



Department of Energy

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JUL 11 2017

Mr. Brian Begley
Federal Facility Agreement Manager
Division of Waste Management
Kentucky Department for Environmental Protection
300 Sower Boulevard, 2nd Floor
Frankfort, Kentucky 40601

PPPO-02-4310559-17

Ms. Julie Corkran
Federal Facility Agreement Manager
U.S. Environmental Protection Agency, Region 4
61 Forsyth Street
Atlanta, Georgia 30303

Dear Mr. Begley and Ms. Corkran:

PADUCAH FEDERAL FACILITY AGREEMENT—SIGNED MEMORANDUM OF AGREEMENT FOR RESOLUTION OF INFORMAL DISPUTE FOR THE C-400 VAPOR INTRUSION STUDY WORK PLAN TO SUPPORT THE ADDITIONAL ACTIONS FOR THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT FIVE-YEAR REVIEW AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY (DOE/LX/07-2403&D2)

Please find enclosed the signed Memorandum of Agreement for Resolution of Informal Dispute of Disputed Conditions Issued on the C-400 Vapor Intrusion Study Work Plan to Support the Additional Actions for the CERCLA Five-Year Review at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-2403&D2.

The U.S. Department of Energy appreciates the U.S. Environmental Protection Agency's and the Kentucky Department for Environmental Protection's efforts in resolving this matter.

If you have any questions or require additional information, please contact me at (270) 441-6862.

Sincerely,

A handwritten signature in black ink, appearing to read "Tracey Duncan".

Tracey Duncan
Federal Facility Agreement Manager
Portsmouth/Paducah Project Office

Enclosure:

Signed Memorandum of Agreement

e-copy w/enclosure:

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MEMORANDUM OF AGREEMENT FOR RESOLUTION OF INFORMAL DISPUTE
of disputed conditions issued on the *C-400 Vapor Intrusion Study Work Plan to Support the Additional Actions for the CERCLA Five-Year Review at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
(DOE/LX/07-2403&D2)

Background

On September 30, 2014, the U.S. Environmental Protection Agency (EPA) informed the U.S. Department of Energy (DOE) that EPA did not concur with the protectiveness statement (“short-term protective”) for the C-400 Building Electrical Resistance Heating Interim Remedial Action (2005 Interim Record of Decision) set forth in DOE’s *Five-Year Review for Remedial Actions at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1289&D2/R1. EPA issued a “protectiveness deferred” determination until a vapor intrusion study is conducted that is consistent with EPA protocol and based on current toxicity values and risk assessment methodology and the protectiveness of the remedy can be determined. EPA required the vapor intrusion study to be conducted in the near term to determine whether this potential pathway presents an unacceptable risk to human health such as workers that work in and around the C-400 Building and not delayed until a subsequent C-400 action. EPA established a completion date for reporting the results of the Vapor Intrusion Study within 1.5 years (March 2016), after which EPA would make a revised protectiveness determination.

On October 20, 2016, DOE submitted the *C-400 Vapor Intrusion Study Work Plan to Support the Additional Actions for the CERCLA Five-Year Review at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-2403&D2, (Work Plan) to the Kentucky Department for Environmental Protection (KDEP) and EPA for review and approval. On November 17, 2016, pursuant to Section XX, Review/Comment on Draft/Final Documents, and Section XXX, Five Year Review, of the Paducah Gaseous Diffusion Plant (PGDP) Federal Facility Agreement (FFA), EPA issued 23 conditions for approval of the Work Plan. EPA’s conditions fell into two separate groups. The first group included Conditions 1 through 4 and was related to EPA’s requirement that DOE collect and analyze sub-slab samples beneath the C-400 Building, consistent with the EPA OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (OSWER Publication 9200.2-154, 2015). The second group included Conditions 5 through 23 and was related to EPA’s requirement that DOE revise the Quality Assurance Project Plan, Appendix B of the work plan. KDEP approved the Work Plan on November 18, 2016.

Pursuant to Section XXV.A, Informal Dispute, of the PGDP FFA, DOE invoked informal dispute resolution on December 19, 2016, regarding all 23 Conditions of EPA’s conditional concurrence. The FFA parties, in good faith, conducted a period of informal dispute under Section XXV.A, Informal Dispute, of the FFA and reached mutually acceptable resolution on the disputed conditions. This memorandum of agreement for resolution of this dispute (MOA) resolves the conditions for approval of the work plan to conduct the C-400 field activities to support DOE submittal of the Vapor Intrusion Study Addendum to the 2013 Five Year Review.

Resolution

The undersigned agree that the Informal Dispute invoked by DOE is hereby resolved. The terms of the MOA are set forth below.

DOE shall incorporate resolution of EPA's 23 Conditions into the revised *C-400 Vapor Intrusion Study Work Plan to Support the Additional Actions for the CERCLA Five-Year Review at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/LX/07-2403&D2/R1). The attached summary entitled *Resolution of Disputed Conditions of the U.S. Environmental Protection Agency (EPA) November 17, 2016, Conditions issued on the C-400 Vapor Intrusion Study Work Plan to Support the Additional Actions for the CERCLA Five-Year Review at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/LX/07-2403&D2), describes how each disputed condition was resolved and identifies the specific revisions to the Work Plan that the FFA parties agreed shall be made by DOE in order to resolve the conditions.

The FFA parties agree that a revised Work Plan, incorporating the changes agreed to in this MOA, will be submitted to EPA and KDEP within 30 days of the date of the last party's signature on this agreement.

Other Terms and Conditions

Pursuant to Section XXV.B.10 of the FFA, resolution of this dispute constitutes a final resolution of the dispute, which resolution is incorporated into and becomes a term and condition of the FFA. Nothing in this MOA modifies other FFA Terms and Conditions or other CERCLA projects at PGDP, except as specifically stated above.

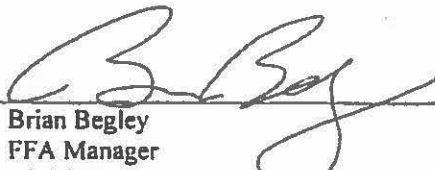
To the extent authorized under the FFA, nothing in this MOA shall prevent any of the Parties from disputing any other matters related to the aforementioned projects.



Tracey Duncan
FFA Manager
U.S. Department of Energy

6/28/17

Date



Brian Begley
FFA Manager
Division of Waste Management
Kentucky Department of Environmental Protection

06-29-2017

Date



Julie Corkran
FFA Manager
U.S. Environmental Protection Agency

June 29, 2017

Date

**Resolution of Disputed Conditions of the U.S. Environmental Protection Agency
November 17, 2016, Conditions issued on the C-400 Vapor Intrusion Study Work Plan to
Support the Additional Actions for the CERCLA Five-Year Review at the Paducah Gaseous
Diffusion Plant, Paducah, Kentucky, DOE/LX/07-2403&D2.**

Sampling Specific Conditions

Condition 1 Resolution.

The following general sampling requirements were agreed to by the Federal Facility Agreement (FFA) Parties during resolution meetings and will be incorporated into the revised work plan, along with specific sampling resolutions for specific Conditions 2, 3, and 4 below.

1. All sampling and measurements (unless otherwise specified) will be conducted in the “breathing zone,” which is assumed to be at 5-6 feet above ground surface. Protection will be needed for summa canisters during sampling to ensure safety/integrity of the device.
2. Sampling will not be attempted during inclement weather (inclement weather will be defined in the revised work plan) or when there is a sustained wind speed of 25 mph or greater.
3. For each sampling scenario, there are eight locations for indoor air sampling (total of 24 samples for the 3 sampling events). Each sample will be a 10-hour composite sample by summa canister. Each indoor air location will have the differential pressure (relative to ambient outdoor air) measured six times per sampling event (total of 144 measurements for the 3 sampling events). Ambient and sub-slab temperatures will be recorded for each location when the differential pressure is measured.
4. For each sampling scenario, a weather station, located outside of the C-400 building, will record barometric pressure, wind direction and speed, relative humidity, and temperature every two hours yielding six readings per each 10 hour sampling event (i.e., a total of 18 sets of readings over the three sampling scenarios). Weather reporting data from the weather station located at the Paducah airport (i.e., official weather data) will also be included in the project's report.
5. For each sampling scenario, there will be seven sub-slab locations for sub-slab soil vapor samples (total of 21 samples for the 3 sampling events). Each sub-slab location will have a pressure differential measured (split manometer) between the sub-slab and the indoor atmosphere with the pressure differential to be recorded every two hours. The sub-slab samplers will be collected concurrently with the indoor air and outside ambient air samples for the 3 sampling events. The slab thickness will be measured and recorded at each sub-slab location. The Data Quality Objective for the sub-slab soil vapor samples will state these samples are being collected to monitor the difference between sub-slab vapors and indoor air vapors.
6. The revised work plan will rename the sampling locations in a consistent manner to reflect the agreed to locations.

Condition 2 Resolution.

As part of the resolution discussion, the Figure 10 sampling locations originally proposed in the D2 C-400 Vapor Intrusion Study Work Plan (copy included herein for reference only) were compared to the location descriptions identified in EPA Condition 2. The resulting agreement on

sample locations are shown on the attached figure titled, “Condition 2 Indoor Sampling Locations for C-400 Building Vapor Intrusion Study as Agreed by the FFA Parties” and are reflected in the descriptions below for a, b, c, d, e, f, and g. These locations will be included on a revised figure in the revised work plan. Additionally, the revised work plan will include photos of each sampling location. Also, the work plan will be revised to ensure photos are taken during the sampling event(s) to be included in the report.

- a. The U.S. Department of Energy (DOE) will collect sub-slab and indoor air samples at the location shown on the attached figure, as “Location 3. Southeast Corner Near Column E2 (EPA Condition 2a).” Samples are to be collected within 10 feet of Column E2). The D2 C-400 Vapor Intrusion Study Work Plan Location “3. Test Loop,” will be eliminated due to another sample nearby that can serve the same purpose.
- b. DOE will collect sub-slab and indoor air samples at the location shown on the attached figure, as “11. Deteriorated Concrete Near Column A10 (EPA Condition 2b).” The revised work plan will identify that the samples will be collected 25-50 feet from the wall.
- c. DOE will collect sub-slab and indoor air samples at the location shown on the attached figure, as “5. Basement Level Near Degreaser Tanks (EPA Condition 2c).” The revised work plan will identify that the samples will be collected in the corridor next to the degreaser tank.
- d. DOE will collect sub-slab and indoor air samples at the location shown on the attached figure, as “6. Main Floor Adjacent to Degreaser (EPA Condition 2d).” The D2 C-400 Vapor Intrusion Study Work Plan Location “6. Central Area Main Floor Near Column C 4 1/2” will be eliminated since it is near this new location.
- e. DOE will collect one sample at the air intake (C-400 Vapor Intrusion Study Work Plan Location “7. Basement Fan Room Intake/Exhaust Plenum Fans 88/89” (EPA Condition 2e).” The revised work plan will describe how the sample will be taken. DOE may install a sampling port on the exhaust side of the operating fan. The D2 C-400 Vapor Intrusion Study Work Plan Location 8 will be eliminated.
- f. DOE will collect sub-slab and indoor air samples at the location shown on the attached figure, as “1. Southeast Office (EPA Condition 2f).”
- g. DOE will collect sub-slab and indoor air samples at the location shown on the attached figure, as “2. Northeast Central Near Column D12 (EPA Condition 2g).” DOE will also retain the sampling at Work Plan Location “4. Basement Furnace Room on North End”.
- h. DOE will utilize manometers at the indoor sampling locations with the following reflected in the revised work plan.
 - Each indoor air location will have the differential pressure (relative to ambient outdoor air) measured six times per sampling event (total of 144 measurements for the 3 sampling events).

- Each sub-slab location will have a pressure differential measured (split manometer) between the sub-slab and the indoor atmosphere with the pressure differential to be recorded every two hours.
- i. DOE will collect ambient air samples from all four sides of the building as required by the EPA condition with the following reflected in the revised work plan.
- The two locations identified in the D2 C-400 Vapor Intrusion Study Work will be replaced with four newly identified locations.
 - For each sampling scenario, there will be 4 outside (ambient) air samples (total of 12 samples for the 3 sampling events). Each sample will be a 10-hour composite sample by summa canister.
 - Outside sampling locations will be within 50 to 100 feet from the building, not in Solid Waste Management Units (SWMU), dumpsters, roads, construction, or other items that could influence the sampling results. The revised work plan will also include a figure to depict the SWMUs in and around the C-400 building. Outside sampling locations will be selected after the locations are walked down. The selection process will be documented and locations will be included on a figure in the revised work plan.
 - The revised work plan will identify two location options for ambient air sampling on the east side of the building (north and south of the operating stack). The decision rule for the location option used on the day of the sampling will be the upwind location, as determined by the weather conditions on the day of the sampling. The objective is for the sample not to be influenced by the stack. The revised work plan will include a requirement for the sampling team to document the rationale for the selected location.

Condition 3 Resolution.

- a. Sampling will be at 10 hour periods, where applicable, to coincide with standard work timeframes for current workers at the C-400 Building.
- b. DOE will collect samples under three scenarios.
 - (i) exhaust fan on and doors open,
 - (ii) exhaust fan on but doors closed and
 - (iii) the exhaust fan off and the doors closed.
- c. The revised work plan will specify that each scenario in (b) above will be established for 24 hours prior to sampling to permit air/vapor conditions to equilibrate.

Condition 4 Resolution.

The EPA OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (OSWER Publication 9200.2-154, 2015) states the following:

Consider collecting multiple rounds of indoor air samples, using time-integrated measurements to estimate exposure concentrations appropriate for the exposure (occupancy) scenario being evaluated (e.g., residential versus commercial), when the risk assessment for an existing building would support a conclusion that the human health risks are acceptable.

The revised work plan will: (i) identify an initial round of sampling events to address the three scenarios described under Condition 3 resolution, representing best case to worse case operating

conditions with respect to potential vapor intrusion; (ii) state that a second round of data collection is contingent upon evaluation and agreement by DOE, EPA and KDEP of the initial round of data collection and current and expected building occupancy, if necessary to manage uncertainties in support of evaluating remedy protectiveness; and (iii) state that the scope of any contingent sampling event is not included in the revised work plan.

Condition 6 Resolution.

Appendix B will be further revised to reflect the agreed to sampling as identified in the resolutions for Conditions 1 through 4.

Condition 15 Resolution.

Worksheet #17 will be revised to reflect the agreed to sampling as identified in the resolutions for Conditions 1 through 4.

Condition 16 Resolution.

Worksheet #18 will be further revised to reflect the agreed to sampling as identified in the resolutions for Conditions 1 through 4.

Project-Specific Quality Assurance Project Plan (QAPP) – Non-Sampling Conditions

Note – the attached worksheet changes reflect the resolutions for the following QAPP conditions. Appendix B (QAPP) will be further revised to update information related to the change in sampling based on resolution of Conditions 1 through 4 (location and number/description of methods) as part of the work plan revision and submittal.

Condition 5 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #10 for resolution of the QAPP condition.

Condition 7 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheets #6, #16, #18, #28, #29, and #31 for resolution of the QAPP condition.

Condition 8 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #3 for resolution of the QAPP condition.

Condition 9 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #4 for resolution of the QAPP condition.

Condition 10 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #5 for resolution of the QAPP condition.

Condition 11 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #7 for resolution of the QAPP condition.

Condition 12 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #11 and Work Plan Section 7 for resolution of the QAPP condition.

Condition 13 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #12 for resolution of the QAPP condition.

Condition 14 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #15 for resolution of the QAPP condition.

Condition 17 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #19 for resolution of the QAPP condition.

Condition 18 Resolution.

The worksheet has been revised to show that the analytical method number will be determined by the DOE Consolidated Audit Program (DOECAP)-certified laboratory. The worksheet was not revised to state that the laboratory Standard Operating Procedures (SOPs) will be provided as an Addendum. The DOE national DOECAP program performs annual audits of the laboratories used by DOE. The audit includes a rigorous review/crosswalk of the EPA approved methods compared to the laboratories procedures. DOE does not require DOECAP certified laboratories to submit SOPs on a project basis; therefore, the FFA Parties agreed that SOPs cannot be provided as requested.

Condition 19 Resolution.

FFA Parties agree that no change to Worksheet #24 is required. The contracted laboratory is responsible for analytical instrument calibration per their Quality Assurance (QA) Plan and procedures. DOE national DOECAP program performs annual audits of the laboratories used by DOE. The audit includes a rigorous review of each laboratory QA Plan and procedures and reviews analytical instrument calibration logs to ensure they are maintained in accordance with the laboratory's QA Plan and procedures. DOE does not require DOECAP certified laboratories to submit SOPs on a project basis; therefore, the FFA Parties agreed that SOPs cannot be provided as requested.

Condition 20 Resolution.

The contracted laboratory is responsible for instrument and equipment maintenance, testing, and inspection information per their QA Plan and procedures. DOE national DOECAP program performs annual audits of the laboratories used by DOE. The audit includes a rigorous review of each laboratory QA Plan and procedures and reviews instrument/equipment maintenance logs to ensure they are maintained in accordance with the laboratory's QA Plan and procedures. DOE does not require DOECAP certified laboratories to submit SOPs on a project basis; therefore, the

FFA Parties agreed that SOPs cannot be provided as requested. Information regarding the DOECAP Program has been added to Worksheet #25.

Condition 21 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #35 for resolution of the QAPP condition.

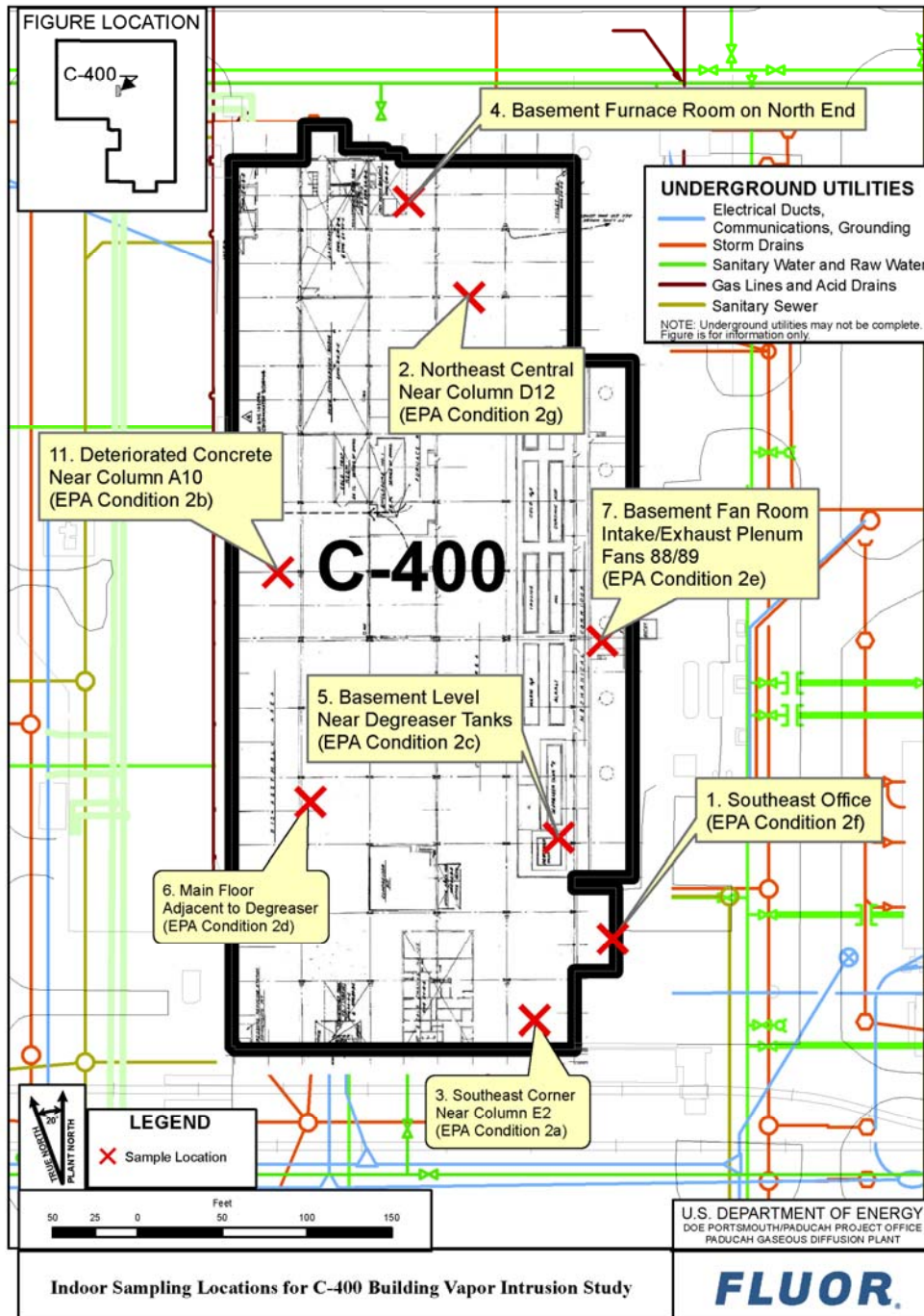
Condition 22 Resolution.

The FFA Parties agree to revisions as shown in attached Worksheet #36 for resolution of the QAPP condition.

Condition 23 Resolution.

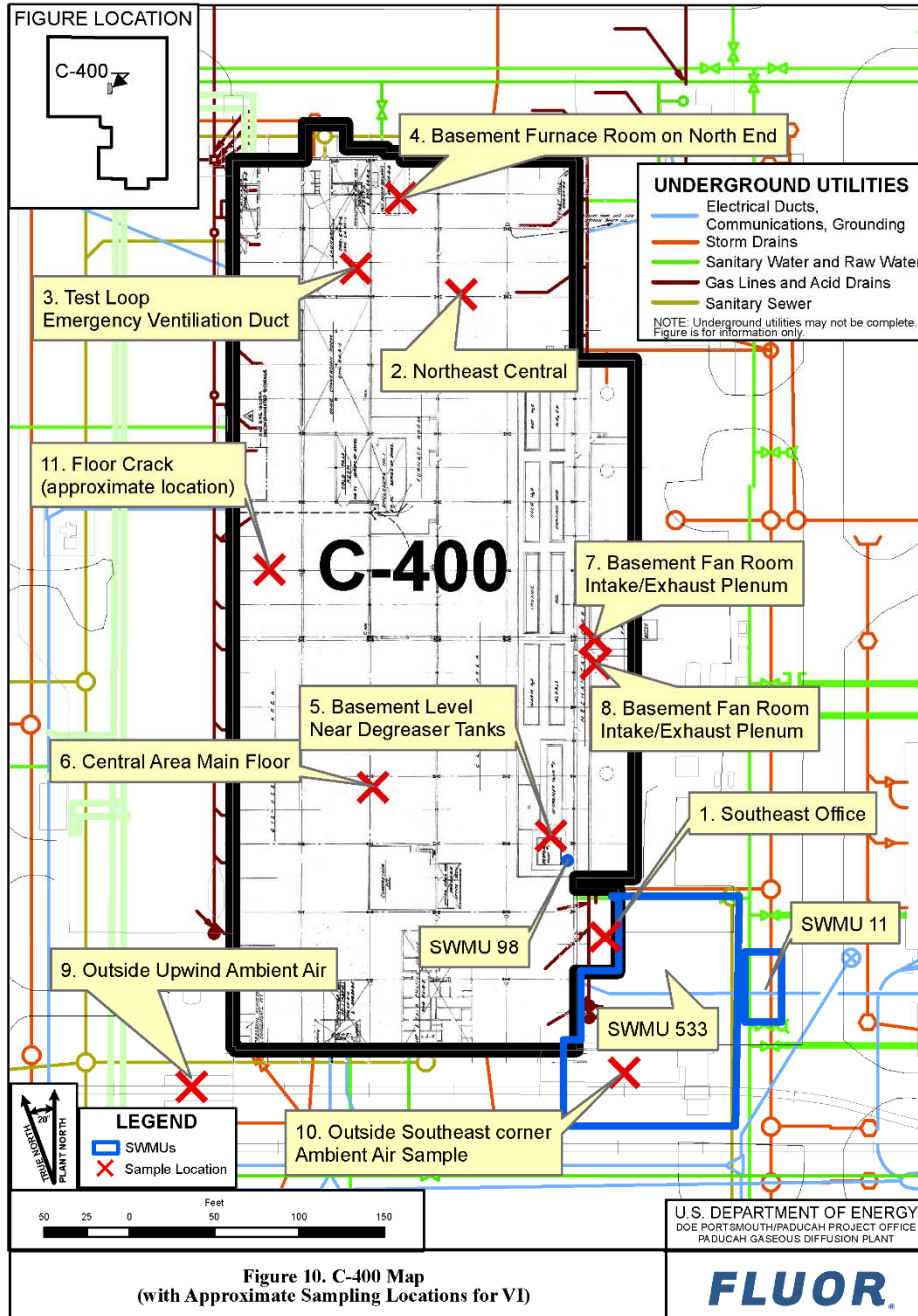
The FFA Parties agree to revisions as shown in attached Worksheet #37 for resolution of the QAPP condition.

**Attached Figure Showing
Condition 2 Indoor Sampling Locations for C-400 Building Vapor Intrusion Study
as Agreed by the FFA Parties**



G:\GIS\ARCVIEW\PROJECTS\Vapor Intrusion\MOA 400\C-400_utilities with samples w EPA samples no SWMUs.mxd 5/30/2017

Copy of Figure 10 from the C-400 Vapor Intrusion Study Work Plan to Support the Additional Actions for the CERCLA Five-Year Review at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-2403&D2.



**QAPP Worksheet #10.
Problem Definition**

The problem to be addressed by the project: The problem being addressed is a concern that volatile organic compounds (VOCs) vapors including 1,1-dichloroethene (1,1-DCE); *cis*-1,2-DCE; *trans*-1,2-DCE; trichloroethene; and vinyl chloride may be migrating from the PGDP Regional Gravel Aquifer plume and from contaminated soils of the Upper Continental Recharge System (UCRS) and into the C-400 Cleaning Building at unacceptable levels.

The environmental questions being asked: Are vapors migrating from VOCs in the groundwater into the air of C-400 Cleaning Building?

Observations from any site reconnaissance reports: See [Work Plan Section 6.1, Site Operations TCHd That Could Have Released VOCs, Section 6.2, Chemicals of Interest, and Section 6.4, C-400 Cleaning Building Characteristics of the Work Plan.](#)

A synopsis of secondary data or information from site reports: See [Work Plan Section 6.5, Potential Sources of Chemicals of Interest of the Work Plan.](#)

The possible classes of contaminants and the affected matrices: Volatile organic compounds (VOCs), including TCE (and related compounds listed in Section 5, Table 1) 1,1,1-trichloroethane (TCA), and a commonly used stabilizer, 1,4-dioxane.

The rationale for inclusion of chemical and nonchemical analyses: See Worksheets #11 and #17.

Information concerning various environmental indicators: Based on KDEP Environmental Indicator determination, contaminated groundwater migration currently is not considered to be under control at PGDP, under the Government Performance and Results Act.

Project decision conditions (“If..., then...” statements): See [Work Plan Section 10, Investigation Decision Rules of the Work Plan.](#)

QAPP Worksheet #6. Communication Pathways

NOTE: Formal communication across company or regulatory boundaries occurs via letter. Other forms of communication, such as e-mail, meetings, phone calls, etc., will occur throughout the project. The DOE Project Manager will communicate preliminary analytical results and field updates with the regulatory agencies project managers throughout the project. The project will establish regular conference calls during fieldwork and throughout preparation of the report to discuss analytical data and other project information. Issues identified during field work that require changes to the work plan or deviations will be communicated by the DOE Project Manager to the regulatory agencies project managers via phone call or email and followed up with a formal letter from DOE documenting the issue and resolution. This type of communication will be as timely as possible.

B-22

Communication Drivers	Organizational Affiliation	Position Title Responsible	Procedure
Federal Facility Agreement, DOE/OR/07-1707	DOE Paducah <u>Site Lead</u>	<u>Paducah Site Lead Federal Facility Agreement Manager</u>	Formal communication among DOE, EPA, and KDEP.
Federal Facility Agreement, DOE/OR/07-1707	DOE Paducah	DOE Project Manager	Formal communication between DOE and contractor for Environmental Remediation Projects.
Project requirements	FPDP	Director of Environmental Management	Formal communication among the project, the Site Lead, and the DOE Project Manager.
Project requirements	FPDP	Project Manager	Communication between the project and the FPDP Environmental Remediation Project Manager.
Project quality assurance (QA) requirements	FPDP	Quality Manager	Project quality-related communication between the QA department and FPDP project personnel.
FFA Compliance	FPDP	<u>Regulatory Affairs Manager Federal Facility Agreement Manager</u>	Internal communication regarding FFA compliance with the FPDP Project Manager.

QAPP Worksheet #6. Communication Pathways (Continued)

Communication Drivers	Organizational Affiliation	Position Title Responsible	Organizational Department Manager	Procedure
Sampling Requirements	FPDP	Sample Team Lead	Environmental Monitoring <u>and Reporting Project Manager</u>	Internal communication regarding field sampling with the FPDP Project Manager.
Analytical Laboratory Interface	FPDP	Scientist	Sample Management Office	Communication between FPDP and analytical laboratory.
Waste Management Requirements	FPDP	Waste Coordinator	Project Integration and Operations <u>Waste Manager</u>	Internal communication regarding project waste management with FPDP Project Manager.
Environmental Compliance Requirements	FPDP	Regulatory Compliance Manager	Regulatory Affairs Manager	Internal correspondence regarding environmental requirements and compliance with the FPDP Project Manager.
Subcontractor Requirements (if applicable)	FPDP	Subcontract Administrator	Business Manager <u>Project Operations and Integration Manager</u>	Correspondence among the project and subcontractors, if applicable.
Health and Safety Requirements	FPDP	Health and Safety Manager	Health and Safety Manager	Internal communication regarding safety and health requirements with the FPDP Project Manager.

QAPP Worksheet #16. Project Schedule/Timeline Table

The schedule for this project has not been developed yet. Section 7 of the work plan describes the locations and approach to sampling to be used for the C-400 vapor intrusion sampling. Once the work plan is approved by the regulatory agencies, planning activities, including laboratory contracting, work package preparation, training, and other preparatory activities will be completed in 30 days. The total duration of the field sampling period is approximately three weeks. An actual start date and corresponding finish date are not forecast at this time, pending approval of the work plan. Analytical laboratory analyses are expected within 14 days of completion of the fieldwork. Data verification, validation, and assessment will be completed in 14 days following receipt of data; however, real-time data will be shared via email with the FFA Parties and conference calls held to discuss the results.

<u>Activities</u>	<u>Organization</u>	<u>Actual Dates Will be Based on Approval of the Work Plan</u>		<u>Deliverable</u>	<u>Deliverable Due Date</u>
		<u>Anticipated Date(s) of Initiation</u>	<u>Anticipated Date of Completion</u>		
<u>Vapor Intrusion sampling conducted in C-400</u>	<u>FPDP</u>	<u>Field work mobilization for sub-slab coring—begin 30 days after Work Plan approval.</u>	<u>1 week after initiation of coring</u>	<u>Five Year Review Addendum Report</u>	<u>Within 90 days after receipt of laboratory data.</u>
		<u>SUMMA Canister sampling ~ 5 weeks after Work Plan approval</u>	<u>~3 weeks after initiation of sampling</u>		
		<u>Laboratory analysis</u>	<u>14 days of receipt of last sample</u>		
		<u>Data verification and validation</u>	<u>14 days of receipt of laboratory data</u>		

QAPP Worksheet #18. Sampling Locations and Methods/Standard Operating Procedure Requirements Table

See Section 7. Sampling Locations and Rationale, and Section and 8, Sampling and Analysis Methods

<u>Sampling Location/ID Number</u>	<u>Matrix</u>	<u>Analytical Group</u>	<u>Method^a</u>	<u>Number of Samples (identify field duplicates)</u>	<u>Sampling SOP Reference</u>	<u>Rationale for Sampling Location</u>
<u>Basement Furnace Room on North End/Location 4</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>6</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>
<u>Basement Level Near Degreaser Tanks/Location 5</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>9*</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>
<u>Main Floor Adjacent to Degreaser/Location 6</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>9*</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>
<u>Basement Fan Room Air Intake/Exhaust Plenum Fans 88/89/Location 7</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>3</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>
<u>Southeast Office/Location 1</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>6</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>
<u>Northeast Central Near Column D12/Location 2</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>6</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>
<u>Southeast Corner Near Column E2/Location 3</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>6</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>
<u>Deteriorated Concrete Near Column A10/Location 11</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>6</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>
<u>Outside Ambient Air Locations</u>	<u>Air</u>	<u>VOCs</u>	<u>EPA TO-15</u>	<u>12</u>	<u>See Worksheet #21</u>	<u>See Section 7 of the Work Plan</u>

^a See Analytical SOP References Table (Worksheet #23).

* Duplicate sampling location

QAPP Worksheet #28-A. QC Samples Table

Matrix: Air						
Analytical Group/Concentration Level: VOCs/Low						
Sampling SOP: See Worksheet #21						
Analytical Method/SOP Reference: TO-15						
Sampler's Name/Field Sampling Organization: FPDP						
Analytical Organization: <u>GELTBD</u>						
No. of Sample Locations: 10 Locations for a total of 13 + 1 duplicate = 14 samples						
QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field duplicate	1	As with other samples	Data reviewer will place qualifiers on samples affected	Project	Homogeneity/ Precision	RPD ≤ 50%
<u>Routine Laboratory</u>	<u>Per laboratory SOP</u>	<u>Per laboratory SOP</u>	<u>Per laboratory SOP</u>	<u>Per laboratory SOP</u>	<u>Per laboratory SOP</u>	<u>Per laboratory SOP</u>
<u>Method Blank (MB)</u>	<u>Each 12-hour time period, minimum of one per SDG</u>	<u>< CRQL for each compound</u>	<u>Ensure lab determines source of contamination and takes appropriate corrective measures before further analysis. Qualify analytes if found in both the blank and associated samples.</u>	<u>Data reviewer/Data validator</u>	<u>Contamination-Accuracy/bias</u>	<u>See data validation procedure CP2-ES-5105/RO (Volatile and Semivolatile Analyses Data Verification and Validation)</u>
<u>Laboratory spiked blanks</u>	<u>1 analytical batch</u>	<u>70-130% recovery</u>	<u>Check calculations and instrument; reanalyze affected samples. Qualify data based on the percent recovery.</u>	<u>Laboratory should alert project</u>	<u>Accuracy</u>	<u>See procedure CP3-ES-5003, Quality Assured Data.</u>

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QAPP Worksheet #28-A. QC Samples Table (Continued)

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate standards ^a	All samples, blanks, and QC samples	80-120% recovery	Reanalyze affected samples. Qualify data based on the percent recovery.	Laboratory analyst/Data reviewer/Data validator	Accuracy	See data validation procedure CP2-ES-5105/RO (Volatile and Semivolatile Analyses Data Verification and Validation)
Internal Standards	One per SDG-All samples, blanks, and QC samples	Peak area % difference between 50 and 200	Check calculations and instrument; reanalyze affected samples. Qualify data based on the percent difference.	Laboratory analyst	Accuracy	See procedure CP3-ES-5003. Quality Assured Data.

^a [1,2-dichloroethane-d4, Toluene-d8, and 4-Bromofluorobenzene. If other surrogates are used the laboratory must demonstrate that the surrogates do not interfere with any target analytes.](#)

[Reanalyze samples containing target analytes at concentrations greater than the initial calibration range. Analyze a smaller aliquot of sample from the SUMMA® canister. If after analyzing a smaller aliquot, the concentration is still greater than the initial calibration range, then dilute the sample and reanalyze according to procedures outlined in EPA Method TO-15. If sample dilution is necessary, the dilution must be adjusted so that the target analyte is quantitated at a level in the upper half of the calibration range. Report the results and submit documentation for the analysis of both the diluted and undiluted sample.](#)

[Both the primary ions and the secondary ions must be present in the spectra. The acceptance level for relative abundance of the appropriate ions in all standards, method blanks, QC samples, laboratory duplicates and field samples is determined to be ±20% of the expected abundance observed in the most recent continuing calibration standard. All ions greater than 15% in the standard spectrum must be present in the sample spectrum.](#)

QAPP Worksheet #29. Project Documents and Records Table

All project data and information must be documented in a format that is usable by project personnel. The QAPP describes how project data and information shall be documented, tracked, and managed from generation in the field to final use and storage in a manner that ensures data integrity, defensibility, and retrieval. Project data and associated documents will be managed in accordance with the Data and Documents Management and Quality Assurance Plan for Paducah Environmental Management and Enrichment Facilities, DOE/OR/07-1595&D2, which describes the data base and document requirements for all FFA-related records.

Field data will be recorded on chain-of-custody forms, in field logbooks, and field data sheets. The fixed-base laboratory will provide data in an Electronic Data Deliverable. Project data following verification assessment and validation will be placed into and reported from the Paducah Oak Ridge Environmental Information System (OREIS). Data loaded into Paducah OREIS will be made available to the public stakeholders via the Portsmouth/Paducah Project Office Environmental Geographic Analytical Spatial Information System (PEGASIS). Field and analytical data are entered/transferred electronically, verified and assessed per DOE Prime Contractor procedure CP3-ES-5003, *Quality Assured Data*.

Data assessment packages will be created per this procedure. The data assessment packages will include field and analytical data, chains-of-custody, data verification and assessment queries, and other project- specific information needed for personnel to review the package adequately. Data assessment packages will be reviewed to document any issues pertaining to the data and to indicate if data met the DQOs of the project. Data is loaded for storage in the Paducah OREIS data system, maintained on the Paducah Site servers and included in the Administrative Record by reference. The system will be maintained for future reference as part of the Administrative Record at the Paducah Site.

QAPP Worksheet #29. Project Documents and Records Table (Continued)

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records <u>Project Reports and Correspondence</u>	Data Assessment Documents and Records*	Other
<p>Data logbooks and associated completed sampling forms; sample chains-of-custody, <u>field notes, documentation of sample location and coordinates, sampling notes, site conditions</u></p> <p><u>Where Maintained:</u></p> <p><u>Initially kept with the field sampling organization satellite records center; transferred to the project file within the DOE onsite records repository (electronic storage on server hosting the DOE Electronic Documents Management System) and the Administrative Record.</u></p>	<p>Laboratory data packages (<u>including sample receipt, custody, and tracking records; sample preparation, equipment calibration, and run logs;</u> OREIS database, and associated data packages</p> <p><u>Where Maintained:</u></p> <p><u>Initially kept with the Sample Management Office satellite records center; transferred to the project file within the DOE onsite records repository (electronic storage on server hosting the DOE Electronic Documents Management System) and the Administrative Record.</u></p>	<p>OREIS database and associated data packages <u>Emails, status reports, project report documents, sign-off forms, and report submittals</u></p> <p><u>Where Maintained:</u></p> <p><u>Initially kept with the Contractor project team files during field effort and report writing; transferred to the project file within the DOE onsite records repository (electronic storage on server hosting the DOE Electronic Documents Management System) and the Administrative Record.</u></p>	<p>CP3-ES-5003, Att. G, Data Assessment Review Checklist and Comment Form</p> <p><u>Where Maintained:</u></p> <p><u>Initially kept with the Sample Management Office satellite records center; transferred to the project file within the DOE onsite records repository (electronic storage on server hosting the DOE Electronic Documents Management System) and the Administrative Record.</u></p>	<p>CP3-OP-0009-F01, Observation Checklist Form</p> <p><u>Where Maintained:</u></p> <p><u>Initially kept with the Sample Management Office satellite records center; transferred to the project file within the DOE onsite records repository (electronic storage on server hosting the DOE Electronic Documents Management System) and the Administrative Record.</u></p>

*It is understood that SOPs are DOE Prime Contractor specific.

QAPP Worksheet #3. Minimum Distribution List

Distribution is based on the position title. A change in the individual within an organization will not trigger a resubmittal of the QAPP. DOE may choose to update the sheet and submit changes to the document holders. This change will not require a review by FFA stakeholders because it is not a substantive change. Managers are responsible for distribution to their staff.

Controlled copies of this QAPP will not be generated nor submitted. Uncontrolled copies of the QAPP will be distributed with the SAP according to the distribution list below.

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Position Title	Organization	QAPP Recipients	Current Telephone Number	Current E-mail Address	Document Control Number
Paducah Site Lead	DOE	Jennifer Woodard	(270) 441-6820	jennifer.woodard@lex.doe.gov	1
FFA Manager	DOE	Tracey Duncan	(270) 441-6862	tracey.duncan@lex.doe.gov	2
Project Manager	DOE	Cynthia Zvonar	(859) 219-4066	cynthia.zvonar@lex.doe.gov	3
Director of Environmental Management	FPDP	Mark Duff Myrna Redfield	(270) 441- 5030 5113	mark.duff@ffspaducah.com myrna.redfield@ffspaducah.com	4
Regulatory Affairs Manager	FPDP	John Morgan (Acting) Kelly Layne (Acting)	(270) 441- 5113 5069	john.morgan@ffspaducah.com kelly.layne@ffspaducah.com	5
Project-Program Manager Assigns Project Manager Manages Subcontractors	FPDP	Craig Jones	(270) 441-5114	craig.jones@ffspaducah.com	6
Project Manager (Field Team Lead)	FPDP	Teresa Overby	(270) 441-5188	teresa.overby@ffspaducah.com	8
Division of Waste Management, Hazardous Waste Branch, PGDP Section Supervisor and FFA Manager	KDEP	Brian Begley	(502) 564-6716	brian.begley@ky.gov	7 9
Kentucky Division of Waste Management	KDEP	Gaye Brewer	(270) 898-8468	gaye.brewer@ky.gov	8 10
FFA Manager	EPA	Julie Corkran	(404) 562-8547	corkran.julie@epa.gov	9 11
Remedial Project Manager	EPA	Jon Richards	(404) 562-8648	richards.jon@epa.gov	10 12
Environmental Radiation Protection and Risk Assessment Manager	FPDP	LeAnne Garner	(270) 441-5136	leanne.garner@ffspaducah.com	11 13
Senior Remedial Project Manager and FFA Manager	FPDP	Jana White	(270) 441-5185	jana.white@ffspaducah.com	12 14
Quality Assurance Manager	FPDP	Kelly Ausbrooks (Acting)	(270) 441-5123	kelly.ausbrooks@ffspaducah.com	13 15
Environmental Monitoring and Reporting Project Manager	FPDP	Lisa Crabtree	(270) 441-5135	lisa.crabtree@ffspaducah.com	14 16
Health and Safety Manager	FPDP	Roland Chretien	(270) 441-6238	roland.chretien@ffspaducah.com	15 17

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Revision Number: 12
Revision Date: 9/20162/2017

Regulatory Compliance Manager	FPDP	Michael Gerle Kelly Layne (Acting)	(270) 441-6680	michael.gerlekelly.layne@ffspaducah.com	+618
Sample Management Office Oversees Laboratory Contracts Manages Data Validators	FPDP	Jaime Morrow	(270) 441-5508	jaimemorrow@ffspaducah.com	+719

QAPP Worksheet #4. Project Personnel Sign-Off Sheet: Sample Collection, Data Analysis, Data Validation

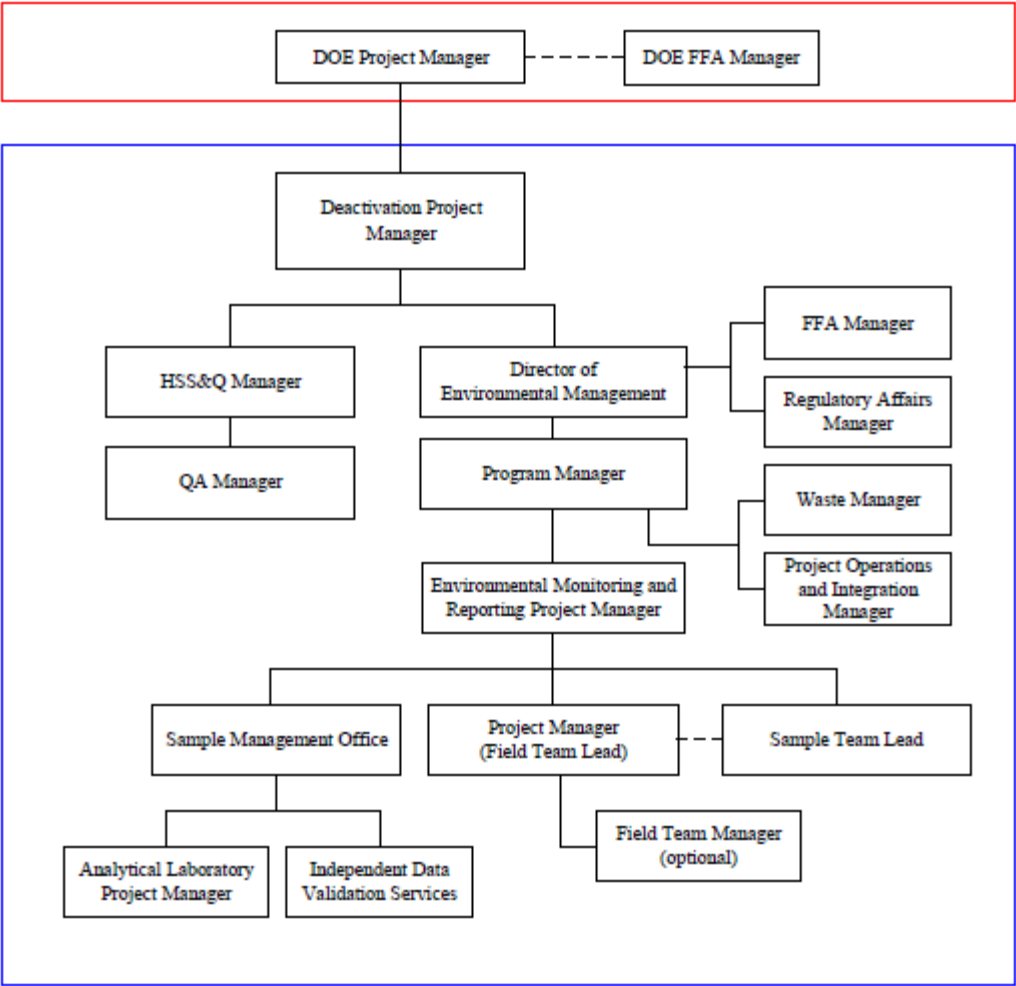
Personnel actively engaged in sample collection, data analysis, and data validation for this project are required to read applicable sections of this QAPP and sign a Personnel Sign-off Sheet. The master list of signatures will be kept with the project work control documentation.

Project Position Title	Organization	Specialized Training/ Certification, if any	Signature*	Date
Sampler	FPDP	Per Training Position Description (TPD)		
<u>Sample Team Lead</u>	<u>FPDP</u>	<u>Per TPD</u>		
Sample Management Office <u>Responsible for analytical laboratory</u>	FPDP	Per TPD		
Independent Third-Party Data Validator	Los Alamos Technical Associates (LATA), Ohio	Bachelor degree plus relevant experience		
Environmental Radiation Protection and Risk Assessment Manager <u>Responsible for Data Analysis</u>	FPDP	Per TPD		
<u>Environmental Monitoring Project Manager</u>	<u>FPDP</u>	<u>Per TPD</u>		
<u>Project Manager (Field Team Lead)</u>	<u>FPDP</u>	<u>Per TPD</u>		

* QA/QC reviews are performed by each position relative to their respective area of expertise.

**Signatures indicate personnel have read and agree to implement this project-specific QAPP as written.

QAPP Worksheet #5-A. Project Level Organizational Chart



NOTE: DOE contractor and subcontractor personnel inside blue box.

QAPP Worksheet #7. Personnel Responsibility and Qualifications Table

ORGANIZATION: FPDP

Name	Position Title Responsible	Organization Affiliation	Responsibilities	Education and Experience Qualifications ¹
Craig Jones	Program Manager	FPDP	Overall project responsibility	> 4 years relevant work experience
Teresa Overby	Project Manager/ Field Team Lead	FPDP	Project SAP	Bachelor degree plus > 1 year relevant work experience
John Morgan (Acting) Kelly Layne (Acting)	Regulatory Affairs Manager	FPDP	Project environmental compliance responsibility	Bachelor degree plus > 4 years work experience
Jana White	FFA Manager	FPDP	Project compliance with the FFA	> 4 years work relevant experience
Lisa Crabtree	Environmental Monitoring and Reporting Project Manager – QA/QC	FPDP	Support project on sampling and reporting activities	> 4 years relevant work experience
Jaime Morrow	Sample Management Office	FPDP	Project sample and data management	> 2 years relevant work experience
Steve Wentzel Roland Chretien	Health and Safety Manager	FPDP	Project health and safety responsibility	Bachelor degree plus > 1 year relevant experience
Bill Chase	Waste Coordinator	FPDP	Overall project waste management responsibility	> 4 years relevant experience
James Moore	Data Validator	Los Alamos Technical Associates, Inc.	Performing data validation according to specified procedures	Bachelor degree plus relevant experience
Laboratory Project Manager	Analytical Laboratory Project Manager	Laboratory	Sample analysis and data reporting	Bachelor degree plus relevant experience

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¹ Candidates who do not have a certificate or required degree but demonstrate additional “equivalent relevant work experience” can be considered when evaluating qualifications. This assessment will be conducted by the project manager as he/she assembles the appropriate team for the project.

QAPP Worksheet #11. Project Quality Objectives/Systematic Planning Process Statements

This worksheet details the standards for field and analytical data quality. Analytical data will be generated by DOE Consolidated Audit Program (DOECAP) laboratories utilizing approved laboratory test methods. The overall project quality objectives are to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will meet the DQOs of this project.

Who will use the data? DOE, FPDP, KDEP, and EPA.

What will the data be used for? To eliminate the data gaps identified in Worksheet #10.

What type of data is needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques): Indoor air data, ambient (upwind) air data, air from floor crack.

How “good” do the data need to be in order to support the environmental decision? Data need to have practical quantitation limits below the respective VISL. Data will meet the measurement quality objective and data quality indicators established by the systematic planning process consistent with procedure CP3-ES-5003, *Quality Assured Data*. Results will undergo 100% data validation.

Where, when, and how should the data be collected/generated? See Section 7. Sampling Locations and Rationale, and Section 8, Sampling and Analysis Methods.

Who will collect and generate the data? FPDP. Additionally, ~~meteorological data may be acquired from other sources, as needed.~~ [weather reporting data from the weather station located at the Paducah airport \(i.e. official weather data\) will also be included in the project’s report collected the nearest airport by an agency will be obtained and recorded on days when samples are collected with a focus on wind direction to supplement the on-site wind direction determination.](#)

How will the data be reported? Field data will be recorded on chain-of-custody forms, in field logbooks, and field data sheets. The fixed-base laboratory will provide data in an Electronic Data Deliverable. Project data following verification assessment and validation will be placed into and reported from the Paducah Oak Ridge Environmental Information System (OREIS). Data loaded into Paducah OREIS will be made available to the public stakeholders via the Portsmouth/Paducah Project Office Environmental Geographic Analytical Spatial Information System (PEGASIS).

How will the data be archived? Electronic data will be archived in OREIS in accordance with Section 8.5 (Data and Records Archival) of the *Data and Documents Management and Quality Assurance Plan* (DOE 1998).

NOTE: The worksheet is completed partially with items that will be consistent across project-specific field sampling plans (FSPs). The project-specific FSPs will need to populate the balance of this worksheet.

Sampling will follow the referenced standard operating procedures. The following tables provide the measurement performance criteria.

- Six locations (five samples) inside C-400 (with building doors maintained closed, as practical), each sampled over an 10-hour day:
 - Southeast office (location 1);
 - Northeast Central work area (location 2);
 - Test loop emergency ventilation duct system (location 3);
 - Basement furnace room on north end of C-400 (location 4);
 - Basement level near degreaser tanks (location 5); and
 - Central area main floor (location 6).

NOTE: The building doors will be maintained closed as practical, given the potential need for people to enter and leave the building.

On days when samples are collected, the differential pressures between the inside and outside of the building will be measured. As practical, the differential pressure between the plenum and the air outside the plenum also will be measured. [Additionally, weather reporting data from the weather station located at the Paducah airport \(i.e. official weather data\) will also be included in the project's report with a focus on wind direction to supplement on-site wind direction determination.](#)

- Two locations (total of five samples) within the C-400 basement fan room intake/exhaust plenum:
 - One location at the air intake of the operating exhaust fan (current normal condition), sampled for ten hours on each day (location 7). The sample location will be collected during both rounds of indoor air sampling, three consecutive days with the fan operating and once with the fan turned off;
 - One location at the air intake with a second operating exhaust fan (that will be turned on after the sampling of the other exhaust fan is completed on the third day) and sampled for ten hours for one day (location 8);
- Two locations (two samples) outside C-400, one upwind of C-400 (location 9) and the other outside of the southeast corner (location 10) of C-400 (plant coordinate system), each sampled for ten hours during the period the indoor air samples are collected; and
- One location (one sample) in the floor crack (location 11) discovered in the central main floor area, sampled for ten hours. The crack will be covered with polyethylene sheeting to minimize dilution by indoor air.

Table 4 summarizes the rationale for the sampling locations.

The sample locations in the interior of C-400 (Figure 10) include locations that are near historical sources (basement area near the former large TCE degreaser/cleaning tanks and central main floor near the hand table) or areas of higher potential for VI (basement/plenum exhaust, basement near the former large TCE degreaser/cleaning tanks, and north basement furnace room).

C-400 currently is ventilated with one of ten available fans (~ 41,000 cfm design) located in a basement room in which proposed indoor air samples are located. The fans draw air through a below grade concrete plenum that is a potential entry point for VI. Comparison of the concentrations obtained from the exhaust fan samples will be compared to the other concentrations to determine if the plenum or other areas serve as points of vapor entry. To assess the benefit of added ventilation, one additional fan (for a total of two

QAPP Worksheet #12. Measurement Performance Criteria

Matrix	Air				
Analytical Group^a	C-400 VOCs, including trichloroethene, 1,2-DCE, vinyl chloride, 1,1-DCE				
Concentration Level	Very Low				
Sampling Procedure^b	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria^c	Quality Control (QC) Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
CP4-ER-1035, Vapor Sampling	EPA-TO-15. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)	Precision-Lab	N/A	Evaluate lab data packages	A

^a If information varies within an analytical group, separate by individual analyte.

^b The most current version of the method will be used.

^c [Measurement Performance Criteria \(MPC\) is listed as N/A for EPA-TO-15 because air samples are stand-alone samples, and the results of one sample cannot be used to evaluate sampling and analysis precision, accuracy, or bias. Thus, MPC cannot be provided. Replicate samples will be collected per the work plan and they will be reviewed to estimate the degree of sampling precision, accuracy and bias without defined MPC.](#)

QAPP Worksheet #15. Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

Matrix: Air
Analytical Group: VOCs

VOCs	CAS Number	Project Action Limit (PAL) ($\mu\text{g}/\text{m}^3$) ^e	Project Action Limit Reference ^a	Site COPC? ^b	Laboratory-Specific ^c	
					Practical Quantitation Limits (PQLs) ($\mu\text{g}/\text{m}^3$)	Method Detection Limits (MDLs) ($\mu\text{g}/\text{m}^3$)
1,1-Dichloroethane	75-34-3	7.7	VISL, Commercial^d	No	2.0	0.61
1,1-Dichloroethene	75-35-4	880	VISL, Commercial ^d	Yes	2.0	0.59
1,2-Dichloroethane	107-06-2	0.47	VISL, Commercial^d	Yes	2.0	0.61
1,1,1-Trichloroethane	71-55-6	22000	VISL, Commercial^d	Yes	2.7	0.81
1,1,2-Trichloroethane	79-00-5	0.77	VISL, Commercial^d	Yes	2.7	0.81
<i>cis</i> -1,2-Dichloroethene	156-59-2	N/A, 3500^e	No VISL ^d , Provisional Value	Yes	2.0	0.59
<i>trans</i> -1,2-Dichloroethene	156-60-5	N/A, 3500^e	No VISL ^d , Provisional Value	Yes	2.0	0.59
1,4-Dioxane	123-91-1	2.5	VISL, Commercial^d	No	7.2	N/A
Trichloroethene	79-01-6	3.0	VISL, Commercial ^d	Yes	2.7	0.81
Vinyl Chloride	75-01-4	2.8	VISL, Commercial ^d	Yes	1.3	0.38

^a VISL = Vapor Intrusion Screening Level (Commercial, Carcinogen Target Risk = 1.0E-6, Target Hazard Quotient = 1.0).

^b Analytes marked with chemical of potential concern (COPC) are from Table 2.1 of the Paducah Risk Methods Document (DOE [20152016](#)).

^c Laboratory has PQL of 0.5 ppbv and MDL of 0.15 ppbv. Values were converted to $\mu\text{g}/\text{m}^3$ at 25°C. These are target values; the contract required MDL and PQL will not be established until the laboratory is contracted.

^d VISL Calculator Version 3. [5.1, May 2016](#) ~~4, November 2015~~ Regional Screening Levels: <https://semspub.epa.gov/src/document/11/196702>.

^e Project Action Limits are listed as N/A for *cis*-1,2-Dichloroethene and *trans*-1,2-Dichloroethene because there are no VISL values available for these analytes. EPA has provided a provisional value for *trans*-1,2-Dichloroethene. In addition, EPA recommended use of the *trans*-1,2-Dichloroethene value as a surrogate for *cis*-1,2-Dichloroethene, as presented in this Worksheet. Additional information regarding the derivation of these values can be found in the Agency for Toxic Substances and Disease Registry Guidance.

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QAPP Worksheet #19. Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference^a	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)^b
Air	VOCs	Very Low	See Worksheet #12		SUMMA canister with 108 -hour sample duration ref .		<u>N/A</u>

^a See Analytical SOP References table (Worksheet #23).

^b The Maximum Holding Time is listed as N/A for the analysis because the method does not specify a holding time; however, EPA Method TO-15 has a suggested guideline of 30 days.

QAPP Worksheet #23. Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number^a	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?(Y/N)
TO-15	Determination of VOCs In Air Collected In Specially-Prepared Canisters and Analyzed by GC/MS	Definitive	VOCs	GC/MS	ALS Global <u>TBD</u>	No

^a Analytical method number that the to-be determined DOECAP-certified laboratory will utilize. DOE national DOECAP program performs annual audits of the laboratories used by DOE. The audit includes a rigorous review/crosswalk of the EPA approved methods compared to the laboratories procedures. Therefore, DOE does not require DOECAP audited laboratories to submit SOPS on a project basis.

QAPP Worksheet #25. Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference*
GC/MS	Replace/clean ion source; clean injector, replace injector liner, replace/clip capillary column, flush/replace tubing on purge and trap; replace trap	QC standards	Ion source, injector liner, column, column flow, purge lines, purge flow, trap	As needed	Must meet initial and/or continuing calibration criteria	Repeat maintenance activity or remove from service	Laboratory Section Manager	See Worksheet #23

*The laboratory is responsible for instrument and equipment maintenance, testing, and inspection information per their QA Plan. [DOE national DOECAP program performs annual audits of the laboratories used by DOE. The audit includes a rigorous review of each laboratory QA Plan and procedures and reviews instrument/equipment maintenance logs to ensure they are maintained in accordance with their QA Plan and procedures. DOE, therefore, does not require DOECAP audited laboratories to submit SOPS on a project basis. This information is audited annually by DOECAP. Laboratory\(s\) contracted will be DOECAP audited.](#) Field survey/sampling instrumentation will be maintained, tested, and inspected according to manufacturer's instructions.

QAPP Worksheet #35. Assessment, Verification, and Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description ^a	Responsible for Validation (Name, Organization)
IIa	Data Deliverables, Analytes, and Holding Times	The documentation from the contractual screening will be included in the data assessment packages, per DOE Prime Contractor procedure CP3-ES-5003, <i>Quality Assured Data</i> . Data assessment qualifiers and definitions are included in the procedure CP3-ES-5003, Quality Assured Data.	Sample Management Office Personnel, Contractor
IIa	Chain-of-Custody, Sample Handling, Sampling Methods and Procedures, and Field Transcription	These items will be validated during the data assessment process as required by DOE Prime Contractor procedure CP3-ES-5003, <i>Quality Assured Data</i> , and CP3-ES-1003, <i>Developing, Implementing, and Maintaining Data Management Implementation Plans</i> . The documentation of this validation will be included in the data assessment packages.	Sample Management Office Personnel, Contractor
IIa	Analytical Methods and Procedures, Laboratory Data Qualifiers, and Standards	These items will be reviewed during the data validation process as required by DOE Prime Contractor data validation procedures. Data validation will be performed in parallel with data assessment. The data validation report and data validation qualifiers will be considered when the data assessment process is being finalized. Data validation qualifiers and definitions are listed in the procedures used for validation: CP2-ES-5105/RO (Volatile and Semivolatile Analyses Data Verification and Validation) CP2-ES-5107/RO (Inorganic Analyses Data Verification and Validation)	Data Validation Subcontractor, and Sample Management Office Personnel, Project, Contractor
IIa	Audits	The audit reports and accreditation and certification records for the laboratory supporting the projects will be considered in the bidding process.	QA Personnel
IIb	Deviations and qualifiers from Step IIa	Any deviations and qualifiers resulting from Step IIa process will be documented in the data assessment packages.	Sample Management Office Personnel, Project, and QA Personnel, Contractor
IIb	Sampling Plan, Sampling Procedures, Co-located Field Duplicates, PQLs, Confirmatory Analyses, Performance Criteria	These items will be evaluated as part of the data verification and data assessment process per DOE Prime Contractor procedure CP3-ES-5003, <i>Quality Assured Data</i> . These items will be considered when evaluating whether the project met their DQOs. Data assessment qualifiers and definitions are included in the procedure CP3-ES-5003, Quality Assured Data.	Sample Management Office Personnel, Project, and QA Personnel, Contractor

^a It is understood that SOPs are DOE Prime Contractor specific.

QAPP Worksheet #36. Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
Step IIa/IIb	Air	VOCs	Very Low	SOP CP2-ES-5105/RO (Volatile and Semivolatile Analyses Data Verification and Validation) SOP CP2-ES-5107/RO (Inorganic Analyses Data Verification and Validation) National Functional Guidelines; Worksheets #12, #15, and #28	Data Validator ^a

^a Validation is to be conducted by a qualified individual, independent of sampling, laboratory, project management, or other decision making personnel for the task. This could be an outside party or someone within FPDP who is not involved in the project.

QAPP Worksheet #37. Usability Assessment^{1,2}

FPDP shall determine the adequacy of data based on the results of validation and verification. The usability step involves assessing whether the process execution and resulting data meet project quality objectives documented in the QAPP.

Summarize the usability assessment process and procedures, including interim steps and any statistics, equations, and computer algorithms that will be used: Field and analytical data are verified and assessed per procedure CP3-ES-5003, *Quality Assured Data*. Data assessment packages will be created per this procedure. Data assessment packages will include field and analytical data, chains-of-custody, data verification and assessment queries, and other project-specific information needed for personnel to review the package adequately. Data assessment packages will be reviewed to document any issues pertaining to the data and to indicate if DQOs of the project were met. For data selected for validation, the following procedures are used: CP2-ES-5105 and CP2-ES-5107.

Describe the evaluative procedures used to assess overall measurement error associated with the project: PARCCS parameters (precision, accuracy, representativeness, comparability, completeness, and sensitivity) will be evaluated per procedure, CP3-ES-5003, *Quality Assured Data*. This information will be included in the data assessment packages for review by project personnel. Data assessment also will include documentation of QC exceedances, trends, and/or bias in the data set. Data assessment will document any statistics used; however, for this project, the sampling design is not random and statistical tests may not be appropriate.

Identify the personnel responsible for performing the usability assessment: Project personnel, as verified by QA personnel.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies: Data assessment packages will be created, which will include data assessment comments/questions and laboratory comments. Data verification and assessment queries indicating any historical outliers and background exceedances also will be included in the data assessment packages. Once data assessment is complete, project personnel will compare the data against the data quality objectives to determine if the data collected are sufficient to meet the objectives. Data summaries will be prepared to demonstrate that DQOs have been met and the information is suitable for decision making. This information is typically included in the project report, along with the final decisions associated with the project.

¹ It is understood that SOPs are DOE Prime Contractor specific.

² Additional usability assessment information can be referenced on Worksheets #11, #13, #14, and #16.

OTHER CHANGES FOR PROJECT UPDATES

QAPP Worksheets #1 and #2. Title and Approval Page

Site Name/Project Name: PGDP/C-400 Vapor Intrusion Study

Site Location: Paducah, Kentucky

Site Number/Code: KY8890008982

Contractor Name: FPDP

Contractor Number: Task Order DE-DT0007774

Contract Title: Paducah Gaseous Diffusion Plant Deactivation Project

Document Title: *C-400 Vapor Intrusion Study Work Plan to Support the Additional Actions for the CERCLA Five-Year Review at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky; Appendix B, Quality Assurance Project Plan for C-400 Vapor Intrusion Study to Support the Five-Year Review*

Lead Organization: U.S. Department of Energy (DOE)

Preparer's Name and Organizational Affiliation: Joseph Towarnicky, Ph.D., FPDP

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Preparation Date (Month/Year): 9/2016 2/2017

Document Control Number: Appendix B to the Work Plan, DOE/LX/07-2403&D12

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FPDP Signature: _____
Shelley Snyder Kelly Layne
Acting Regulatory Affairs Manager

Date: _____

FPDP Signature: _____
Lisa Crabtree
Environmental Monitoring and Reporting Project Manager

Date: _____

FPDP Signature: _____
Kelly Ausbrooks
Acting QA Acting Manager

Date: _____

QAPP Worksheet #30. Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/ Organization (Name and Address, Contact Person and Telephone Number)^a	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)^a
Air	VOCs	Low	See Section 7, Sampling Locations and Rationale	See Worksheet #23	28-day	ALS Global 960 West LeVoy Drive Salt Lake City, UT 84123 PM: Kevin Griffiths (801) 266-7700 <u>TBD</u>	TBD

^a Laboratory contracting will be subsequent to the approval of the SAP to Support Additional Action for the CERCLA Five-Year Review, therefore this is listed as TBD (To be determined) until a laboratory is selected through the procurement process. Informaiton will be updated once a laboratory is selected.

QAPP Worksheet #20. Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	Inorganic	No. of Field Blanks	No. of Equip. Blanks	No. of Proficiency Testing (PT) Samples ^a	Total No. of Samples to Lab ^b
						No. of MS				
Air	VOCs	Low	See Worksheet #12	11 (See SAP Section 7)	2 Replicates	N/A	0	0	N/A	25 (See SAP, Section 7, Table 4)

^a PT sample will be collected only when required by a specific project.
^b All analyses will be performed by a fixed-base laboratory.
[N/A – there are no inorganic parameters collected for this project.](#)