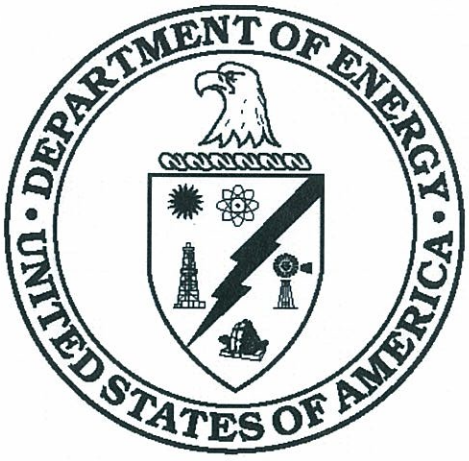
DOE/LX/07-0031&D2/R1
Secondary Document

Construction Quality Control Plan for the Interim Remedial Action for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky



This document is approved for public release per review by:

Paducah Classification and Control Office
Swift and Staley Team

9.18.08
Date

DOE/LX/07-0031&D2/R1
Secondary Document

Construction Quality Control Plan for the Interim Remedial Action for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—October 2008

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

THIS PAGE INTENTIONALLY LEFT BLANK

APPROVALS

Construction Quality Control Plan for the Interim Remedial Action
for the Volatile Organic Compound Contamination
at the C-400 Cleaning Building
Paducah, Kentucky

DOE/LX/07-0031&D2/R1

October 2008

Tracey Duncan
Environmental Monitoring/Environmental
Restoration Manager

10/15/08
Date

Mike Clark
C-400 Interim Remedial Action Project Manager

10-15-08
Date

Rick Keeling
Quality Assurance Manager

10-15-08
Date

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

ACRONYMS

ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
CFR	*Code of Federal Regulations*
CGI	commercial grade item
CoC	certificate of compliance
CQCP	Construction Quality Control Plan
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERH	Electrical Resistance Heating
FCR	Field Change Request
HASP	Health and Safety Plan
ISMS	Integrated Safety Management System
IRA	Interim Remedial Action
M&TE	Measuring and Test Equipment
NFPA	National Fire Protection Association
PDS	power delivery system
PGDP	Paducah Gaseous Diffusion Plant
PM	Project Manager
PRS	Paducah Remediation Services, LLC
QAPP	Quality Assurance Program Plan
QA	quality assurance
QAP	Quality Assurance Plan
QC	quality control
RAWP	Remedial Action Work Plan
RDR	Remedial Design Report
RGA	Regional Gravel Aquifer
ROD	Record of Decision
S/CI	suspect/counterfeit items
SAP	Sampling and Analysis Plan
SME	subject mater expert
SSC	system, structure, or component
SQA	software quality assurance
TCE	trichloroethene
TS	treatment system
VOCs	volatile organic compounds
WMP	Waste Management Plan

THIS PAGE INTENTIONALLY LEFT BLANK

EXECUTIVE SUMMARY

This Construction Quality Control Plan (CQCP) has been prepared for the installation of the C-400 Electrical Resistance Heating (ERH) treatment system (TS), which is the alternative selected as the Interim Remedial Action in the *Record of Decision for Interim Remedial Action for the Groundwater Operable Unit for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2150&D2/R2. The Interim Remedial Action is intended to treat a source area contaminated with trichloroethene (TCE) and other volatile organic compounds (VOCs) found at the C-400 Cleaning Building area.

In August 1988, VOCs and radionuclides were detected in residential wells near the U.S. Department of Energy's Paducah Gaseous Diffusion Plant. Past chemical releases resulted in a subsurface source zone of TCE and other VOCs at the south end of the C-400 Cleaning Building Area. The ERH TS is designed to heat discrete (vertical and horizontal) subsurface intervals of the subsurface source zone resulting in volatilization, removal, and recovery of VOCs from the C-400 treatment area.

Quality Assurance (QA) for this plan is defined as a planned system of activities to provide confidence that the facility is constructed as specified in the design. Quality Control (QC) for this plan is defined as a planned system of inspections and tests to directly monitor and control the quality of the construction project. The Paducah Remediation Services, LLC, *Quality Assurance Program Plan for the Paducah Environmental Remediation Project*, PRS-CDL-0058, defines a quality assurance program as the overall program or management system established to assign responsibilities and authorities, define policies and requirements, and provide for the performance and assessment of work.

The overall objective of the CQCP is to ensure that the finished system adheres to the technical specifications for the ERH TS. The CQCP is to be followed during installation of the ERH TS to ensure that construction materials are of suitable quality, that system components are capable of meeting the operating criteria, that proper installation methods and techniques are followed, and that installation quality checks have been performed and approvals obtained before the system is operated. This CQCP identifies the QA/QC team members and outlines their responsibilities. The CQCP addresses procurement and construction activities and provides the quality measures needed to ensure that items, materials, services, or workmanship meet the required specifications for performance.

THIS PAGE INTENTIONALLY LEFT BLANK

1. CONSTRUCTION QUALITY CONTROL PLAN DESCRIPTION

This Construction Quality Control Plan (CQCP) has been prepared for the installation of the C-400 Electrical Resistance Heating (ERH) treatment system (TS), which is the alternative selected as the Interim Remedial Action (IRA) in the *Record of Decision for Interim Remedial Action for the Groundwater Operable Unit for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (ROD), DOE/OR/07-2150&D2/R2. The IRA is intended to treat a source area contaminated with trichloroethene (TCE) and other volatile organic compounds (VOCs) found at the C-400 Cleaning Building area.

The objective of the CQCP is to ensure that the finished system adheres to the technical specifications for the ERH TS. The CQCP is to be followed during installation of the ERH TS to ensure that construction materials are of suitable quality, that system components are capable of meeting the operating criteria, that proper installation methods and techniques are followed, and that installation quality checks have been performed and approvals obtained before the system is operated.

This CQCP is based on applicable portions of the Paducah Remediation Services, LLC, *Quality Assurance Program Plan for the Paducah Environmental Remediation Project*, PRS-CDL-0058 (QAPP), procedures, and U.S. Environmental Protection Agency (EPA) guidance. Quality Assurance (QA) for this plan is defined as a planned system of activities to provide confidence that the facility is constructed as specified in the design. Quality Control (QC) for this plan is defined as a planned system of inspections and tests to directly monitor and control the quality of the construction project. The QAPP defines a quality assurance program as the overall program or management system established to assign responsibilities and authorities, define policies and requirements, and provide for the performance and assessment of work. The CQCP identifies the QA/QC team members and outlines their responsibilities.

The QAPP outlines how the quality assurance program is implemented to meet the quality program requirements for the Environmental Remediation Project at the Paducah Gaseous Diffusion Plant under DOE contract number DE-AC30-06EW05001. The QAPP serves to identify those QA program requirements for flow down to project activities and performance documents. Effective implementation of QA program requirements supports the principles and functions of the Integrated Safety Management System program.

The QAPP describes the use of training, procedures, work instructions, issues management, lessons learned, audits and assessments, management oversight, and quality improvement functions as tools for execution of quality-related functional and project activities, including work performed by teaming partners and subcontractors. Work is planned and conducted in a manner that will protect the environment, human health and safety, and meet or exceed contract and regulatory requirements. For subcontracted work, this is accomplished through a flow down of QA program requirements and standards into subcontract document terms and conditions section.

2. PROJECT GOALS

The IRA objectives for the C-400 Cleaning Building, as defined by Section 2.8 of the ROD, are as follows:

- Prevent exposure to contaminated groundwater by on-site industrial workers through institutional controls (e.g., excavation/penetration permit program);

- Reduce VOC contamination (primarily TCE and its breakdown products) in Upper Continental Recharge System soil at the C-400 Cleaning Building area to minimize the migration of these contaminants to Regional Gravel Aquifer (RGA) groundwater and to off-site points of exposure; and

- Reduce the extent and mass of the VOC source (primarily TCE and its breakdown products) in the RGA in the C-400 Cleaning Building area to reduce the migration of the VOC contamination to off-site points of exposure.

The remediation goal for this interim action, as documented in the ROD, is to operate the ERH TS until monitoring indicates that heating has stabilized in the subsurface and that recovery of TCE, as measured in the recovered vapor, diminishes to a point at which the recovery rate is constant (i.e., recovery is asymptotic). The ROD directs that remedial action design documents include the requirements and approach that will enable determination of asymptosis and heating stabilization, signaling when operation of the ERH TS will cease. The *Remedial Design Report, Certified for Construction Design Drawings and Technical Specifications Package, for the Groundwater Operable Unit for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (RDR), DOE/LX/07-0005&D2/R1, defines asymptotic recovery in more detail and provides additional detail regarding criteria for ceasing ERH operations.

3. GENERAL REQUIREMENTS

The entire ERH TS is described in the *Remedial Action Work Plan for the Interim Remedial Action for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (RAWP), DOE/LX/07-0004&D2/R1, which includes a Sampling and Analysis Plan (SAP), a Quality Assurance Plan (QAP), and a Waste Management Plan (WMP). Design specifications are contained in the RDR. The CQCP has been developed concurrently with the RDR to maintain consistency among the documents. Quality issues are covered in various components of the QAPP, RAWP, the RDR, and the CQCP. QAPP, RAWP, the RDR, CQCP, and all applicable procedures will be readily available in the field to all project personnel including subcontractors either in hardcopy or electronic format during construction activities. If electronic files are provided, a computer will be available to access the document. Adherence to the QAPP, RAWP, the RDR, CQCP, and applicable procedures will be required during installation and operation of the ERH TS. These documents address applicable QA elements in the *EPA Requirements for QA Project Plans* (QA/R-5) and the 10 QA elements discussed in 10 *Code of Federal Regulations (CFR)* § 830.122. A summary table of QA/R-5 and 10 *CFR* § 830.122, *Quality Assurance Criteria* and applicable project documents is included in Appendix A.

The implementation of QC systems during the installation of the ERH TS will include the involvement of personnel from U.S. Department of Energy (DOE), the DOE prime contractor, and the subcontractors' project teams. Procedures referenced in the document are those followed by the current DOE Prime Contractor. If a change in DOE prime contractor occurs, the procedures followed by the new DOE Prime Contractor will be substantially equivalent to those referenced. The most current versions of all contractor procedures are to be used. Documents referenced in this CQCP may be revised from time-to-time without amending this plan. The CQCP addresses procurement and construction activities and provides the quality measures needed to ensure that items, materials, services, or workmanship meet the required specifications for performance. Table 1 is a crosswalk between the applicable portions of the EPA Remedial Design/Remedial Action Handbook Guidance, Appendix E, pertaining to Construction Quality Assurance Plans and the related sections of the CQCP and supporting documents and procedures. There may be additional related documents or procedures that are not included in Table 1.

Table 1. Crosswalk Between the CQCP and Supporting Documents with Portions of the EPA Remedial Design/Remedial Action Handbook Guidance

EPA Handbook* Element	Related DOE PRIME CONTRACTOR'S Procedure+ or Supporting Document Reference
"Responsibility and authority of all organization and key personnel involved in the remediation action construction" (Appendix E, Section 3.11.12.1 and Section 7.3.3)	QAPP Sections: 1.4 Organization and Responsibilities; 1.5 Management Processes RAWP Sections: 5 Project Organization; 9.2 Project Organization; 10.9 Data Management Tasks and Roles and Responsibilities CQCP Section: 4 Quality Assurance Responsibilities and Authorities
"CQA Personnel Qualifications. The contractor shall establish the minimum qualifications of the CQA Officer and supporting inspection personnel" (Appendix E, Section 3.11.12.2 and Section 7.3.3)	QAPP Sections: 2.2 Training Requirements and Qualification of Personnel; 2.3 Training Implementation RAWP Sections: 12.3.4 Waste Management Training; 7.6 Training; 7.17.4 Radiation Safety Training; 9.3 Personnel Qualifications and Training CQCP Section: 5 Personnel Qualifications and Training
"Inspection Activities. The contractor shall establish the observations and tests that will be required to monitor the construction and/or installation of the components of the Remedial Action(s). The plan shall include the scope and frequency of each type of inspection to be conducted. Inspections shall be required to verify compliance with environmental requirements and include, but not be limited to, air quality and emissions monitoring records, waste disposal records (e.g., RCRA transportation manifests), etc. Inspections shall also ensure compliance with all health and safety procedures." (Appendix E, Section 3.11.12.3 and Section 7.3.3)	Calibration of Measuring and Test Equipment: PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment* Evaluations for Suspect/Counterfeit Items: PRS-QAP-1009, *Identification, Control, and Disposition of Suspect/Counterfeit Items* Inspection and Test Plans and Review of Vendor/Supplier QA Program: PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements* QAPP Sections: 1.8 Special Program requirements; 3.1 Quality Improvement Program; 3.2 Issues Management Program; 5.2 Work Management System; 5.3 Identification and Control of Items, Including Suspect or Counterfeit; 5.4 Handling, Storing, and Shipping; 5.5 Control of Process Monitoring and Data Collection Equipment; 8.1 Inspection and Acceptance Testing; 8.2 Measuring and Test Equipment; 8.3 Radiation Safety Measuring and Test Equipment; 9.0 Management Assessments; 10.0 Independent Assessments; 11.1 Control of Safety-Related Software RAWP Sections: 7 Health and Safety Plan; 8 Sampling and Analysis; 8.1 Baseline and Post-Operation Sampling and Analysis Plan; 9.10 Instrument Calibration and Frequency; 9.14 Audits, Surveillances, and Assessments; 9.18 Inspection of Materials; 11.4.1 Fugitive Dust Emissions; 11.4.3.1 Construction Fugitive Emissions; 11.4.4 Subsurface ERH Components; 12 Waste Management Plan CQCP Sections: 6 Quality Control Activities; 10.2 Supplier Selection and Evaluation; 11 Critical Items; 12 Commercial Grade Items; 13 Data Gathering Devices; 14 Measuring and Test Equipment; 15 Product Acceptance; 15.1 Inspection and Test Plans; 15.2 Inspection and Acceptance Testing; 16 Installation Phases

Table 1. Crosswalk Between the CQCP and Supporting Documents with Portions of the EPA Remedial Design/Remedial Action Handbook Guidance (Continued)

EPA Handbook* Element	Related DOE PRIME CONTRACTOR'S Procedure+ or Supporting Document Reference
"Sampling requirements. The contractor shall establish the requirements for sampling activities, sample size, sample lactations, frequency of testing, criteria for acceptance and rejection, and plans for correcting problems as addressed in the project specifications." (Appendix E, Section 3.11.12.4 and Section 7.3.3)	Calibration of Measuring and Test Equipment: PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment* Chain-of-Custody: PRS-ENM-2708, *Chain-of-Custody forms, Field Sample Logs, Sample Labels, and Custody Seals* Collection of Field Quality Control Samples: PRS-ENM-2704, *Trip, Equipment, and Field Blank Preparation* Issue Management (includes corrective action): PRS-QAP-1210, *Issues Management Program* Nonconforming Items and Services: PRS-QAP-1440, *Control of Nonconforming Items and Services* Quality Assured Data: PRS-ENM-5003, *Quality Assured Data* RAWP Sections: 8.1 Baseline and Post-Operation Sampling and Analysis Plan; 9.5 Quality Objectives and Criteria for Measurement Data; 9.6 Sampling Procedures; 9.7 Sample Handling and Custody Requirements; 9.10 Instrument Calibration and Frequency; 9.11 Analytical Procedures; 9.12 Data Review and Reporting; 9.13.2 Laboratory QC Samples and Internal QC Checks; 9.18 Inspection of Materials CQCP Sections: 11 Critical Items; 12 Commercial Grade Items; 13 Data Gathering Devices; 14 Measuring and Test Equipment; 15 Product Acceptance; 15.1 Inspection and Test Plans; 15.2 Inspection and Acceptance Testing; 16 Installation Phases
"Documentation. The contractor shall describe the reporting requirements for CQA activities. This shall include such items as daily summary reports and inspection data sheets." (Appendix E Section 3.11.12.5 and Section 7.3.3)	Documenting and Controlling Field Changes to Approved Plans: PRS-WCE-0021, *Work Execution;* PRS-WCE-0027, *Field Change Request (FCR), Field Change Notice (FCN), and Design Change Notice (DCN) Process* Field Logbooks: PRS-ENM-2700, *Logbooks and Data Forms* Issue Management (includes corrective action): PRS-QAP-1210, *Issues Management Program* Nonconforming Items and Services: PRS-QAP-1440, *Control of Nonconforming Items and Services* Records Management: PRS-DOC-1002, *PGDP DMC Document/Record Requests and Records Submittals;* PRS-DOC-1009, *Records Management, Administrative Record, and Document Control* QAPP Sections: 4.1 Documents; 4.2 Records RAWP Section: 9.4 Document Control and Records Management CQCP Sections: 6 Quality Control Activities; 8 Documentation

* United States Environmental Protection Agency (EPA) *Remedial Design/Remedial Action Handbook* (EPA 540/R-95/059), Construction Quality Assurance Plan elements contained in Appendix E.

\+ The listed procedures were the governing procedures at the time this document was written.

The RDR provides a detailed design of the IRA system with specific locations determined for subsurface components. The RDR also provides a detailed performance specification for the aboveground vapor/liquid treatment system that describes the influent and effluent design criteria, specifies the appropriate liquid and vapor phase treatment technology, defines the treatment process flow, and presents preliminary process monitoring and control functions. Due to the potential for significant interference during installation caused by existing underground and overhead utility locations, active Paducah Gaseous Diffusion Plant (PGDP) operations at the C-400 Cleaning Building and train and cylinder hauler traffic in the treatment area, final engineering activities and installation of the vapor/liquid treatment system and mechanical/electrical connections to the ERH treatment components will be field engineered, similar to the methodology used for the Six-Phase Treatability Study. Communication and resolution of issues that cut across PGDP organizations will be accomplished in accordance with PRS-PRM-4010, *Shared Site Issues*. Additional information regarding health and safety, waste management, QA, data management, and environmental compliance for this IRA can be found in the RAWP.

3.1 ENVIRONMENT, HEALTH, AND SAFETY

Health and Safety procedures and requirements are provided in the RAWP Health and Safety Plan (HASP). The HASP describes the health and safety related activities that will be performed during installation of the treatment system. Work will be performed in accordance with the DOE's Integrated Safety Management System (ISMS) and its Environmental Compliance and Health and Safety policy statement; these establish a goal of zero-accident performance. The core functions and guiding principles of ISMS will be implemented by incorporating applicable programs, policies, technical specifications, and procedures from DOE, project team, and other applicable regulatory guidance. Activity-specific health and safety procedures and health requirements along with a brief description of the ISMS five core functions are provided in the RAWP HASP.

3.2 RADIATION PROTECTION

Radiation protection procedures and requirements are provided in the PRS Radiation Protection Plan, PRS-CDL-0060, *Radiation Protection Program for the Paducah Environmental Remediation Project*. The Radiation Protection Plan describes the radiation protection related activities that will be performed during installation of the treatment system.

3.3 WASTE MANAGEMENT

Waste management procedures and requirements are provided in the RAWP WMP. The RAWP WMP describes the waste management activities that will be performed during installation of the treatment system. Activity-specific waste management procedures and waste management requirements are given in the RAWP WMP.

4. QUALITY ASSURANCE RESPONSIBILITIES AND AUTHORITIES

The QA team members represent qualified individuals with strong professional training and prior work experience in implementing QA activities and a demonstrated ability to perform the required QA functions. The RAWP contains a project-specific organizational chart and associated roles and

responsibilities. The principal parties involved in QA activities for the installation of the ERH TS system include DOE, the DOE prime contractor, and the contractor's project team.

4.1 DOE

DOE performs oversight of the DOE prime contractor and the project. DOE will review and approve the FFA primary documents and the CQCP and will participate, as needed, in pre-start up reviews. DOE also is responsible for communications with the EPA and state regulatory agencies. The EPA and the Kentucky Department for Environmental Protection also will review and comment on these documents.

4.2 DOE PRIME CONTRACTOR (CONTRACTOR)

The DOE prime contractor is responsible for communications with DOE and for planning, overseeing, and completing the project.

4.3 CONTRACTOR ENVIRONMENTAL MONITORING/ENVIRONMENTAL RESTORATION MANAGER

The DOE prime contractor Environmental Monitoring/Environmental Restoration Manager is the primary point of contact with DOE to implement site-wide environmental restoration programs. The DOE prime contractor Environmental Monitoring/Environmental Restoration Manager performs work in accordance with the baseline scope and schedule and directs the day-to-day activities of the DOE prime contractor personnel performing environmental monitoring and restoration activities.

4.4 CONTRACTOR C-400 IRA PROJECT MANAGER

The C-400 IRA Project Manager (PM) serves as the IRA action primary point of contact and is responsible for the performance, quality, schedule, and budget. The PM provides overall project direction and execution, implements corrective actions, as necessary, verifies compliance with safety and health requirements, and participates in the readiness review. The PM directs the project team in determining potential sources of existing data, identifying the study area and/or facility to be addressed by the project, and selecting the most effective data collection approach to pursue. The PM also may be the technical contact for subcontracted project support and ensures that the flow down of data management requirements, QA requirements, and ISMS is defined in a statement of work or through project-specific plans and technical standard operating procedures. Other mechanisms include, but are not limited to, program/project management systems, employee training, communication, work site inspections, independent assessments, and audits.

4.5 CONTRACTOR QA MANAGER

The DOE prime contractor QA Manager (QA Manager) is responsible for verifying implementation of the DOE prime contractor QA program by the project team during the installation of the ERH TS system, coordination with the project QA staff to ensure an appropriate level of QA oversight, and scheduling audits, surveillances, and assessments needed to verify compliance with quality commitments and requirements. The detail and frequency of review will be determined using a graded approach based on the work and complexity involved. See Section 9.14 of the RAWP for more information on audits, surveillances, and assessments. The QA Manager has overall responsibility of approving, tracking, and

evaluating effectiveness of corrective actions. The QA Manager receives copies of field changes and approves field changes related to quality. The QA Manager is independent of the project.

4.6 CONTRACTOR QA SPECIALIST

The QA Specialist verifies work is completed in accordance with the QAPP, RAWP (including the Data Management and Implementation Plan found in Section 10 of the RAWP), RDR, and CQCP. The QA Specialist also develops QA/QC procedures, implements administrative procedures that govern both technical and nontechnical work, and reviews project documentation to determine if the project team followed applicable procedures.

4.7 CONTRACTOR SITE SUPERINTENDENT

The Site Superintendent oversees all field preparation, construction, and testing activities and verifies that field operations follow established and approved plans and procedures. The Site Superintendent supervises all field team activities, including performance/acceptance testing and field data collection. The Site Superintendent, along with all other personnel, is responsible for performing work in accordance with ISMS. The Site Superintendent ensures that all field activities are properly recorded and reviewed in the field logbooks and on any necessary data collection forms. The Site Superintendent is responsible for identifying, recording, and reporting project nonconformances or deviations. The Site Superintendent interfaces with the IRA PM during field activities.

The Site Superintendent will perform the following QA functions:

- Have a complete understanding of the RAWP, the RDR, and the CQCP;
- Recognize and immediately report deviations from the RAWP, the RDR, and the CQCP;
- Prepare any field change request forms;
- Communicate with the subcontractors and other involved parties during system installation activities;
- Perform or oversee field testing and/or acceptance testing to verify that installed items, equipment, or systems, perform according to required specification; and
- Review work products for acceptance, rejection, or further evaluation, and verify that appropriate corrective measures have been taken to resolve nonconformance situations.

4.8 SUBCONTRACTORS

The Subcontractors are responsible for the implementation of those aspects of the ERH TS installation contracted to the Subcontractor. The Subcontractors are responsible for fulfilling the QA/QC tasks from the RAWP, the RDR, and the CQCP assigned to them. The Subcontractors will provide direction to their field staff and lower-tier subcontractors and will interface with the DOE prime contractor management and field personnel. The Subcontractors will be responsible for the following:

- Have a complete understanding of the RAWP, the RDR, the CQCP, and all controlling field procedures provided by the DOE prime contractor;

- Recognize and immediately report deviations from the RAWP, the RDR, or the CQCP to the DOE prime contractor Site Superintendent;

- Communicate with the field personnel, lower-tier Subcontractors, and other involved parties during the system installation activities;

- Participate in the daily work planning meetings as well as any site-specific health and safety, work process, or QA/QC training activities;

- Prepare and maintain, as applicable, a set of as-built drawings during system construction and installation;

- Prepare and maintain detailed field notes documenting subcontractor's field activities;

- Properly record data and information as required, in accordance with PRS-ENM-2700, *Logbooks and Data Forms* and maintain the records in accordance with PRS-DOC-1009, *Records Management, Administrative Record, and Document Control* until they are provided to the DOE prime contractor*;* and

- Review the QA/QC requirements for the project as directed and ensure that all required QC data and data information is recorded on the proper forms.

4.9 SUSPEND/STOP WORK AUTHORITY

All personnel have suspend/stop work authority for conditions adverse to safety or quality. In accordance with PRS-ESH-2018, *Suspension Of Work (Safety Related)*, DOE prime contractor and subcontractor employees have the responsibility and authority to suspend or stop any work, activity, or process that jeopardizes personnel safety or health or has the potential for significant environmental insult. Work that is suspected or proven to place workers, the public, or the environment at risk shall be suspended until it can be demonstrated that it is safe to proceed with the work. The DOE prime contractor Procurement Manager or the DOE prime contractor QA Manager is responsible for stopping subcontracted work as necessary to ensure that planning or scheduling considerations do not override safety or quality considerations. Prior to restart of work after a work suspension or stoppage due to safety or quality concerns, appropriate restart readiness/operational reviews will be planned, performed, and documented, as required by DOE prime contractor procedures to verify that conditions warranting the work stoppage have been resolved.

5. PERSONNEL QUALIFICATIONS AND TRAINING

All personnel will have training as specified in the RDR, CQCP, and RAWP, which includes the SAP, QAP, HASP, and WMP. Personnel also may receive site-specific orientation and training for the PGDP including Radiological Worker Training II. All personnel qualifications and training records will be recorded and maintained in accordance with PRS-TRN-0702, *Conduct of Training*. All personnel (including subcontractors) performing activities under the CQCP are required to be familiar with the procedures and documents assigned to them as required reading. Project personnel will receive an orientation to this CQCP or will be required to read this document before participating in project activities. A field-planning meeting will be the forum for an orientation that will be documented by an

attendance list. Completion of required reading is documented in accordance with PRS-TRN-0750, *Required Reading*.

The specific activities required to install the ERH TS system require specific skills and training. The ERH Subcontractor's PM will have direct experience as the lead design engineer and PM on a minimum of three previous ERH projects. The ERH Subcontractor's Field Operations Manager will have direct experience in the same role on a minimum of three previous ERH projects. The ERH Subcontractor's Field Technicians will have direct experience on a minimum of one previous ERH project.

A drilling company certified to install monitoring wells in the Commonwealth of Kentucky will provide drilling services. The drillers provided by the drilling Subcontractor also will be certified to install monitoring wells or work under the on-site supervision of a driller certified to install monitoring wells in the Commonwealth of Kentucky.

6. QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

The measures required to verify the quality of work performed and compliance with the specified project requirements include the following:

- Successful completion of the required readiness reviews;
- Review of procurement documents to ensure that specifications and requirements are accurate, complete, and clearly stated;
- Verification that items, materials, or equipment that are procured meet the specified requirements for performance and do not include suspect/counterfeit items;
- Monitoring Measuring and Test Equipment (M&TE) for proper identification, calibration, and maintenance;
- Inspection of items, materials, equipment, and workmanship before and during the performance of each task comprising the ERH system installation effort; and
- Resolution of all reported deficiencies and nonconformance issues.

Progress monitoring will be documented in field documents and will be verified through QA assessments, management assessments, or independent assessments as applicable. The field documents may include but are not limited to logbooks, test forms, or inspection documentation. The project team, including QA Specialists, is responsible for monitoring progress. A minimum of one assessment shall be performed within the first month of field work, which shall include an evaluation of how the project is managing QA requirements. Progress monitoring activities will include the following:

- Check work quality to ensure that contract requirements and design specifications are being met;
- Verify site activities are in accordance with the project plans and requirements;
- Check that QA provisions are in place and activities are completed in compliance with QA requirements and procedures;

- Check that QC inspections are sufficiently rigorous to ensure compliance with the QA program;
- Check that any nonconformance issues are recorded, tracked, and resolved; and
- Check that QC records are accurate, timely, complete, and in compliance with QA requirements and procedures.

Follow-up and completion activities will include the following:

- Resolution of all nonconformance reports, and
- Resolution of all outstanding discrepancies.

QA activities associated with nonconforming items and processes include validation of the nonconformance, review of item disposition documentation, verification of completion of disposition actions, and closure of the reporting document (nonconformance reports, occurrence reports, etc.). Other reporting documents (e.g., fact sheets) may be used depending on the consequence of failure or severity of operational impact. The system for identifying and controlling nonconforming items/services utilizes problem identification and corrective action methods.

Procedures to be used, as applicable, to ensure QA/QC requirements are met include the following:

- PRS-CDL-0058, *Quality Assurance Program Plan for the Paducah Environmental Remediation Project, Paducah Kentucky*
- PRS-DOC-1002, *PGDP DMC Document/Record Requests and Records Submittals*
- PRS-DOC-1009, *Records Management, Administrative Record, and Document Control*
- PRS-ENM-0021, *Temperature Control for Sample Storage*
- PRS-ENM-2700, *Logbooks and Data Forms*
- PRS-ENM-2704, *Trip, Equipment, and Field Blank Preparation*
- PRS-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*
- PRS-ENM-5003, *Quality Assured Data*
- PRS-ESH-2001, *Identifying Defective Equipment*
- PRS-QAP-1009, *Identification, Control, and Disposition of Suspect/Counterfeit Items*
- PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment*
- PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements*
- PRS-QAP-1210, *Issues Management Program*
- PRS-QAP-1420, *Conduct of Assessments*

- PRS-QAP-1440, *Control of Nonconforming Items and Services*
- PRS-QAP-1650, *Graded Approach*
- PRS-WCE-0001, *Field Engineering Inspections and Surveys*
- PRS-WCE-0021, *Work Execution*
- PRS-WCE-0027, *Field Change Request (FCR), Field Change Notice (FCN), and Design Change Notice (DCN) Process*

7. GRADED APPROACH

Consistent with the *EPA Quality Manual for Environmental Programs* (CIO 2105-P-01-0), the level of detail in this plan is based on a common sense, graded approach that establishes QA and QC activities commensurate with the importance of the work, the available resources, and the unique needs of the organization. The graded approach is designed to impose levels of control commensurate with the consequences of failure or occurrence of an adverse event; however, the graded approach is not used in implementing the Unreviewed Safety Question process or in implementing technical safety requirements. Graded approach is a process by which the level of analysis, documentation, and actions necessary to comply with a requirement are commensurate with the following criteria:

- Relative importance to personnel and general public safety, safeguards, and security;
- Magnitude of any hazard involved as identified, analyzed, and controlled in the facility safety authorization basis document;
- Life cycle stage of the facility/project;
- Impact/consequences on programmatic mission of the facility/activity or project;
- Particular characteristics of the facility/project;
- The nuclear safety classification or hazard category of the item or activity;
- Complexity of products or services involved; and
- History of problems at a site facility or project;

Further information on applying a graded approach is described in PRS-QAP-1650, *Graded Approach*.

8. DOCUMENTATION

The RDR, CQCP, RAWP HASP, QAP, SAP, WMP, and field operating procedures identify system installation activities that should be monitored, describe the varying levels of monitoring required, and assign responsibility for monitoring. To be effective, these QA/QC monitoring activities must be

documented. Each subcontractor will be responsible for documenting that QA/QC requirements assigned to them have been properly addressed and satisfied. A project record will be prepared by each subcontractor, as applicable, that includes all required documentation and will be delivered to the DOE prime contractor no later than during project close out. All records and documentation shall be maintained in accordance with PRS-DOC-1009, *Records Management, Administrative Record, and Document Control*, until they are provided to the DOE prime contractor. The DOE prime contractor may inspect subcontractor project records or require submission of project records at any time prior to the completion of the project.

8.1 QC DOCUMENTATION

The QC documentation for materials and equipment purchased may include some, if not all, of the following: engineering documents, drawings, specifications, performance criteria, manuals, inspection procedures, and inspection reports. Quality verification documents may include some, if not all, of the following: material verification reports, material test reports, cleaning verification reports, inspection verification reports, performance testing reports, and summary reports that cover procurement requirements, approved changes, waivers, or deviations. Receipt inspections for materials and equipment will be traceable to DOE prime contractor purchase orders or requests.

8.2 FIELD LOGBOOK

Field logbooks shall be maintained in accordance with PRS-DOC-1009, *Records Management, Administrative Records, and Document Control* for the duration of the field work associated with the installation and operation of the C-400 IRA. To reduce the risk of loss, records are kept in fire proof file cabinets or duplicate records are maintained at different locations and/or in different media. Entries into the logbook will be made in accordance with PRS-ENM-2700, *Logbooks and Data Forms*. In addition to other project requirements, the logbook will contain a diary of daily events and progress and a record of site meetings. The intent of keeping a logbook is to provide sufficient detail for the reader to be able to recreate an event as accurately and completely as possible based on the written information. The logbook also will contain any observations of unusual or previously unnoticed site conditions and field data. As required by PRS-ENM-2700, *Logbooks and Data Forms*, reviews of data forms and logbooks (including data forms placed in logbooks) will be conducted at least monthly during field operations to verify accuracy of entries, legibility and clarity of entries, completeness, consistency of information recorded, signature and date of entries by the designated team member, and compliance to the requirements in PRS-ENM-2700.

8.3 DATA FORMS

Prior to the start of installation activities and as necessary thereafter, the forms required by the RDR, CQCP, RAWP, HASP, QAP, SAP, WMP, and field operating procedures necessary for recording field data and information will be produced. These forms will be available to field personnel and shall be used to properly record data and information in accordance with PRS-ENM-2700, *Logbooks and Data Forms*. The Subcontractors will be responsible for the safekeeping, filing, retrieval, and retention of all completed forms in their possession in accordance with PRS-DOC-1009, *Records Management, Administrative Record, and Document Control* until they are provided to the DOE prime contractor.

8.4 QC FORMS

All required QC data and data information shall be recorded on the proper forms or in a project logbook in accordance with PRS-ENM-2700, *Logbooks and Data Forms*. The safekeeping, filing, retrieval, and retention of these forms are governed by PRS-DOC-1009, *Records Management, Administrative Record, and Document Control* until they are provided to the DOE prime contractor.

8.5 AS-BUILT DRAWINGS

The DOE prime contractor is responsible for ensuring that as-built drawings for the ERH TS system are prepared and updated. The subcontractors will provide updated as-built drawings to the DOE prime contractor, as requested. The DOE prime contractor Site Superintendent is responsible for ensuring the on-site safekeeping, filing, retrieval, and retention of these drawings in accordance with PRS-DOC-1009, *Records Management, Administrative Record, and Document Control*.

9. FIELD CHANGES

Field changes must be governed and documented by control measures in accordance with PRS-WCE-0027, *Field Change Request (FCR), Field Change Notice (FCN), and Design Change Notice (DCN) Process* commensurate with those applied to the documentation of the original design.

- Major changes from approved field operating procedures or project scope, cost, or schedule will be documented on a FCR. The Site Superintendent or designee will initiate and maintain the FCR.

- The C-400 IRA Project Manager or designee must approve each FCR before work proceeds. Approval by the C-400 IRA Project Manager can be obtained verbally or via telephone, with follow-up sign-off. In no case will a field change be initiated that has not been appropriately approved.

- The lead engineer or designee must evaluate all FCRs to determine whether review is needed from other organizations (e.g., Nuclear Safety; QA; Health and Safety; etc.) in accordance with PRS-WCE-0027, *Field Change Request (FCR), Field Change Notice (FCN), and Design Change Notice (DCN) Process*.

- If a field change is proposed by DOE or other oversight agency, the group proposing the change will be documented on the FCR.

- Copies of the FCR will be kept on-site until the fieldwork is complete and then will be transmitted to the project files.

- Variances or minor changes to field operating procedures and other work control documents will be allowed and performed in accordance with PRS-WCE-0021, *Work Execution* or PRS-DOC-1107, *Development, Approval, and Change Control for PRS Performance Documents*.

- If deemed necessary, relevant project documents will be revised, reviewed, accepted, and reissued with control measures commensurate with the original documents.

- Specific additional requirements for field changes, such as required PGDP approvals, will be addressed in contractual documentation as necessary.

10. PROCUREMENT REQUIREMENTS AND SUPPLIER SELECTION

The DOE prime contractor shall ensure that the items and services provided by suppliers meet the requirements of the final RDR. Subcontractors providing on-site services must meet the DOE prime contractor Environmental, Safety, and Health prequalification criteria as well as federal, state, and site-specific health and safety training requirements. All samples to be analyzed by a laboratory will be planned through the Paducah Sample Management Office and sent to a Sample Management Office-approved laboratory that has been audited under the DOE–Consolidated Audit Program and, if required, is certified by Kentucky Department for Environmental Protection to perform the requested analyses.

Supplier selection and evaluation applies to the procurement of items and services that are important to safety, including any dedicated CGI. Potential suppliers are evaluated early in the design and procurement process in accordance with PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements* by DOE prime contractor QA to determine their capabilities and to ensure they are included in the approved supplier's list, as required. The vendor/supplier evaluations are performed based on the requirements of the QAPP, item/product specifications, procurement requirements, and may include other criteria requested by responsible technical authority and function or project management.

10.1 PROCUREMENT REQUIREMENTS

The selection of procurement requirements is commensurate with the importance of the purchased items or services using the graded approach. Technical, administrative, and quality requirements applicable to items or services being procured are to be identified and specified in procurement documents. These requirements can include, as applicable:

- Applicable codes, regulations, and consensus industry standards;
- Specifications;
- Tests and inspections;
- Criteria for acceptance or rejection of items or service;
- Traceability, special procedures, or instructions; and
- Any other requirements referenced in the design or the technical specification documents.

Procurement procedures require that the following essential elements are provided or communicated in applicable purchase documents:

- Clear specifications and work scope;
- Prequalification of vendors, if required;
- Adequate oversight of subcontractors; and
- Work suspension/stop work orders.

Purchase requisitions for items or services critical to safety or having significant project operational risks are reviewed by QA and responsible functional or project engineering/technical authority personnel. Changes affecting quality or technical requirements are subject to the same degree of review and approval as used in preparation of the original requirements. Items procured for safety applications in nuclear or radiological facilities system, structure, or component (SSC) either are purchased from a supplier whose QA program has been evaluated and found acceptable or are prior-approved, CGI acceptable for safety system use as validated by project design and/or nuclear safety engineering.

Where applicable, requirements needed for execution of inspection/test plans or procedures shall be specified in procurement documents per PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements.*

10.2 SUPPLIER SELECTION AND EVALUATION

Supplier selection and evaluation applies to the procurement of items and services that are important to safety, including dedicated CGI. Items may be dedicated for safety related applications. Dedication is requested by function or project engineering personnel and is achieved by defining the critical characteristics of the item and associated verification requirements. Potential suppliers are evaluated early in the design and procurement process to determine their capabilities. The QA department performs vendor/supplier evaluations based on the requirements of PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements,* the QAPP, item/product specifications, procurement requirements, and may include other criteria requested by responsible technical authority and function or project management. Currently, the DOE prime contractor QA has determined that all supplier qualification files will be reviewed and updated, if required, on an annual basis.

Approved prospective suppliers are selected based on specified criteria, using a graded approach in accordance with PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements,* to verify their capability to meet performance and schedule requirements. Using the graded approach, the DOE prime contractor may perform evaluations of suppliers for compliance with QA requirements. Not all suppliers of services or items require quality program evaluations. Subcontractors working on-site and furnishing services that would require a quality program may choose to perform work in accordance with the QAPP, or submit their quality program to the DOE prime contractor for review and approval. New suppliers may be approved based on QA review and approval of supplier QA plans in concert with supplier assessments conducted by independent third parties and verification of other quality related certifications (ISO 9000/14000 series) as applicable.

When "in-plant" supplier assessments are required, they will be conducted and documented in accordance with PRS-QAP-1420, *Conduct of Assessments*. Supplier assessments will be conducted on an "as-needed" basis and led by a qualified lead auditor, using approved checklist criteria, with assistance from subject matter experts (SMEs) when required, to ensure the scope of the assessment is appropriate. Records of supplier assessments (checklists and other supporting documentation, if used) are maintained in accordance with PRS-DOC-1009, *Records Management, Administrative Record, and Document Control*.

The following are evaluation methods that may be used in combination with an on-site supplier audit:

- Review of the supplier's history for providing identical or similar items or services;
- Review of shared supplier quality information;
- Evaluation of certifications or registrations awarded by nationally accredited third parties; and
- Evaluation of documented qualitative and quantitative information provided by the supplier.

The method or combination of methods chosen provides adequate confidence that the supplied item or service will meet requirements. Items or services are procured from suppliers whose evaluation results satisfy the requirements of the procurement specifications. In addition, supplier performance shall be evaluated periodically during the life of the contract to verify ongoing compliance with the procurement requirements. Suppliers are monitored to ensure that acceptable items or services are produced and schedule requirements are being met.

Supplier monitoring may include the following:

- Surveillance or assessment of work activities using approved checklists;
- Inspection of facilities and processes;
- Review of plans and progress reports;
- Processing of change information;
- Review and disposition of nonconforming items; and
- Selection, qualification, and performance monitoring of suppliers and manufacturers.

11. CRITICAL ITEMS

Components, items, and services that are considered critical (here after referred to as critical items) are goods and services that require rigorous procurement and inspection processes to prevent (a) significant personal injury to the workforce and the public, and/or (b) environmental noncompliances, as defined by PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements*. In addition to the requirements in this section, the requirements in Section 10 of this CQCP also apply to critical items. Critical items are listed in Table 2. Additional components, items, or services that meet the definition of critical that are not listed in Table 2 must also meet the procurement requirements for critical items. Subcontractors shall provide procurement specifications to the IRA PM or designee for review and approval prior to initiating purchases of critical components.

Table 2. Critical Components, Items, and Services

Analytical lab services
Compressed gas cylinders
Hoisting & rigging equipment and hardware
Instrument calibration services
Measuring and test equipment
Pressure vessels
Safety class, safety significant, fire protection or defense in depth items
Sorbent or absorbent materials used in waste packaging
Systems and components identified in the safety basis for a specific facility
Transportation
Treatment Units
Waste assay equipment (i.e., *In Situ* Object Counting System)
Waste assay services (including nondestructive assay)
Waste containers (i.e. shipping casks, intermodals, drums, waste boxes)
Waste treatment equipment
Waste treatment services

11.1 CRITICAL ITEM SUPPLIER EVALUATION

Suppliers of critical items must be evaluated and approved prior to procurement if they are not on the DOE prime contractor's QA Approved Supplier List. QA is responsible for determining if a supplier is capable of meeting specified QA criteria described in Title 10 *CFR* § 830.122, PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements*, and the QAPP.

QA will evaluate the proposed supplier based on the requirements of the QAPP and PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements*, using a graded approach. Aspects of the award such as the importance to safety, hazard levels, complexity, risk to workers or the public, as well as other criteria noted in PRS-QAP-1650, *Graded Approach* shall be considered. The environmental compliance history of the potential supplier also should be evaluated when appropriate.

Before awarding a subcontract or purchase order, QA and/or Engineering shall determine if any of the following apply:

- The scope of services or the quality requirements of the proposed work exceeds that for which the supplier has been qualified previously;
- The supplier is new to the DOE prime contractor and has not been qualified for the intended purchase or subcontract work;
- The supplier was previously approved and has changed ownership/management or not performed work for a DOE prime contractor project during the previous 12 months;
- The supplier's approval time frame will expire prior to the scheduled award date; or
- Unresolved supplier quality problems are known to exist.

The requirement for a supplier assessment may be waived, with Engineering Manager approval and QA concurrence, if sufficient historical information exists on the supplier. See PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements* for examples of sufficient historical information.

11.2 CRITICAL ITEM INSPECTION REQUIREMENTS

During the procurement of critical items, the inspection and acceptance criteria shall be defined and documented with Engineering, QA, and/or applicable SMEs considering the following:

- Application of a graded approach;
- SMEs used, as applicable, in the development of inspection/test plans and in the execution of receipt inspections;
- Inspection/test plans developed using established acceptance and performance criteria based on applicable codes, standards, regulatory requirements, procedures, or procurement documents;
- Qualifications required to perform receipt inspections;

- Determination of who to contact when received; and
- Special handling instructions.

11.3 CONDUCTING RECEIPT INSPECTIONS OF CRITICAL ITEMS

Inspection and receiving requirements developed during the procurement of critical items shall be used to conduct receipt inspections upon receipt of items from suppliers. QA, engineering, or SMEs shall perform receipt inspections and/or testing of activities or items using established inspection/test plans, specifications, and/or applicable procedures. The inspector shall verify that required documentation has been provided by the supplier, as specified. Any items found to be nonconforming shall be documented and dispositioned in accordance with PRS-QAP-1440, *Control of Nonconforming Items and Services*, and PRS-QAP-1210, *Issues Management Program*.

12. COMMERCIAL GRADE ITEMS

Commercial grade or off-the-shelf items, (hereafter referred to as CGI) are defined as items or services other than real property that is of a type customarily used for non-governmental purposes and that has been sold, leased or licensed to the general public or has been offered for sale, lease, or license to the general public, excluding critical items and services, as defined by PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements*.

Appropriate QA and engineering controls are implemented through procedures for items designated as CGI for use and installation in Category 2 or 3 nuclear facilities, radiological, and high or moderate hazard facilities under the DOE prime contractor's custodianship. CGI controls are implemented and defined through procedure to require the following, as applicable:

- An engineering evaluation is performed to determine if the item performs a safety function;
- Item meets CGI definition;
- Criteria are defined by the technical authority when a CGI item cannot be purchased;
- CGI items or services are not procured from suppliers with undocumented QA programs;
- Procedures and work control prevent usage in unauthorized SSCs;
- CGI provides acceptable assurance that it meets acceptance criteria for dedication;
- Vendor audits are performed to review supplier performance records and ability to meet acceptance criteria; and
- Deficiencies are identified and corrected in the supplier's corrective action system.

13. DATA GATHERING DEVICES

Data gathering instruments will be used to assist the installation process and will be installed into the system to monitor and record operating parameters. Data gathering devices will be inspected upon delivery in the same manner as other project materials and will be checked to ensure that they meet the appropriate design and procurement specifications. Additionally, calibration certifications for devices that are delivered calibrated by the manufacturer will be collected, reviewed, and processed per the requirements of the RAWP QAP and approved the DOE prime contractor procedures. If the device requires calibration, once calibration has been established, a calibration label will be attached to the device in accordance with the appropriate QA procedures. Data gathering devices will not be used, if the device requires calibration, until the calibration requirements of PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment,* and the RAWP QAP have been met.

QC activities associated with data gathering instruments will include inspections for damage and for compliance with design and purchasing specifications. These inspections will be performed prior to on-site use. At all times, safe storage, proper positioning, set-up, and use of data gathering devices will be enforced. Once installed, all data gathering and reporting instruments and systems, including remote access and alarm notification systems, will be tested against the RDR specifications as part of system startup (see Section 16.4 for further information). Any discrepancies will be noted and resolved.

If data gathering devices use or involve the application of computer code or software, a software quality assurance (SQA) review will be performed by the project team in accordance with the DOE prime contractor's SQA program to verify the authenticity of any commercially provided software. This SQA review also will verify that any software related to the operation and control of systems under the DOE prime contractor's SQA program have been independently verified and validated to ensure the accuracy of output data. SQA requirements will remain in place throughout the duration of the IRA.

14. MEASURING AND TEST EQUIPMENT

M&TE typically includes instruments, tools, gauges, reference and transfer standards, and nondestructive examination equipment. Equipment used for quality class item inspection and/or testing is calibrated, handled, stored, and maintained in accordance with written procedures and/or manufacturers' instructions. Calibration and maintenance controls applicable to M&TE are established and implemented by PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment*. Appropriate training (and/or qualification) requirements and records of training activities for M&TE users shall be documented, implemented, and maintained per PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment*.

Calibration and traceability requirements for M&TE are defined and based on usage. Engineering is responsible for defining M&TE calibration frequencies. Calibration frequencies are based on required accuracy, intended use, frequency of use, stability characteristics, and other conditions affecting M&TE performance. M&TE calibration is performed using proper environmental controls based on manufacturer instructions and/or applicable consensus industry standards. Accuracy of each M&TE calibration standard is established so that equipment being calibrated will be within required tolerances. When required, reference standards have a minimum accuracy four times greater than the M&TE being calibrated so that the reference standard contributes no more than one-fourth (25 percent) of the allowable calibration tolerances. Calibration standards shall be traceable to national standards. If no national standards exist, the responsible technical authority will identify acceptable alternative standards.

If M&TE use or involve the application of computer code or software, a SQA review will be performed by the project team to verify the authenticity of any commercially provided software. This SQA review also will verify that any software related to the operation and control of systems under the DOE prime contractors' SQA program has been independently verified and validated to ensure the accuracy of output data. SQA requirements will remain in place throughout the duration of the IRA.

M&TE traceability and accountability is also required. M&TE shall be labeled, tagged, or otherwise controlled as required by PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment*, to indicate calibration status. M&TE identification provides traceability to calibration and test data. Calibration certificates include date of calibration, any calibration information necessary for interpretation of calibration result and verification of conformances with calibration criteria. M&TE is checked prior to its use to verify the proper type, range, and accuracy and that it is uniquely identified, traceable to its calibration data, and not beyond its calibration due date.

M&TE found to be out of calibration or out of tolerance is tagged or segregated to prevent inadvertent use until it is re-calibrated or replaced. The M&TE control program requires formal, documented review, in accordance with PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment*, of the usage of such equipment dating back to its last known in-calibration date (reverse traceability). This review is to determine if the use of the M&TE resulted in the acceptability of items or processes becoming either invalid or indeterminate. The basis for acceptance of these nonconforming or indeterminate items and processes is formally evaluated and documented.

15. PRODUCT ACCEPTANCE

Procured items or services will be accepted by the methods specified by the requesting organization and/or design documents in accordance with PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements*. Technical specifications and drawings are contained in the RDR. In addition to the inspection and test acceptance criteria discussed in Section 15.1, procured services may be accepted by the review and technical validation of data or certificates of compliance (CoC) reports submitted by the supplier. Acceptance of items from professional service providers may include verification of data; review and acceptance for content; factual accuracy of authored documents, manuals, procedures, training programs, etc.; an audit of the service; or review of objective evidence for conformance to procurement specifications.

Frequency or necessity of item/service performance validation or verification is determined by the following requirements, as applicable:

- Procurement contract documents;
- Applicable specifications, codes, and standards;
- Uniqueness, complexity, and application of the item;
- Quantity and frequency of the procurement; and
- Previous quality-related performance of the supplier.

Procured items are put into service after the acceptance requirements of the procurement documents have been satisfied. If an item does not meet a specified requirement or has a documentation deficiency, a nonconformance report shall be initiated by the QA Specialist or any other employee to document and disposition the deficiency in accordance with PRS-QAP-1440, *Control of Nonconforming Items and Services.* Identified deficiencies are dispositioned and corrective action is taken and verified per PRS-QAP-1210, *Issues Management Program* prior to the item's being used.

Post-maintenance, functional, or pre-operational testing is performed after installation of procured items as specified by procedure, work package instruction, and/or engineering specification. These tests verify actual performance of the item against established criteria for the item and the system. Post-test inspection acceptance conformance items are agreed to by the supplier, the organization purchasing the item, and the design authority, if required. Tests, in-service inspections, and preventive maintenance programs monitor the performance of the procured item against established criteria, as applicable.

15.1 INSPECTION AND TEST PLANS

As required by PRS-QAP-1208, *Supplier Quality Program Evaluation and Receipt Inspection and Testing Requirements*, during design or specification development, items requiring inspection or testing shall be identified along with the qualifications required to perform the inspection or testing. Inspection/test plans or procedures define the requirements and acceptance criteria to be met. Inspection/test plans or procedures shall be prepared prior to procurement or use of items or performance of activities, based on applicable codes, standards, regulatory requirements, procedures, specifications, or procurement documents. Appropriate sections of standard test procedures [e.g., American Society for Testing Material (ASTM) methods, vendor manuals, maintenance instructions, approved drawings, or national standards or codes such as American National Standards Institute (ANSI)/American Society of Mechanical Engineers] may be used instead of unique test procedures.

A startup and shakedown test section will be developed as part of the Operations and Maintenance Plan for the project that will include pre-operational testing requirements. Test requirements and acceptance criteria will be developed by the design authority. Tools and equipment used to fulfill test requirements will be appropriate so that obtained test results are accurate. M&TE (see Section 14 for a list of items typically considered M&TE) required for the execution of inspection/test plans or procedures shall comply with the requirements of PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment*. For equipment or systems being tested, designated personnel review the test packages for impact on and interface with operating systems and confirm that proposed testing will provide adequate validation that the equipment will perform its intended function. Designated personnel are selected by the project manager or appropriate functional managers.

Item or SSC inspection or test planning includes the following, as applicable:

- Item or process characteristics to be inspected;
- Type of item and the length of time it is expected to remain in storage;
- Inspection/test techniques and equipment to be used including calibration requirements;
- Acceptance criteria including allowed tolerance values;
- Hold and witness points;
- Identification of the organization performing inspection/tests;
- Required independence and qualifications of individuals who perform examinations;
- Suitable environmental conditions;
- Required safety measures;
- Completeness and accuracy of obtained data to requirements or specifications;
- Test article configuration;
- Shelf life and maintenance;
- Required Environmental Protection Controls; and
- Design authority documentation that requirements have been satisfied.

Inspection/test plans or procedures shall define requirements to be met and acceptance criteria considering the following:

- Identification and configuration of the of the item(s) and characteristics to be inspected;
- Schedule or frequency requirements for performing inspections/tests, verification of qualifications and training, and independence from the user organization;
- Identification of required M&TE;
- Application of a graded approach per PRS-QAP-1650, *Graded Approach* to ensure that results verify design requirements as opposed to verifying the acceptability of performed work;
- Evaluation for suspect/counterfeit (S/CI) items per PRS-QAP-1009, *Identification, Control, and Disposition of Suspect/Counterfeit Items*;
- Provisions for monitoring the execution of the inspection/test plan or procedure including hold points;
- Conditions and the tolerance that must be maintained (e.g., temperatures, flow requirements, and weather limitations);
- Documentation that is required (e.g., photographs, ancillary inspections of tested items), including documentation to be provided by suppliers;
- Any applicable work control or safety precautions that must be taken during the execution of the inspection/test plan or procedure;
- Acceptance criteria that must be met to demonstrate the acceptability of the item and test requirements needed to verify completeness and accuracy of the test data;
- CoCs are traceable to the item, identify the specific requirements that are met, and certify compliance with identified requirements;
- Disposition options for items that fail to meet the requirements of the inspection/test plan or procedure; and
- Qualification and training requirements for persons responsible for execution of inspection/test plans or procedures.

Final inspections are distinct from inspections conducted during the work process. Final inspection confirms that the item, service, or process is ready for acceptance testing and/or operation. As such, it confirms completeness, cleanliness, identification/markings, calibration, alignment/adjustment, adequate records, or other characteristics indicating conformance to requirements. Final inspection and test results identify, at a minimum, the following elements:

- Item;
- Date;
- Name of individual performing inspection/test;
- Observations;

- Results and acceptability; and
- Quality, nonconformance, or S/CI problems and actions taken to address problems.

15.2 INSPECTION AND ACCEPTANCE TESTING

Inspection and acceptance testing of items, services, and processes are conducted based on criteria identified in procedures, procurement documents and/or test documents. These documents contain the applicable codes, standards, or other requirements for acceptance.

Inspections/tests are structured to distinguish between those that verify design requirements and those that verify operation within safety limits and requirements. The inspection/testing process verifies that specified items, services, or processes meet or exceed specified requirements in design output or procurement documents. Test procedures include test objectives and requirements for calibrated instruments, equipment, any environmental controls or conditions, and data acquisition provisions. Examples of inspections/acceptance testing can include the following:

- Source inspections;
- Receipt inspections;
- Final acceptance inspections;
- Post-maintenance tests;
- Pre-and post-operational tests; and
- Bench tests and proof tests.

Receipt inspections or inspections at the supplier's facility are performed using approved inspection/test plans, inspection checklists, or procedures. Receipt inspections are used to verify item conformance, including any dedicated CGI. The objective evidence to be reviewed during the inspection can include the following:

- Item configuration;
- Item identification;
- Item dimensional measurements are within tolerance;
- No shipping damage to the item;
- Item does not appear to be suspect or counterfeit;
- Item is clean;
- Specified documentation has been provided by the supplier, such as Material Safety Data Sheet and operating manuals; and
- Item conforms to purchase requisition specifications.

Inspections or tests are performed by technically qualified personnel using a DOE prime contractor-approved checklist. Inspection personnel must be independent of the activities being inspected or tested and have the freedom to report the results of the inspections/tests. These individuals may be DOE prime contractor personnel, designated subcontract personnel, or qualified vendor personnel. M&TE, if

required, for the execution of inspection/test plans or procedures shall comply with the requirements of PRS-QAP-1020, *Control and Calibration of Measuring and Test Equipment*.

Inspection/test results are evaluated and approved by authorized personnel, selected by the project manager or appropriate functional managers, to document that the applicable requirements have been satisfied. Final acceptance is verified and documented by the project. The results of inspection/test plans or procedures will be documented and retained per PRS-DOC-1009, *Records Management, Administrative Record, and Document Control*.

Purchased items are examined for potential suspect or counterfeit part characteristics. If identified as suspect or counterfeit, the items are evaluated by engineering and/or the user organization technical authority. Based on evaluation findings and/or subsequent test or inspection results, the item may be removed, replaced, or left in place until the next scheduled maintenance if it is not installed in a safety system, critical hoisting equipment, or a non-safety system that could result in injury to personnel. S/CIs are reported as a reportable occurrence in accordance with QA occurrence reporting procedures.

If required, special post-delivery inspections, testing, or calibrations, will be performed in a timely manner and be adequate to ensure conformance with the controlling requirements. Materials, supplies, and equipment belonging to subcontractors that will be used for the project will also be subjected to the same degree of inspection. The frequency of QC checks for materials, equipment, and the installation processes will be determined utilizing a graded approach. All Subcontractors within the project team may be involved in performing checks and inspections, but the DOE prime contractor is responsible for ensuring that checks and inspections are done.

15.2.1 Construction Equipment

Construction equipment will be inspected upon delivery to the site. The inspection will note the type and model of equipment and determine that it is appropriate for its intended use as defined by the design and procurement specifications. Prior to on-site use, a visual examination will be performed to ensure that there are no signs of debilitating damage, hazards and incipient failures such as fluid leaks or worn components, and that the equipment is properly decontaminated for the intended use. The equipment, including accessories and tooling, also will be inspected to ensure that it is capable of performing to design and purchasing specifications. If any discrepancies are discovered, they will be noted and corrected before the equipment is put into use. At all times, safe storage, proper positioning, set-up, and use of construction equipment will be enforced.

15.2.2 Well Construction Materials

Construction details for system components are presented in the RDR. Many of the materials required for construction of the ERH TS can be obtained only from specialty manufactures and suppliers. Materials identified in the certified for construction version of the RDR will have precedence over those listed in any other document. QA and QC activities associated with construction materials will include inspections for damage and compliance with design and purchasing specifications. Inspections will be performed when the materials arrive on-site. Any discrepancies will be noted and resolved in accordance with PRS-QAP-1440, *Control of Nonconforming Items and Services*.

15.2.3 ERH and Aboveground Treatment System Equipment

The ERH TS will consist of large-scale components. The ERH TS will be constructed of the materials and components specified in the RDR. Some system equipment will be manufacturer's prefabricated units matching the RDR criteria. A surveillance has been conducted to evaluate the manufacturer's process for

assembly of electrodes to be used in C-400 IRA Project at the electrode manufacturer's plant site in Calgary, Alberta, Canada. A surveillance checklist (PRS-2008-0070) was completed in accordance with procedure PRS-QAP-1420, *Conduct of Assessments*. The checklist was developed based on specifications provided in the design and subcontract with the electrode fabricator. The project manager and an electrical engineer performed the surveillance. No observations or findings were identified during the surveillance.

QA and QC activities associated with system equipment will include inspection of the equipment for damage upon arrival onsite and for compliance with design and purchasing specifications. Testing and inspection of system equipment shall follow the inspection/test plans or procedures (see Section 15.1) as defined by the design and procurement specifications for the equipment. The testing and inspection shall include, as appropriate, inspection for S/CI items per PRS-QAP-1009, *Identification, Control, and Disposition of Suspect/Counterfeit Items*. Although system equipment cannot be inspected under operating conditions before it is installed, visual inspections will be performed. Delivery documentation will be collected and checked against the procurement specifications. A check will be made to ensure that the model of the equipment matches the procurement specifications. The equipment will be examined to ensure that there are no signs of damage to the equipment and to ensure there are no incipient hazardous conditions such as fluid leaks or missing safety guards. Components such as belts, hoses, and cables will be inspected for misalignment or wear and tear and repaired or replaced, as necessary, before the equipment is placed into use. At all times, safe storage, proper positioning, set-up, and use of system equipment will be enforced.

Once it is possible to test system equipment under operating conditions, performance testing shall be completed to verify that it can perform to the RDR requirements, as configured. All required QC documents intended to indicate how the equipment performs against the specification requirements will be completed. Any discrepancies will be noted and resolved in accordance with PRS-QAP-1440, *Control of Nonconforming Items and Services*.

16. INSTALLATION PHASES

The DOE prime contractor will be responsible for the overall management of the system installation, including QA, QC, radiological protection, and health and safety activities. While there may be some overlap of phases during system installation, the process will proceed through the following major phases.

16.1 PROCUREMENT PHASE

All necessary system components will be procured and mobilized to the site and services arranged, as needed. System components will include, but are not limited to, items necessary to install electrodes, vapor treatment system, vapor extraction wells and piping, groundwater monitoring wells, and power delivery systems (PDS). Services include, but are not limited to, drilling services, mechanical services, and electrical services. Receipt inspections will be performed as items are obtained to ensure that they meet procurement specifications and will be controlled and segregated as appropriate prior to use.

16.2 PREPARATION PHASE

The DOE prime contractor will coordinate general site preparation activities. Site preparation may include, but is not limited to, the installation of asphalt pads on which some of the aboveground ERH

components and some of the aboveground treatment systems will be placed. Site preparation also will include the staging of an operations trailer and removal of existing infrastructure to allow flexibility in the placement of remedial system components and reduce overhead hazards. The infrastructure removal activities may include, but are not limited to, dismantling and removing a bridge crane, removing a TCE tank and associated concrete, removing a TCE pumping station and associated piping at the southeast corner of the C-400 building, excavating a concrete sump, removing the tanker off-loading platform, and removing the containment tank at the southwest corner of the C-400 Building. The debris resulting from the infrastructure removal will be disposed of in accordance with the RAWP WMP. Asphalt will be applied to the grassy areas surrounding the treatment area once infrastructure removal activities are complete. Quality inspections will be performed to ensure that all preparation activities have been completed and that design specifications have been met.

16.3 CONSTRUCTION PHASE

The construction phase includes the installation of common utilities and system components. Common utilities include compressed air, potable water, electricity, telecommunications, and back-up power as described in the RDR. System components include installation of subsurface electrodes, vapor extraction wells, and an aboveground vapor and liquid treatment system, as necessary. The electrical connections to the system components will be completed and the interlock control wiring between the components will be installed. Many components of the ERH system will be installed in subsurface borings. These borings will be completed under the direction of a certified driller. All construction activities will be conducted under the supervision of the DOE prime contractor and the ERH Subcontractor. The drilling waste will be disposed in accordance with the RAWP WMP.

The RDR provides a detailed design of the ERH TS with specific locations determined for subsurface components. Coordinates have been identified for subsurface components. A checklist based on the design specifications provided in the RDR has been developed for each boring and will be used in the field during the installation and construction to ensure proper component installation. Appendix B contains an example checklist of each type of component boring; these checklists may be revised from time-to-time without amending this plan. During installation, there will be some flexibility to adjust the location of these components to accommodate unexpected underground hazards. Due to the potential for significant interference during installation caused by existing underground and overhead utility locations, active PGDP operations at the C-400 Cleaning Building and train and cylinder hauler traffic in the treatment area, final engineering activities and installation of the vapor/liquid treatment system and mechanical/electrical connections to the ERH treatment components will be field engineered. The procedures to be used to document the engineering decisions made during construction are listed in Section 3. ERH Subcontractor's subject matter experts will be on-site to provide consultation and guidance prior to relocating any of the components. Subsurface components will be installed as designed in borings completed using traditional drilling techniques. Sonic drilling is the preferred method of installation for all ERH equipment; however, in some locations, sonic drilling equipment may not fit within the congested work area and an alternate drilling method may be used. Locations of PDSs indicated on the drawings are suggested and will be finalized during installation. QA measures will be employed to ensure that any field and/or design changes are effectively identified, communicated, and implemented and that engineering design and as-built drawings accurately reflect the work performed. See Section 9 of this document for more information on field changes.

16.3.1 System Equipment

System equipment will be clean when arriving on-site and a radiological survey will be performed before it is released for initial use, as required by DOE prime contractor -approved procedures. Prior to leaving

the site, a radiological survey will be performed on the equipment, as required by DOE prime contractor-approved procedures. Decontamination, if required, will be performed in accordance with the HASP and with the DOE prime contractor-approved procedures for equipment decontamination. Waste generated from the decontamination process will be handled in accordance with the RAWP WMP and the HASP. Specific DOE prime contractor-approved procedures address on-site handling and disposal of waste material and handling, transporting, and relocating waste containers.

16.3.2 Construction Equipment

Construction equipment necessary for system installation activities will be clean when arriving on-site and a radiological survey will be performed before it is released for initial use, as required by DOE prime contractor-approved procedures. Down-hole equipment and tooling that will be used to collect samples will go through an on-site decontamination process before being released for use. Before leaving the site, construction equipment will be decontaminated and a radiological survey will be performed on the equipment, as required by DOE prime contractor-approved procedures. Decontamination will be performed in accordance with the HASP and the DOE prime contractor-approved procedures for equipment decontamination. Waste generated from the decontamination process will be handled in accordance with the RAWP WMP and the HASP. Specific DOE prime contractor-approved procedures address on-site handling and disposal of waste material and handling, transporting, and relocating waste containers.

Drill rigs capable of producing the boreholes necessary to install the electrodes, soil vapor extraction wells, and the groundwater extraction wells will be required. Drilling locations will be verified by civil survey and marked before setup of equipment on the site. Drilling locations will be visually reconfirmed before drilling equipment penetrates the soil. Locations will be established by civil survey after construction activities have been completed. Surveyed locations will be shown on the as-built drawings. Waste generated from drilling activities will be handled in accordance with the RAWP WMP and the HASP. Specific DOE prime contractor-approved procedures address on-site handling and disposal of waste material and handling, transporting, and relocating waste containers.

16.3.3 Electrical Systems

To the maximum extent possible, electrical connections will be accomplished in accordance with the applicable provisions of ANSI C2, National Electrical Manufacturers Association WC-7, and National Fire Protection Association (NFPA) 70. Electrical work shall comply with NFPA 70E (Standard for Electrical Safety in the Workplace), NFPA 70 (National Electric Code), and USEC procedure CP2-SH-IS1065 (Instructions for Lockout/Tagout). Exceptions will be made for prefabricated equipment and those components of the ERH system that operate on the principle of putting energy to ground.

Prior to acceptance, an operational test of all electrical, electrical data gathering, and equipment control systems will be performed to determine if the systems meet the purpose and intent of the RDR. Testing shall demonstrate that the systems are electrically, mechanically, structurally, and otherwise sound, are in safe and satisfactory condition and conform to specified operating characteristics. If any deficiencies to pertinent components are revealed during these tests, they will be corrected and the tests will be repeated until all deficiencies have been resolved.

16.4 TESTING PHASE

A startup and test plan will be developed during the treatment system installation. Testing of the ERH system, the vapor extraction system, and the liquid/vapor treatment system will be performed after

construction and prior to operations. Testing will demonstrate that the installation of equipment, instrumentation, piping, and valves, and ultimately the functionality and operability of the system is in accordance with the design. Testing will be performed and adjustments made as many times as necessary to successfully complete the tests. Startup Testing includes but is not limited to, the following:

- Verify proper installation of components
- Fully test operability of all systems
- Test network communication from the server to components
- Verify operation and control of components
- Conduct electrical step and touch potential tests for exposed metal above the surface
- Check the tanks and fittings for leaks
- Test level indicators/elements
- Test pumps, valves, programmable logic controller controlled instrumentation

Appropriate testing work instructions and worker training will control these testing activities. These work instructions will be included as part of the work package that will be used along with the Operations and Maintenance Plan that will be developed as part of the field installation task. Field logbooks, checklists, drawings, and startup and testing documents (to be provided in the O&M Plan) will be generated as applicable to demonstrate the as-constructed system meets its design requirements. A checklist based on the design specifications provided in the RDR has been developed for each boring and will be used in the field during the installation and construction to ensure proper component installation. Appendix B contains an example checklist of each type of component boring; these checklists may be revised from time-to-time without amending this plan.

QA measures include control of M&TE used for testing, ensuring that test plans that address required operational conditions have been approved, and that all required training has been completed. See Section 14 for additional information on M&TE.

After the startup testing of the ERH system, and the liquid/vapor extraction system is complete with acceptable results, as determined by the C-400 IRA PM, routine operations will begin. Routine operations are not governed by this CQCP. After construction is complete, all project activities will be governed by the remaining documents (RAWP, RDR, O&M Plan, QAPP, procedures, and work instructions).

APPENDIX A

SUMMARY TABLE OF QA/R-5 AND

10 *CFR* § 830.122, *QUALITY ASSURANCE CRITERIA*

THIS PAGE INTENTIONALLY LEFT BLANK

Criteria	Related Document
10 *CFR* § 830.122, *Quality Assurance Criteria*	
Criterion 1—Management/Program. (1) Establish an organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing the work. (2) Establish management processes, including planning, scheduling, and providing resources for the work.	QAPP Sections: 1.4 Organization and Responsibilities 1.5 Management Processes RAWP Sections: 5 Project Organization 9.2 Project Organization 10.9 Data Management Tasks and Roles and Responsibilities CQCP Section: 4 Quality Assurance Responsibilities and Authorities
Criterion 2—Management/Personnel Training and Qualification. (1) Train and qualify personnel to be capable of performing their assigned work. (2) Provide continuing training to personnel to maintain their job proficiency.	QAPP Sections: 2.2 Training Requirements and Qualification of Personnel 2.3 Training Implementation RAWP Sections: 12.3.4 Waste Management Training 7.6 Training 7.17.4 Radiation Safety Training 9.3 Personnel Qualifications and Training CQCP Section: 5 Personnel Qualifications and Training
Criterion 3—Management/Quality Improvement. (1) Establish and implement processes to detect and prevent quality problems. (2) Identify, control, and correct items, services, and processes that do not meet established requirements. (3) Identify the causes of problems and work to prevent recurrence as a part of correcting the problem. (4) Review item characteristics, process implementation, and other quality-related information to identify items, services, and processes needing improvement.	QAPP Sections: 3.1 Quality Improvement Program 3.2 Issues Management Program RAWP Sections: 7.1.5 Feedback/Improvement 9.14 Audits, Surveillances, and Assessments CQCP Sections: 6 Quality Control Activities 10.2 Supplier Selection and Evaluation
Criterion 4—Management/Documents and Records. (1) Prepare, review, approve, issue, use, and revise documents to prescribe processes, specify requirements, or establish design. (2) Specify, prepare, review, approve, and maintain records.	QAPP Sections: 4.1 Documents 4.2 Records RAWP Section: 9.4 Document Control and Records Management CQCP Sections: 6 Quality Control Activities 8 Documentation

Criteria	Related Document
Criterion 5—Performance/Work Processes. (1) Perform work consistent with technical standards, administrative controls, and other hazard controls adopted to meet regulatory or contract requirements, using approved instructions, procedures, or other appropriate means. (2) Identify and control items to ensure their proper use. (3) Maintain items to prevent their damage, loss, or deterioration. (4) Calibrate and maintain equipment used for process monitoring or data collection.	QAPP Sections: 1.8 Special Program requirements 5.2 Work Management System 5.3 Identification and Control of Items, Including Suspect or Counterfeit 5.4 Handling, Storing, and Shipping 5.5 Control of Process Monitoring and Data Collection Equipment 11.1 Control of Safety-Related Software RAWP Sections: 4.3 Sampling and Analysis 8.1 Baseline and Post-Operation Sampling and Analysis Plan 9.10 Instrument Calibration and Frequency CQCP Sections: 13 Data Gathering Devices 14 Measuring and Test Equipment 15.1 Inspection and Test Plans 15.2 Inspection and Acceptance Testing
Criterion 6—Performance/Design. (1) Design items and processes using sound engineering/scientific principles and appropriate standards. (2) Incorporate applicable requirements and design bases in design work and design changes. (3) Identify and control design interfaces. (4) Verify or validate the adequacy of design products using individuals or groups other than those who performed the work. (5) Verify or validate work before approval and implementation of the design.	QAPP Sections: 6.1 General 6.2 Design Process 6.3 Design Interface and Communication 6.4 Design Verification and Validation 6.5 Design Change Control 6.6 Temporary Modifications 6.7 Design Records 6.8 Suspect/Counterfeit Items RAWP Sections: 4.1 Design 8.1 Baseline and Post-Operation Sampling and Analysis Plan
Criterion 7—Performance/Procurement. (1) Procure items and services that meet established requirements and perform as specified. (2) Evaluate and select prospective suppliers on the basis of specified criteria. (3) Establish and implement processes to ensure that approved suppliers continue to provide acceptable items and services.	QAPP Sections: 7.1 Procurement Program 7.2 Supplier Selection and Evaluation 7.3 Product Acceptance CQCP Sections: 10 Procurement Requirements and Supplier Selection 11 Critical Items 12 Commercial Grade Items 16.1 Procurement Phase

Criteria	Related Document
Criterion 8—Performance/Inspection and Acceptance Testing. (1) Inspect and test specified items, services, and processes using established acceptance and performance criteria. (2) Calibrate and maintain equipment used for inspections and tests.	QAPP Sections: 8.1 Inspection and Acceptance Testing 8.2 Measuring and Test Equipment 8.3 Radiation Safety Measuring and Test Equipment RAWP Section: 9.18 Inspection of Materials CQCP Sections: 11 Critical Items 12 Commercial Grade Items 14 Measuring and Test Equipment 15 Product Acceptance 15.1 Inspection and Test Plans 15.2 Inspection and Acceptance Testing 16 Installation Phases
Criterion 9—Assessment/Management Assessment. Ensure managers assess their management processes and identify and correct problems that hinder the organization from achieving its objectives.	QAPP Section: 9.0 Management Assessments RAWP Section: 9.14 Audits, Surveillances, and Assessments CQCP Section: 6 Quality Control Activities
Criterion 10—Assessment/Independent Assessment. (1) Plan and conduct independent assessments to measure item and service quality, to measure the adequacy of work performance, and to promote improvement. (2) Establish sufficient authority, and freedom from line management, for the group performing independent assessments. (3) Ensure persons who perform independent assessments are technically qualified and knowledgeable in the areas to be assessed.	QAPP Section: 10.0 Independent Assessments RAWP Section: 9.14 Audits, Surveillances, and Assessments CQCP Sections: 6 Quality Control Activities 10.2 Supplier Selection and Evaluation
EPA Requirements for QA Project Plans (QA/R-5)	
GROUP A: PROJECT MANAGEMENT	
A1 Title and Approval Sheet	RAWP Section: Appendix C, Section 9 QAP Approval Page CQCP Section: Approval Sheet
A2 Table of Contents	RAWP Section: Contents CQCP Section: Contents
A3 Distribution List	RAWP Section: Distribution List on Transmittal Letter CQCP Section: Distribution List on Transmittal Letter

Criteria	Related Document
A4 Project/Task Organization: Identify individuals or organizations participating in the project and discuss their roles, responsibilities and organization	RAWP Section: 9.2 Project Organization CQCP Section: 4 Quality Assurance Responsibilities and Authorities
A5 Problem Definition/Background: 1) State the specific problem to be solved or the decision to be made. 2) Identify the decision maker and the principal customer for the results.	RAWP Sections: 8.1 Baseline and Post-Operation Sampling and Analysis Plan 9.1 Project Description CQCP Sections: 1 Construction Quality Control Plan Description 2 Project Goals
A6 Project/Task Description: 1) Hypothesis test, 2) expected measurements, 3) ARARs or other appropriate standards, 4) assessment tools (technical audits), 5) work schedule and required reports.	RAWP Sections: 8.1 Baseline and Post-Operation Sampling and Analysis Plan 6 Project Planning Schedule 9.1 Project Description 9.14 Audits, Surveillances, and Assessments 11 Environmental Compliance CQCP Sections: 6 Quality Control Activities 10.2 Supplier Selection and Evaluation
A7 Quality Objectives and Criteria: Decision(s), population parameter of interest, action level, summary statistics and acceptable limits on decision errors. Also, scope of the project (domain or geographical locale).	RAWP Sections: 8.1 Baseline and Post-Operation Sampling and Analysis Plan 9.5 Quality Objectives and Criteria for Measurement Data
A8 Special Training/Certification: Identify special training that personnel will need.	RAWP Section: 12.3.4 Waste Management Training 7.6 Training 7.17.4 Radiation Safety Training 9.3 Personnel Qualifications and Training CQCP Section: 5 Personnel Qualifications and Training
A9 Documents and Records: Itemize the information and records that must be included in a data report package, including report format and requirements for storage, etc.	RAWP Section: 9.4 Document Control and Records Management CQCP Sections: 6 Quality Control Activities 8 Documentation
GROUP B: DATA GENERATION AND ACQUISITION	
B1 Sampling Process Design (Experimental Design): Outline the experimental design, including sampling design and rationale, sampling frequencies, matrices, and measurement parameter of interest	RAWP Section: 9.6 Sampling Procedures
B2 Sampling Methods: Sample collection method and approach	RAWP Section: 9.6 Sampling Procedures
B3 Sample Handling and Custody: Describe the provisions for sample labeling, shipment, chain-of-custody forms, procedures for transferring and maintaining custody of samples.	RAWP Section: 9.7 Sample Handling and Custody Requirements

Criteria	Related Document
B4 Analytical Methods: Identify analytical method(s) and equipment for the study, including method performance requirements.	RAWP Section: 9.11 Analytical Procedures 9.13.2 Laboratory QC Samples and Internal QC Checks
B5 Quality Control: Describe quality control procedures that should be associated with each sampling and measurement technique. List required checks and corrective action procedures	RAWP Section: 9.13.2 Laboratory QC Samples and Internal QC Checks
B6 Instrument/Equipment Testing, Inspection, and Maintenance: Discuss how inspection and acceptance testing, including the use of QC samples, must be performed to ensure their intended use as specified by the design.	RAWP Section: 9.16 Preventive Maintenance CQCP Sections: 11 Critical Items 12 Commercial Grade Items 14 Measuring and Test Equipment 15 Product Acceptance 15.1 Inspection and Test Plans 15.2 Inspection and Acceptance Testing 16 Installation Phases
B7 Instrument/Equipment Calibration and Frequency: Identify tools, gauges and instruments, and other sampling or measurement devices that need calibration. Describe how the calibration should be done.	RAWP Section: 9.10 Instrument Calibration and Frequency CQCP Sections: 13 Data Gathering Devices 14 Measuring and Test Equipment
B8 Inspection/Acceptance of Supplies and Consumables: Define how and by whom the sampling supplies and other consumables will be accepted for use in the project	RAWP Section: 9.18 Inspection of Materials CQCP Sections: 11 Critical Items 12 Commercial Grade Items 14 Measuring and Test Equipment 15 Product Acceptance 15.1 Inspection and Test Plans 15.2 Inspection and Acceptance Testing 16 Installation Phases
B9 Non-direct Measurements: Define the criteria for the use of nonmeasurement data, such as data that come from databases or literature.	RAWP Section: 9.12 Data Review and Reporting
B10 Data Management: Outline the data management scheme including the path and storage of the data and the data record-keeping system. Identify all data handling equipment and procedures that will be used to process, compile, and analyze the data.	RAWP Section: 9.12 Data Review and Reporting
GROUP C: ASSESSMENT AND OVERSIGHT	
C1 Assessments and Response Actions: Describe the assessment activities needed for this project.	RAWP Section: 9.14 Audits, Surveillances, and Assessments CQCP Sections: 6 Quality Control Activities 10.2 Supplier Selection and Evaluation

Criteria	Related Document
C2 Reports to Management: Identify the frequency, content, and distribution of reports issued to keep management informed.	RAWP Sections: 9.15 QA Reports to Management 9.17 Field Changes CQCP Section: 9 Field Changes
GROUP D: DATA VALIDATION AND USABILITY	
D1 Data Review, Verification, and Validation: State the criteria used to accept or reject the data based on quality.	RAWP Section: 9.12 Data Review and Reporting
D2 Verification and Validation Methods: Describe the process to be used for verifying and validating data, including the chain-of custody for data throughout the lifetime of the project	RAWP Section: 9.12 Data Review and Reporting
D3 Reconciliation with User Requirements: Describe how results will be evaluated to determine if performance criteria have been satisfied.	RAWP Section: 9.5 Quality Objectives and Criteria for Measurement Data CQCP Sections: 11 Critical Items 12 Commercial Grade Items 14 Measuring and Test Equipment 15 Product Acceptance 15.1 Inspection and Test Plans 15.2 Inspection and Acceptance Testing 16 Installation Phases

APPENDIX B

EXAMPLE BORING INSTALLATION CHECKLISTS

THIS PAGE INTENTIONALLY LEFT BLANK

Electrode Boring Installation Checklist for : E074 Area: SE

All units are feet below ground surface (ft bgs) unless otherwise noted

12-in Diameter	**Boring Depth** 46.4	**Number of Electrodes:** 2	**Easting Coordinate (-ft)** 4173.61
Top Heated Depth 14.9	**Bottom Heated Depth** 48.9		**Northing Coordinate (-ft)** 1733.57
Detail Drawing E7DC40000A008	**Boring Type** 20-40 ft Electrode Well - with Upper Vapor Extraction		

Start Date _____ Finish Date _____ Drilling Method _____

Estimated Offset from Planned Location (inches): East or West _____ North or South _____

Soil Samples Required

UCRS (20 – 35)	UCRS (35-45)	UCRS (52-60)	RGA (60-80)	RGA (80-100)	McNairy (100-103)	McNairy Dye Test
YES	YES	YES	YES	YES	YES	YES

Collection Date and Time

Date	Time	Date	Time	Date	Time	Date	Time	Date	Time	Date	Time	Date	Time

Additional Information:

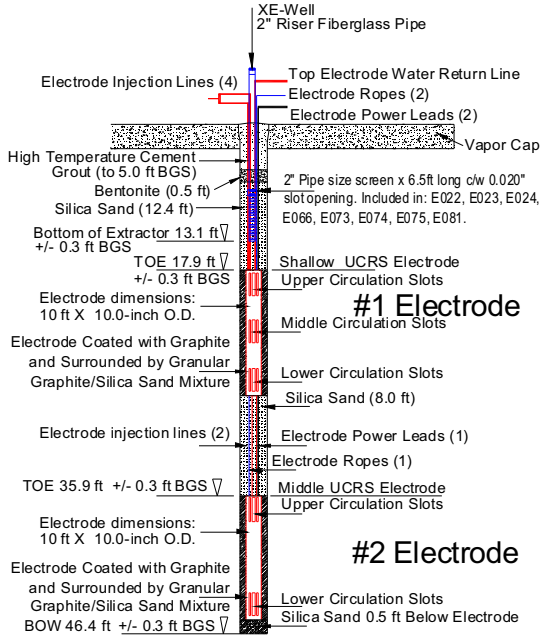
XE074, drill E074 to a depth of 99 ft and collect samples from all five depths to address the concern for possible DNAPL in the SE area. The shallow McNairy soil will be characterized in this boring.

Comments:

Completed by:

Print	Signature	Date

Electrode Boring Installation Checklist for : E074 Area: SE



Planned Depth* (ft bgs)	Actual Depth
Installed BOW Depth	
sand 0.5 ft (45.9 to 46.4)	
#2 electrode 35.9 to 45.9	
graphite/silica sand around #2 electrode	
8 ft of sand (27.9 to 35.9)	
#1 electrode (mid circ. slots) 17.9 to 27.9	
graphite/silica sand around #1 electrode	
4.8 ft of sand (13.1 to 17.9)	
2"F.G.(0 to 6.6)/screen (6.6 to 13.1)	
7.6 ft of sand (5.5 to 13.1)	
0.5 ft bentonite (5.0 to 5.5)	
5.0 ft high temp grout (0 to 5.0)	

* See note 9 below

All Notes from Detail Drawing E7DC40000A008 (some may not apply to this boring)

1) Electrode power lead for each electrode in the well is connected to its own PDS control channel.

2) Top and bottom water injection lines for each electrode are connected to a T fitting at surface from a WCS control valve.

3) Water return line to the uppermost electrode is connected to the input of the water treatment system

4) XE Wellhead connection shown in drawing #C7DC40000A003.

5) Slot sizes on electrodes exaggerated to show feature.

6) Silica sand is No. 30, (0.0234 Sieve Size).

7) Electrodes are connected to a rope for lowering into the hole and as an additional safety factor to prevent movement in case the sand settles within the boring. Rope is constructed of Technora material. Technora is rated for continuous operations at 250 degrees C and has high resistance to organic solvents.

8) Only electrodes listed have upper vapor extraction.

9) Actual depth of electrode placement will be field determined so that the RGA/McNairy interface can be appropriately heated.

Completed by:

Print Signature Date

Extraction Well Installation Checklist for: X07 Area: SE

All units are feet below ground surface (ft bgs) unless otherwise noted

8-in Diameter	**Well Depth** 103.8	**GW Screen** 55.0 to 100.0	**Easting Coordinate (-ft)** 4145.81
Treated Depth*	R-SD, U-D	**Vapor Screen** 50.0 to 55.0	**Northing Coordinate (-ft)** 1832.56
Detail Drawing C7DC40000A002	**Boring Type** Multi-Phase Extraction Well Boring		

Start Date _____ Finish Date _____ Drilling Method _____

Estimated Offset from Planned Location (inches): East or West _____ North or South _____

* R = RGA, U = UCRS - S = shallow, M = middle, D = deep

Water Samples Required

UCRS (20–35 ft)		UCRS (35-45 ft)		UCRS (52-60 ft)		RGA (65 ft)		RGA (75 ft)		RGA (100 ft)	
no		no		no		YES		no		YES	
Collection Date and Time											
N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A		
Date	Time	Date	Time	Date	Time	Date	Time	Date	Time	Date	Time

Soil Samples Required

UCRS (20 – 35)		UCRS (35-45)		UCRS (52-60)		RGA (60-80)		RGA (80-100)		McNairy (100-103)		McNairy Dye Test	
no		no		no		no		no		no		YES	
Collection Date and Time													
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Date	Time	Date	Time	Date	Time	Date	Time	Date	Time	Date	Time	Date	Time

Additional Information:

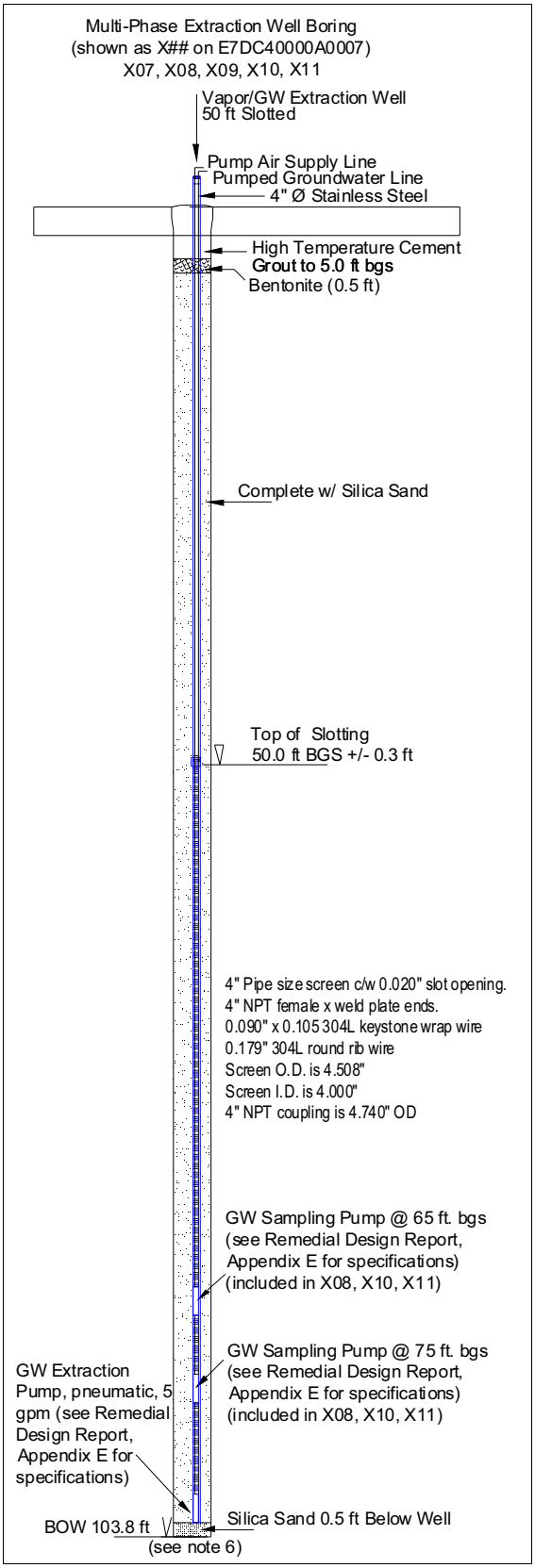
Complete 3 ft into the McNairy to install a sump. Actual depths of wells to be adjusted based on observed field conditions. The shallow McNairy soil will be characterized in this boring.

Comments:

Completed by:

Print	Signature	Date

Extraction Well Installation Checklist for: X07 Area: SE



Planned Depth* (ft bgs)	Actual Depth
Installed BOW Depth	
sand 0.5 ft (103.3 to 103.8)	
4"S.S.(0 to 50.0)/well screen (50.0 to 100.0)	
complete with sand (5.5 to 103.3)	
0.5 ft bentonite (5.0 to 5.5)	
5.0 ft high temp grout (0 to 5.0)	
Bottom of GW extraction pump 103.3	

* See note 6 below

All Notes from Detail Drawing C7DC40000A002 (some may not apply to this boring)

1) All extraction well riser pipes grounded to ET-DSP neutral system above surface.

2) Extraction well piping at the wellhead will be isolated with electrical insulating coating.

3) Connections from extraction wellhead to treatment system must be electrically isolated.

4) Depth of boreholes and vertical extents of extraction wells are determined by the treatment depths at each well location.

5) Wellhead completion details are shown in drawing #C7DC40000A003.

6) Extraction wells completed at the RGA-McNairy interface will be completed 3 ft into the McNairy to install a sump. Actual depths of wells to be adjusted based on observed field conditions.

Completed by:

Print Signature Date

Contingency Well Installation Checklist for: CX03 Area: SE

All units are feet below ground surface (ft bgs) unless otherwise noted

6-in Diameter	**Well Depth** 55.8	**GW Screen** no gw screen		**Easting Coordinate (-ft)**	4143.32
Treated Depth* U-D		**Vapor Screen** 15.0 to 55.0		**Northing Coordinate (-ft)**	1821.30
Detail Drawing C7DC40000A002		**Boring Type** Contingency Well Boring			

Start Date _____ Finish Date _____ Drilling Method _____

Estimated Offset from Planned Location (inches): East or West _____ North or South _____

* R = RGA, U = UCRS - S = shallow, M = middle, D = deep

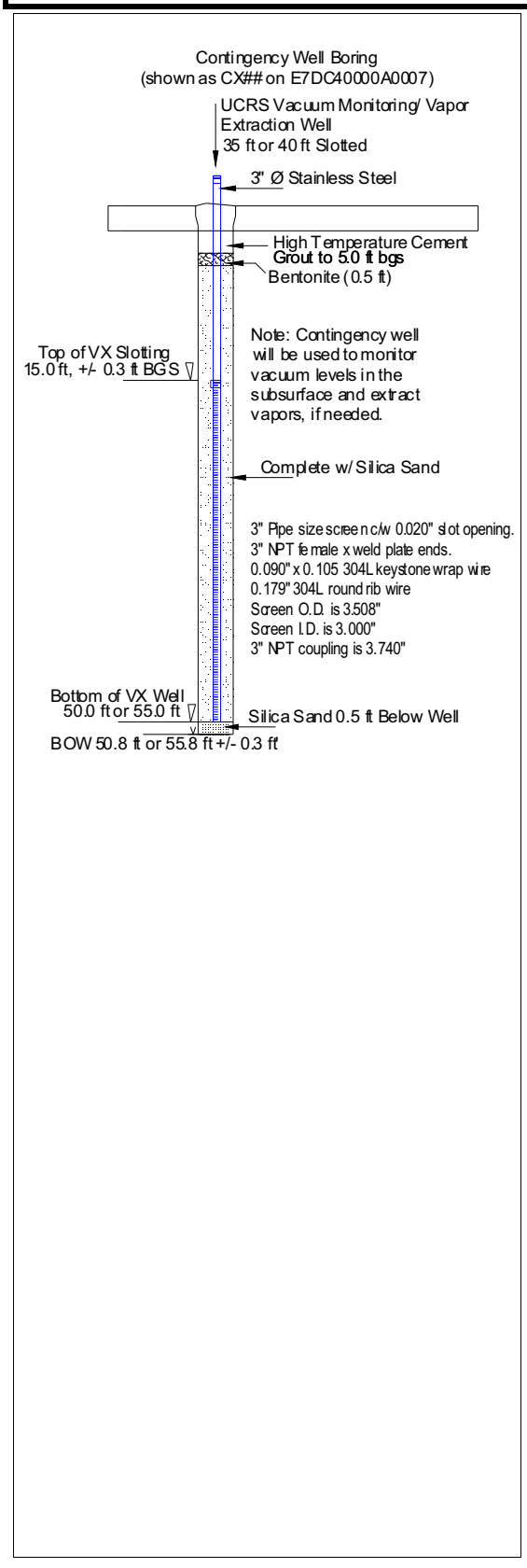
Additional Information:

Comments:

Completed by:

Print Signature Date

Contingency Well Installation Checklist for: CX03 Area: SE



Planned Depth* (ft bgs)	Actual Depth
Installed BOW Depth	
sand 0.5 ft (55.3 to 55.8)	
3"S.S.(0 to 15.0)/well screen (15.0 to 55.0)	
complete with sand (5.5 to 55.3)	
0.5 ft bentonite (5.0 to 5.5)	
5.0 ft high temp grout (0 to 5.0)	

* See note 4 below

All Notes from Detail Drawing C7DC40000A002 (some may not apply to this boring)

1) All extraction well riser pipes grounded to ET-DSP neutral system above surface.

2) Extraction well piping at the wellhead will be isolated with electrical insulating coating.

3) Connections from extraction wellhead to treatment system must be electrically isolated.

4) Depth of boreholes and vertical extents of extraction wells are determined by the treatment depths at each well location.

5) Wellhead completion details are shown in drawing #C7DC40000A003.

6) Extraction wells completed at the RGA-McNairy interface will be completed 3 ft into the McNairy to install a sump. Actual depths of wells to be adjusted based on observed field conditions.

Completed by:

Print | Signature | Date

digiPAM Installation Checklist for: DP03 Area: SE

All units are feet below ground surface (ft bgs) unless otherwise noted

6-in Diameter	**Well Screen Top** 55	**Easting Coordinate (-ft)** 4173.95
Sensor Depth 70	**Well Screen Bottom** 70	**Northing Coordinate (-ft)** 1837.55
Detail Drawing C7DC40000A001	**Boring Type** digiPAM Sensor Well Boring	

Start Date _____ Finish Date _____ Drilling Method _____

Estimated Offset from Planned Location (inches): East or West _____ North or South _____

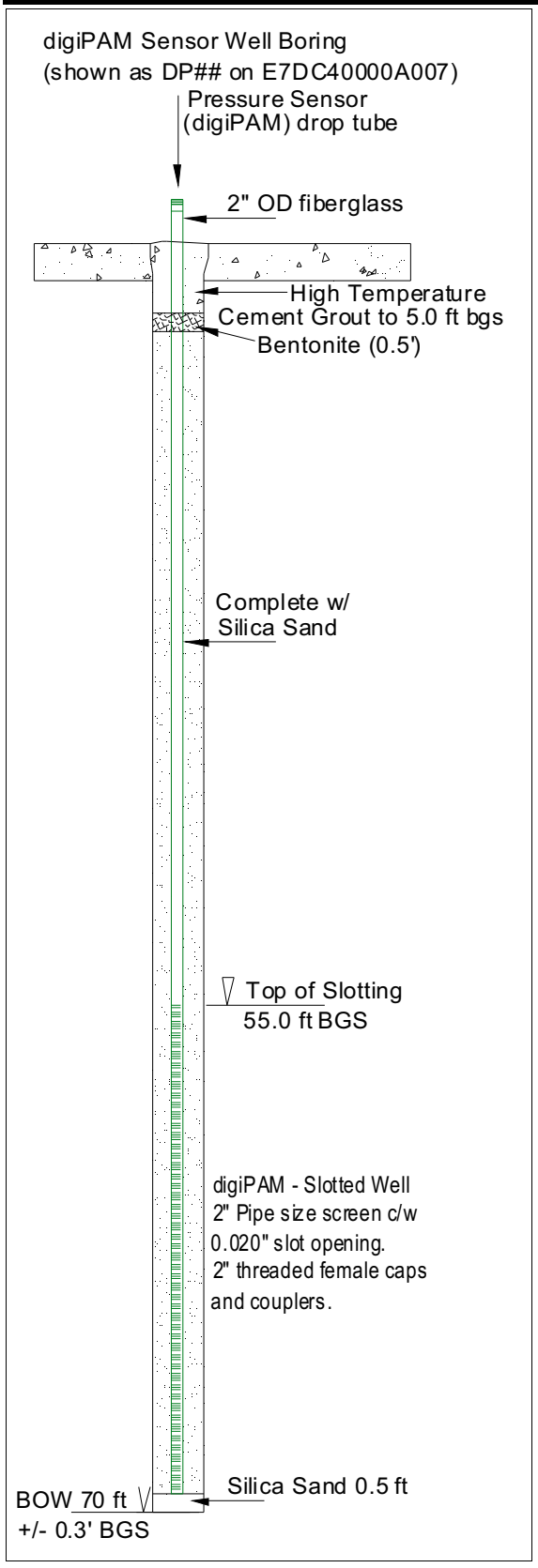
Additional Information:

Comments:

Completed by:

Print Signature Date

digiPAM Installation Checklist for: DP03 Area: SE



Planned Depth* (ft bgs)	Actual Depth
Installed BOW Depth	
sand 0.5 ft (69.5 to 70.0)	
2"F.G.(0 to 55.0)/well screen (55.0 to 69.5)	
complete with sand (5.5 to 69.5)	
0.5 ft bentonite (5.0 to 5.5)	
5.0 ft high temp grout (0 to 5.0)	

* See note 4 below

All Notes from Detail Drawing C7DC40000A001 (some may not apply to this boring)

1. All wellhead details are shown in drawing #C7DC40000A003.
2. Depths of digiTAM drop tubes are determined by the treatment depth at the well location.
3. All fiberglass drop tubes are high-temperature red-thread.
4. Actual depths will be adjusted based on observed field conditions.
5. Vacuum Monitoring and Vacuum Monitoring/digiTAM Wells can be used as contingency wells for vapor extraction.
6. BOW - Bottom of Well.

Completed by:

Print | Signature | Date

digiTAM Installation Checklist for: D13 Area: SE

All units are feet below ground surface (ft bgs) unless otherwise noted

6-in Diameter	**Well Bottom**	100	**Top of Sensor Range**	40	**Easting Coordinate (-ft)** 4166.81
No. of Temperature Points	18 installed at 3 ft intervals in heated zone				**Northing Coordinate (-ft)** 1832.56
Detail Drawing	C7DC40000A001	**Boring Type**	digiTAM Sensor Well Boring		

Start Date _____ Finish Date _____ Drilling Method _____

Estimated Offset from Planned Location (inches): East or West _____ North or South _____

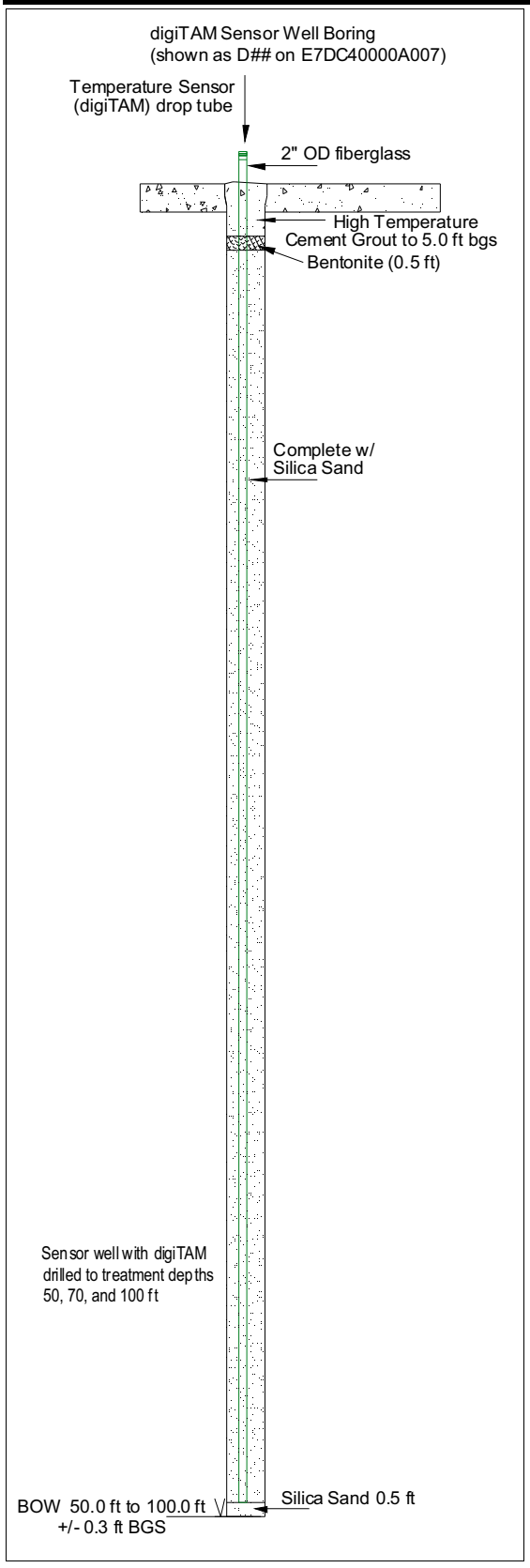
Additional Information:

Comments:

Completed by:

Print Signature Date

digiTAM Installation Checklist for: D13 Area: SE



Planned Depth* (ft bgs)	Actual Depth
Installed BOW Depth	
sand 0.5 ft (99.5 to 100.0)	
digiTAM tube (0 to 99.5)	
complete with sand (5.5 to 99.5)	
0.5 ft bentonite (5.0 to 5.5)	
5.0 ft high temp grout (0 to 5.0)	

* See note 4 below

All Notes from Detail Drawing C7DC40000A001 (some may not apply to this boring)

1. All wellhead details are shown in drawing #C7DC40000A003.
2. Depths of digiTAM drop tubes are determined by the treatment depth at the well location.
3. All fiberglass drop tubes are high-temperature red-thread.
4. Actual depths will be adjusted based on observed field conditions.
5. Vacuum Monitoring and Vacuum Monitoring/digiTAM Wells can be used as contingency wells for vapor extraction.
6. BOW - Bottom of Well.

Completed by:

Print Signature Date

Dual Sensor Installation Checklist for: DP05 and D18 Area: SE

All units are feet below ground surface (ft bgs) unless otherwise noted

7-in Diameter **Northing Coordinate (-ft)** 1801.60 **Easting Coordinate (-ft)** 4130.06

digiTAM information: **Well Bottom** 100 **Top of Sensor Range** 40

No. of Temperature Points 18 installed at 3 ft intervals in heated zone

digiPAM information: **Sensor Depth** 70 **Well Screen Top** 55 **Well Screen Bottom** 70

Detail Drawing C7DC40000A001 **Boring Type** Dual Sensor Well Boring

Start Date _____ Finish Date _____ Drilling Method _____

Estimated Offset from Planned Location (inches): East or West _____ North or South _____

Borings with same Coordinates

DigiPAM#	East (-ft)	North (-ft)	Well Screen Bottom	DigiTAM#	East (-ft	North (-ft)	Well Bottom
DP05	4130.06	1801.60	70	D18	4130.06	1801.60	100

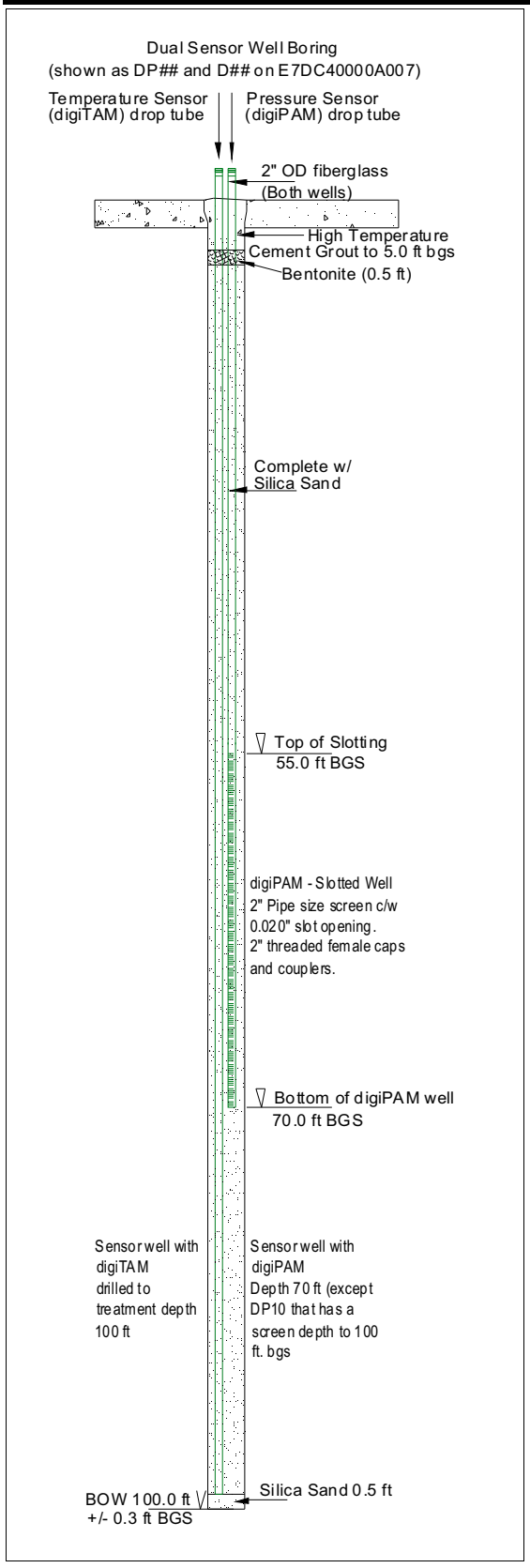
Additional Information:

Comments:

Completed by:

Print Signature Date

Dual Sensor Installation Checklist for: DP05 and D18 Area: SE



Planned Depth* (ft bgs)	Actual Depth
Installed BOW Depth	
sand 0.5 ft (99.5 to 100.0)	
digiTAM tube (0 to 99.5)	
sand (70.0 to 99.5)	
2"F.G.(0 to 55.0)/well screen (55.0 to 70.0)	
complete with sand (5.5 to 70.0)	
0.5 ft bentonite (5.0 to 5.5)	
5.0 ft high temp grout (0 to 5.0)	

* See note 4 below

All Notes from Detail Drawing C7DC40000A001 (some may not apply to this boring)

1. All wellhead details are shown in drawing #C7DC40000A003.
2. Depths of digiTAM drop tubes are determined by the treatment depth at the well location.
3. All fiberglass drop tubes are high-temperature red-thread.
4. Actual depths will be adjusted based on observed field conditions.
5. Vacuum Monitoring and Vacuum Monitoring/digiTAM Wells can be used as contingency wells for vapor extraction.
6. BOW - Bottom of Well.

Completed by:

Print | Signature | Date

Vacuum Mon./digiTAM Installation Checklist for: DV06 Area: SE

All units are feet below ground surface (ft bgs) unless otherwise noted

7-in Diameter	**Vacuum Screen Top** 20.0	**Sensor Top** 65.0	**Easting Coordinate (-ft)** 4094.47
No. of Sensors 11	**Screen Bottom** 50.0	**Sensor Bottom** 100.0	**Northing Coordinate (-ft)** 1631.47
Detail Drawing C7DC40000A001	**Boring Type** Vacuum Monitoring/digiTAM Well Boring		

Start Date _____ Finish Date _____ Drilling Method _____

Estimated Offset from Planned Location (inches): East or West _____ North or South _____

Soil Samples Required

UCRS (20 – 35)	UCRS (35-45)	UCRS (52-60)	RGA (60-80)	RGA (80-100)	McNairy (100-103)	McNairy Dye Test
YES	YES	YES	YES	YES	YES	YES

Collection Date and Time

Date	Time	Date	Time	Date	Time	Date	Time	Date	Time	Date	Time	Date	Time

Additional Information:

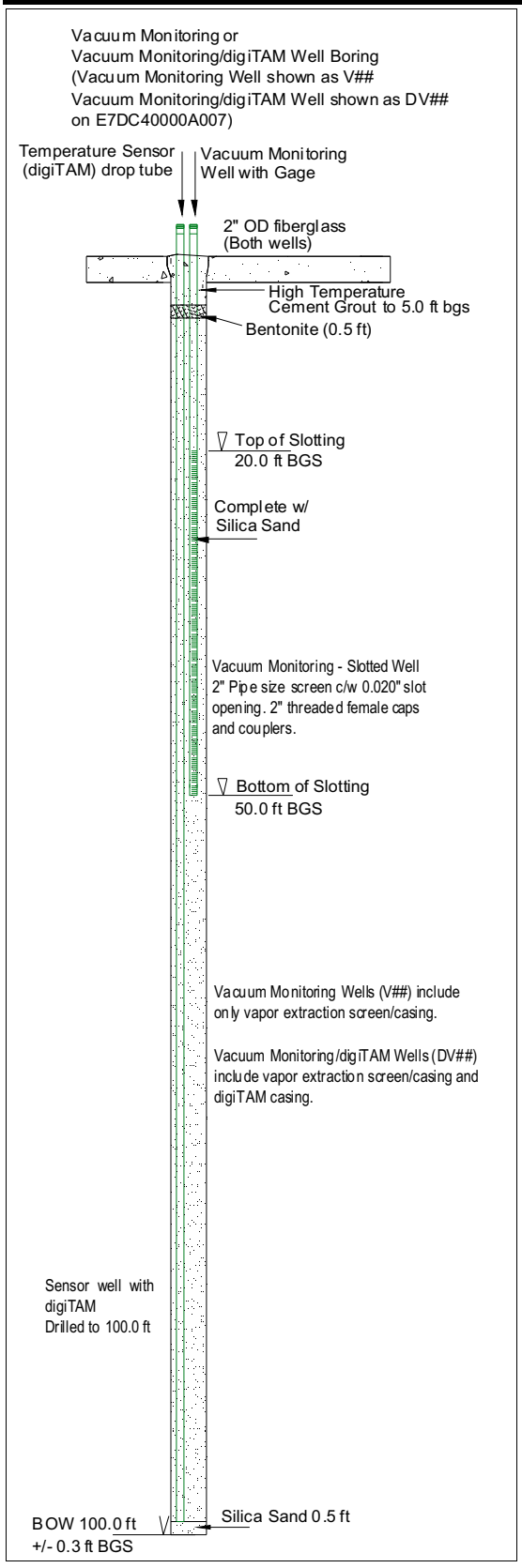
The shallow McNairy soil will be characterized in this boring.

Comments:

Completed by:

Print	Signature	Date

Vacuum Mon./digiTAM Installation Checklist for: DV06 Area: SE



Planned Depth* (ft bgs)	Actual Depth
Installed BOW Depth	
sand 0.5 ft (99.5 to 100.0)	
digiTAM tube (0 to 99.5)	
sand (50.0 to 99.5)	
2"F.G.(0 to 20.0)/well screen (20.0 to 50.0)	
complete with sand (5.5 to 50.0)	
0.5 ft bentonite (5.0 to 5.5)	
5.0 ft high temp grout (0 to 5.0)	

* See note 4 below

All Notes from Detail Drawing C7DC40000A001 (some may not apply to this boring)

1. All wellhead details are shown in drawing #C7DC40000A003.
2. Depths of digiTAM drop tubes are determined by the treatment depth at the well location.
3. All fiberglass drop tubes are high-temperature red-thread.
4. Actual depths will be adjusted based on observed field conditions.
5. Vacuum Monitoring and Vacuum Monitoring/digiTAM Wells can be used as contingency wells for vapor extraction.
6. BOW - Bottom of Well.

Completed by:

Print	Signature	Date

Vacuum Monitoring Installation Checklist for: V03 Area: SE

All units are feet below ground surface (ft bgs) unless otherwise noted

7-in Diameter	**Vacuum Screen Top** 20.0	**Easting Coordinate (-ft)** 4172.09
	Screen Bottom 50.0	**Northing Coordinate (-ft)** 1836.00
Detail Drawing C7DC40000A001	**Boring Type** Vacuum Monitoring	

Start Date _____ Finish Date _____ Drilling Method _____

Estimated Offset from Planned Location (inches): East or West _____ North or South _____

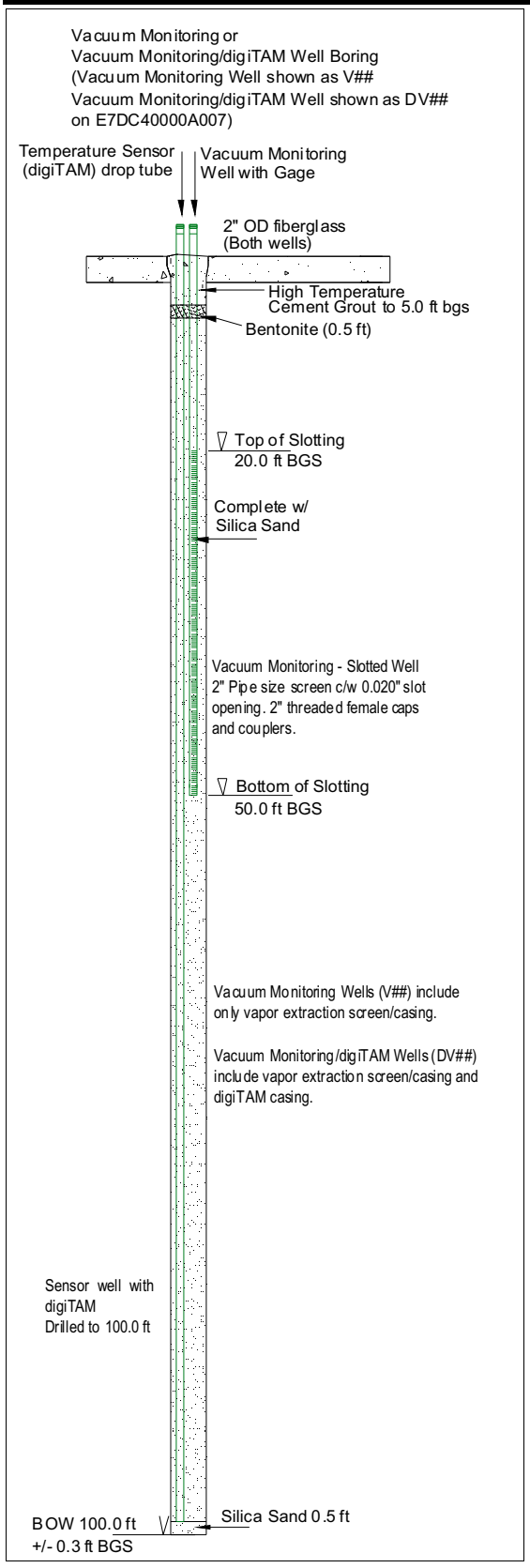
Additional Information:

Comments:

Completed by:

Print Signature Date

Vacuum Monitoring Installation Checklist for: V03 Area: SE



Planned Depth* (ft bgs)	Actual Depth
Installed BOW Depth	
sand (50.0 to 51.0)	
2"F.G.(0 to 20.0)/well screen (20.0 to 50.0)	
complete with sand (5.5 to 50.0)	
0.5 ft bentonite (5.0 to 5.5)	
5.0 ft high temp grout (0 to 5.0)	

* See note 4 below

All Notes from Detail Drawing C7DC40000A001 (some may not apply to this boring)

1. All wellhead details are shown in drawing #C7DC40000A003.
2. Depths of digiTAM drop tubes are determined by the treatment depth at the well location.
3. All fiberglass drop tubes are high-temperature red-thread.
4. Actual depths will be adjusted based on observed field conditions.
5. Vacuum Monitoring and Vacuum Monitoring/digiTAM Wells can be used as contingency wells for vapor extraction.
6. BOW - Bottom of Well.

Completed by:

Print | Signature | Date