groundwater level measurements and well depth data at the PGDP.

2.0 REFERENCES

2.1 Use References

- CP3-ES-2700, *Sample and Miscellaneous Data Forms*
- CP3-RP-1104, *Radiological Area Entry Control*
- CP3-SM-0017, *Measuring and Test Equipment*
- CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*
- CP4-ES-2702, *Decontamination of Sampling Equipment and Devices*

2.2 Source References

- CP2-ES-0006, *Environmental Monitoring Plan Fiscal Year 2025 Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
- CP2-HS-2000, *Worker Safety and Health Program for the Paducah Gaseous Diffusion Plant, Paducah Kentucky*
- CP2-SM-1000, *Activity Level Work Planning and Control Program for the Paducah Gaseous Diffusion Plant, Paducah Kentucky*
- In-Situ Level Troll 400, 500, 700, and 700H Operator's Manual, Rev. 01-23-2024
- JHA-10903, *Monitoring Well Sampling and Water Level Data Collection*

3.0 COMMITMENTS

None

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Precautions

4.1.1 A minimum of two people shall be present and within visual range of each other at all times during any measurement.

4.1.2 Personnel shall exercise caution when unlocking and opening wells known or suspected to be under pressure, or contain insect nests according to the task specific Work Control Package (WCP).

4.1.3 A portable or stationary eyewash station shall be present and capable of providing 15 minutes of continuous flow if working with hazardous chemicals.

4.1.4 Cut resistant gloves (ANSI rated A3 or higher; Tilman Trufit 1477, MCR Ninja Force N9677, or similar) shall be worn when handling materials that may cause cuts or abrasions (e.g., while opening and manipulating well casing lids/caps).

4.1.5 Communication equipment shall be available at all times.

4.1.6 Personnel shall be aware of the potential for chemical hazards in the area and shall evacuate the area and notify supervision if he or she suspects chemical exposure, such as: strange smell, vapor cloud, burning or itching sensation, spill of unknown liquid, broken lines or damage to equipment that may contain hazardous chemicals.

4.1.7 Personnel shall be familiar with the hazards associated with exposure to Volatile Organic Compounds (VOCs), specifically, trichloroethylene (TCE) and vinyl chloride (VCL).

4.1.8 Personnel shall wear chemical resistant gloves (Supreno EC Microflex Nitrile or Showa 730) when handling TCE contaminated equipment, liquid, or soil.

4.1.9 Industrial Hygiene (IH) shall be contacted to monitor for VOC's during ground water level measurement activities. IH monitoring for VOC's, at a minimum, will be conducted on an annual basis and target monitoring wells with a greater potential for VOC's (i.e., monitoring wells located around C-400).

4.1.10 A sustained instrument response at or above the action limit Breathing Zone (BZ) shall require a work pause with Personnel leaving the area and notification to the IH Program Manager and Industrial Safety (IS)/IH Supervisor.

4.1.11 Respiratory protection shall be required when direct read BZ monitoring detects exposure levels greater than the action limits or data shows exposure levels at or above the BZ action limits.

4.2 Limitations

4.2.1 Instruments and equipment shall be decontaminated and ready for use and shall be protected from sources of contamination (for example, wrapped in aluminum foil, sealed in plastic or other storage containers, placed on plastic sheeting in staging area) during transport to the location and during field activities.

4.2.2 The breakthrough time of Supreno EC Microflex Nitrile gloves is 2 hours for TCE. Personnel shall **NOT** use Supreno EC Microflex Nitrile gloves more than 2 hours after contact with TCE contaminated liquid or soil.

4.2.3 The breakthrough time of Showa 730 gloves is 4 hours for TCE. Personnel shall **NOT** use Showa 730 gloves for more than 4 hours after contact with TCE contaminated liquid or soil.

4.2.4 The following Occupational Exposure Limits (OEL) for TCE shall apply:

- 8 hour Time Weighted Average (TWA) = 10 ppm
- 10 hour TWA= 7 ppm
- Action Limit = 5 ppm
- Short Term Exposure Limit (STEL) = 25 ppm

5.0 PREREQUISITES

5.1 **If** required to enter a contamination area, **then** contact Radiological Control (RADCON) to determine the appropriate Radiological Work Permit (RWP) required **and** determine required surveys and monitoring requirements for the RWP.

5.2 **If** required, **then** read **and** sign off on the RWP according to CP3-RP-1104, *Radiological Area Entry Control*.

5.3 Ensure the following:

- Instruments and equipment are decontaminated and ready for use according to CP4-ES-2702, *Decontamination of Sampling Equipment and Devices*.
- Equipment has current calibration records and is within calibration date.

5.4 Contact Waste Management for proper management and/or storage of waste.

6.0 INSTRUCTIONS

6.1 General Requirements

Sampler

NOTE:

Project specific information shall be documented in a logbook at the start of a sampling event and at the time of sample collection but **NO** later than before leaving the sample site. All data that is entered into Project Environmental Measurements System (PEMS) is documented on applicable data forms.

6.1.1 **If** pertinent field observations are made during work activities, **then** record observations and measurements according to CP3-ES-2700, *Sample and Miscellaneous Data Forms*.

6.1.2 Inspect vault doors to determine pinch points that need to be guarded or eliminated **and** ensure well vault doors are secured with a safety latch **prior** to entering the vault.

6.1.3 Review task specific Work Control Package for the following:

- Reference to any photos, maps and figures that indicate or show proposed water level measurement well locations.
- Methods to be used.
- Required notifications and permits needed prior to starting water level measurement event.

6.1.4 Record the location where water level measurements will be taken on the appropriate PEMS generated data form, if **NOT** populated.

NOTES:

The use of caution is required to prevent equipment from contacting potentially contaminated surfaces.

Plastic sheeting may be used to stage equipment and materials around the open borehole, well, or piezometer to protect equipment from cross contamination.

6.1.5 **If** field decontamination is required by the task specific WCP, **then** set up temporary decontamination area.

6.1.6 Document any construction, sampling, development or redevelopment on the well, open borehole, and/or piezometer that occurred within the 24 hours preceding a water level measurement.

6.1.7 Repeat measurements two times to ensure a quality water level measurement.

6.1.8 **If** floating product is known to be present or encountered, **then** measure using an oil/water contact sensor probe.

NOTE:

Cascading water within a borehole can cause false readings with some types of water level measurement devices.

6.1.9 **If** historic water level measurements exist from the same well or piezometer, **then** review measurements to be able to recognize measurement error.

6.1.10 Record any deviations from method or factors that may affect measurements (for example, active recharge due to a precipitation event, saturated zone being stressed due to nearby pumping, drastic atmospheric pressure changes, etc.).

6.2 Electronic Water Level Indicator

Sampler

6.2.1 Obtain an electronic water level indicator to manually measure water levels.

6.2.2 Prior to mobilizing to the field, ensure the following:

A. Electronic water-level indicator is operational and backup batteries are available for use.

B. Alarm functions correctly.

C. Cable is free from damage.

6.2.3 Ensure electronic water-level indicator is decontaminated prior to use.

NOTE:

Personnel performing sampling activities are periodically required to check the accuracy of the decontaminated water-level indicator against a surveyor's tape or other measurement device to verify marks on the cable.

6.2.4 Record the following information for the borehole, well, or piezometer:

- Location
- Date
- Time
- Other pertinent information

6.2.5 Prior to water level measurement, inspect the surface condition of the wellhead, pad, and guard posts (if present) **and** note any adverse conditions.

NOTE:

The reference point (measurement point) is a permanent mark or a "V" notch filed into the top of the well casing.

6.2.6 Locate the reference point (e.g., Top of Outer Casing [TOC], Top of Inner Casing [TIC], Well Wizard Rim [WWR], and Well Wizard Plate [WWP]).

6.2.7 **If** a reference point is **NOT** present, **then** perform the following:

A. Establish a reference by filing a "V" notch on the north side of the well casing with a file, being careful cuttings do **NOT** fall into the well, **or** mark with a suitable marking instrument.

B. Notify the Environmental Monitoring Manager and Supervisor (or Designee) **and** note actions taken.

6.2.8 Record all readings from the reference point.

6.2.9 Document the reference point used if **NOT** populated by PEMS.

6.2.10 Perform the following:

A. **If** tubing/equipment prevent access for water level measurement **and** it can be easily removed, **then** temporarily remove that tubing/equipment.

B. Slowly lower the electronic water level indicator probe (or oil/water interface probe) into the open borehole, well, or piezometer, trying **NOT** to scrape the sides of the well casing or borehole wall with the cord or the probe until alarm sounds **and/or** the indicator light illuminates.

C. Slowly raise probe until the alarm **NO** longer sounds **and/or** the indicator light **NO** longer stays illuminated.

D. Slowly lower the probe **and** stop probe once alarm sounds **and/or** the indicator light stays illuminated.

6.2.11 Hold cord to reference point, **and** mark cord with thumb where it contacts the reference point.

6.2.12 Use a measuring device to determine distance from last marked increment on the cable to the thumb marked point on the cable **or** read the depth directly from the imprinted cable.

NOTE:

Measurements should be repeated until readings remain constant. The accuracy of the water level measurements shall be +/- 0.03 ft.

6.2.13 Repeat Step **6.2.10C** through **6.2.12** a minimum of two times to check for accuracy.

6.2.14 Record measurement to the nearest 0.01 ft.

6.2.15 Wipe the cable and probe with a clean paper towel moistened with analyte-free water when retracting the electronic water level indicator from the well.

6.2.16 **If** final measurement has been recorded, **then** close **and** lock the well cap.

6.3 Pressure Transducer/Data Logger

Sampler

6.3.1 Use a pressure transducer to continuously measure water level.

6.3.2 Open the software on the instrument **and** click the Sensors tab.

6.3.3 Select the level/pressure sensor **and** click the Configure button.

6.3.4 In the Sensor Setup window, select the level parameter, click Configure, **and** select the desired options.

6.3.5 **If** installing or changing out a pressure transducer, **then** prior to mobilizing to the field, ensure the following:

A. Pressure transducer is operational **and** backup batteries are available for use.

B. Cable is free from damage.

C. Cable and pressure transducer are decontaminated.

D. Complete form CP3-SM-0017 F01, *M&TE Use Log*.

NOTE:

Most pressure transducers are pre-calibrated by the manufacturer. Pressure transducers are manufactured to measure pressure over a specific range of submergence. Measurements will **NOT** be accurate outside the manufacturer's specified range.

It is recommended that the manufacturer's specifications be consulted concerning maintenance and chemical compatibility of the pressure transducer to be used to ensure compatibility with expected contaminants. Expected contaminants and concentrations of those contaminants may be found in the task specific WCP.

CAUTION:

Over pressuring by submersing to a depth outside the rated range, or by hitting the water surface too fast, as the transducer is lowered into the well may damage the transducer. Pressure transducers shall **NOT** be submerged beyond their rated depth or lowered at too rapid of a rate.

6.3.6 **Prior** to placing pressure transducer, inspect the surface condition of the wellhead, pad and guard posts (if present) **and** record conditions on the data form CP4-ES-2100-F01 *Pressure Transducer Deployment*, according to CP3-ES-2700, *Sample and Miscellaneous Data Forms.*

6.3.7 Take an initial manual water level measurement from the well to be monitored by using an electronic water level indicator using the steps outlined in Section **6.2**.

6.3.8 Pad sharp edges of the well casing to protect the cables.

6.3.9 Slowly lower the unit **and** secure at the recommended depth for the associated pressure transducer.

6.3.10 Begin continuous water level measuring task using the parameters specified in the WCP, direction per site geologist, or these default items:

- Pressure
- Temperature
- Depth to water
- Scale factor (e.g., linear)
- Time interval
- Fresh water
- Manual start

6.3.11 Ensure parameters are saved and the program has started collecting data **prior** to shutting down and leaving the well location.

6.3.12 **When** specified in the WCP or directed by the site geologist, **then** stop the test **and** transfer data from the pressure transducer to the computer. **If** data collection is continuing, **then** take a manual water level measurement from the well to be monitored by using an electronic water level indicator and the steps outlined in Section **6.2 and** start a new test using Steps **6.3.10** through **6.3.11**.

6.3.13 Upon completion of the test, restore the area around the test well by removing all materials and equipment used to measure continuous water level measurements.

6.3.14 Close **and** lock the well cap.

6.4 Total Well Depth Measurement Techniques

Sampler

NOTE:

The depth to water must be determined **prior** to sounding a well.

Sounding the well to determine the total depth (TD) may be required by the task specific WCP.

6.4.1 **If** sounding the well is required, **then** determine the total depth by lowering a weighted measuring tape or a water level indicator probe to the bottom of the well.

6.4.2 **If** a measuring tape with a weighted end is used for sounding a well, **then** ensure weight is stainless steel or an inert material.

6.4.3 Record well depth measurement.

7.0 ACCEPTANCE CRITERIA

None

8.0 POST PERFORMANCE WORK ACTIVITIES

8.1.1 Contact RADCON **prior** to transporting radiologically contaminated equipment, tools or supplies.

8.1.2 Decontaminate any non-disposable water level measurement equipment, tools, or supplies according to CP4-ES-2702.

8.1.3 Dispose of non-fissile waste or material generated during this work activity according to CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*.

9.0 RECORDS

9.1 Records Generated

The following records may be generated by this procedure:

- Water Level Data Forms (PEMS generated)
- CP4-ES-2100-F01, *Pressure Transducer Deployment Form*

Forms are to be completed according to CP3-OP-0024, *Forms Control*.

9.2 Records Disposition

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

Appendix A – Acronyms/Definitions

ACRONYMS

BZ – Breathing Zone

D&R – Deactivation and Remediation

IH – Industrial Hygiene

IS – Industrial Safety

JHA – Job Hazard Analysis

OEL – Occupational Exposure Limits

PEMS – Project Environmental Measurements System

PGDP – Paducah Gaseous Diffusion Plant

RADCON – Radiological Control

RWP – Radiological Work Permit

STEL – Short Term Exposure Limits

TD – Total Depth

TCE – Trichloroethylene

TIC – Top of Inner Casing

TOC – Top of Outer Casing

TWA – Time Weighted Average

VOC – Volatile Organic Compound

VCL – Vinyl Chloride

WL – Water Level

WCP – Work Control Package

WWP – Well Wizard Plate

WWR – Well Wizard Rim

Appendix A – Acronyms/Definitions (continued)

DEFINITIONS

Electronic Data Logger – An electronic device that can be programmed to receive electrical impulses, which are stored as data. Pressure transducers are designed to be used with automatic data-logging instruments and send a current to the data logger. The current is proportional to the pressure and can be converted to meaningful units by the data logger.

Pressure Transducer - An electronic probe connected to a wire cable that is lowered into the water column of a well to measure pressure. The pressure measured is the total pressure, which includes both the hydrostatic pressure of the fluid column above the transducer and the atmospheric pressure at the fluid surface. Changes in hydrostatic pressure are proportional to changes in the height of the water column or water level.

CP4-ES-2100-F01 – Pressure Transducer Deployment

Project:

Table below lists monitoring wells (MW) with pressure transducers installed. Table below also summarizes data collected from pressure transducers that have been downloaded and new tests started.

Sample Technicians: | Water Level Instrument ID:

MW	Pressure Transducer Stop Time	Point Datum	Water Level Date Collected	Water Level Time Collected*	Water Level (ft)	Barometric Pressure (inches/Hg)	Pressure Transducer Start Time

*Water level collected between the pressure transducer stop time and start times.

Field Comments and Observations:

Sampler Name/Date: | Verifier Initials/Date: