Quality Control Plan

Data Gap Investigation for the Garage Maintenance Area – Former Sellite Area and Unloading Former Plum Brook Ordnance Works, Sandusky, Ohio

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Data Gap Investigation for the Garage Maintenance Area
Former Sellite Area and Unloading Area
Former Plum Brook Ordnance Works, Sandusky, Ohio

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This Quality Control Plan (QCP) was prepared by Shaw Environmental and Infrastructure, Inc. (Shaw) in support of the data gap investigation (RI) of the former Sellite Area/ Unloading Area and the Garage Maintenance Area (Locomotive Building) sump at the former Plum Brook Ordnance Works (PBOW) in Sandusky, Ohio, under Delivery Orders DX01, Indefinite Delivery Contract (IDC) number W91278-10-D-0094, for the Mobile A/E Environmental Services.

PROJECT OBJECTIVE AND SCOPE

The objective to the QCP is to ensure that the data produced from the data gap investigation for the Garage Maintenance Area (Locomotive Building) and former Sellite Area and Unloading Area is of quality required to meet project-specific objectives. Results of this remedial investigation (RI) will be presented in a site characterization report for each area. Following the RI, human health and ecological risk assessments will be performed for each area.

The structure of this QCP is based on the scope of work from delivery orders (DO) DX01 Data Gap Investigation for the Garage Maintenance Area and Former Sellite Area and Unloading Area.

PROJECT TASKS

This QCP presents the following tasks that will need to be completed in order to support the objective of this task order. :

- Task 1.0: Preparation and Submittal of Quality Control Plan (QCP)
- Task 2.0: Preparation and Submittal of a Site-Specific Safety and Health Plan (SSHP) and Site-Specific Sample and Analysis Plan (SSAP) Addenda;
- Task 3.0: Direct Push Investigation
- Task 4.0 Sediment Sampling,
- Task 5.0: Monitoring Well Installation;
- Task 6.0: Monitoring Well Sampling;
- Task 7.0: Locomotive Building Sump Sampling;
- Task 8.0: Analytical Requirements;
- Task 9.0: Disposal of Investigation Derived Waste (IDW);
- Task 10.0: Geographic Information System (GIS) Deliverable;

- Task 11.0: Preparation and Submittal of the Site Characterization Report;
- Task 12.0 Baseline Human Health Risk Assessment
- Task 13.0: Screening Level Ecological risk Assessment;
- Task 14.0: Project Management

The following presents detailed information for each of the above mentioned tasks.

Task 1.0 – Preparation and Submittal of Quality Control Plan

Shaw prepared this QCP based on requirements described in ER 1110-1-12, Quality Management and CEORD 1110-1-9, Quality Control. As part of the QCP development, Shaw incorporated a criteria management process to ensure standard details appropriate for the USACE requirements are developed, updated, and made available to all project stake holders and reviewers. This QCP is an addendum to the Site-Wide Sample and Analysis Plan (SWSAP, prepared under contract number W912DR-05-0026, DX10). The review and verification process is presented in the Quality Assurance/Quality Control section of this QCP. This verification process will be implemented to ensure that the work output is acceptable and meets all requirements detailed in the SOW.

An independent review of documents and submittals, as well as other tasks presented in this QCP, shall be performed to verify that work is conducted in an acceptable manner and meets all the requirements detailed in the SOW.

Task 2.0 – Preparation and Submittal of Site-Specific Safety and Health Plan and Site-Specific Sampling and Analysis Plan Addenda

Shaw will develop and submit a Site-Specific Safety and Health Plan (SSHP) addendum specific to the Data Gap Investigation for the Garage Maintenance Area (Locomotive Building) and former Sellite Area and Unloading Area. The SSHP addendum required by 29 CFR 1910.120(b) (4) shall be prepared and submitted to CELRN-EC-E. This addendum will describe the health and safety procedures, practices to be implemented and equipment utilized to protect affected personnel from the potential hazards associated with the site-specific tasks. The level of detail provided in the addendum will be tailored to the type of work, complexity of operations being accomplished, hazards anticipated and the extent new conditions or procedures affecting the need to supplement the updated *Site-Wide Safety and Health Plan.*

Shaw will also develop a Site-Specific Sampling and Analysis Plan (SSAP) addendum specific to the investigation activities Sellite Area/Unloading Area and the Locomotive

Building. The Site-Wide Sampling and Analysis Plan (SWSAP, prepared under Contract No W912DR-05-D-0026, and DX10) will be used as the base document. The SSAP will be prepared as an addendum to the SWSAP and will present details regarding the investigative work as described in the SOW. The SSAP addendum will identify sampling standard operating procedures, analytical methods and data quality objectives specific to the investigation activities Sellite Area/Unloading Area and the Locomotive Building. In addition, it will identify sampling locations for activities for the Sellite Area/Unloading Area and the Locomotive Building rationale underlying the choice of locations and any expected variations from the SWSAP.

Task 3.0 – Direct-Push Investigation

Clearing and grubbing operations will be conducted to allow unobstructed access soil boring and monitoring well locations. Tree removal will be minimized to the extent possible in order to allow access needed for large drill rigs to install bedrock monitoring wells. The site will be restored to its pre-investigation state to the extent practical to include regarding and reseeding of natural grasses as necessary.

Using direct-push technology (DPT) 14 soil borings will be advanced at the former Sellite Building and 12 boring will be installed at the Unloading Area. Samples will be collected at the following intervals:

- Original ground surface
- 3 to 5 feet bgs
- 8 to 10 feet bgs

If apparent contamination layers are encountered soil samples shall be obtained from the contaminated zones. The site geologist will document this observed change in soil conditions on the HTRW Drilling Log and the Field Activity Daily Log (FADL). Samples collected from the original ground surface and from the 3 to 5 feet bgs intervals will be analyzed for nitroaromatics, SVOCs, TAL metals, and PCBs. Samples collected from the 7 to 10 feet bgs interval will be analyzed for nitroaromatics, SVOCs, TAL metals only.

The groundwater remedial investigation will be conducted as a phased approach using temporary piezometers (Phase 1) and permanent wells (Phase 2 described under Task 5.0). In the first phase of the groundwater investigation, a total of 8 piezometers are planned for installation at the former Sellite Building and 8 piezometers are planned for

installation at the Unloading area. Each of these will be continuously logged to bedrock (i.e., competent shale) during installation. If bedrock is encountered at less than 5 feet and the borehole is dry, then no piezometers will be installed at this location as it is unlikely to produce measurable water. In this case a suitable alternate location for piezometers installation will be sought. Water samples from nearly dry piezometers (e.g., <12 inches of water) are not always representative of formation water and may inappropriately influence contaminant evaluations. If such conditions are encountered, Shaw will propose to CELRN how they intend to proceed.

Before any of the piezometers are sampled, the water levels will be measured and recorded for all of the piezometers involved in this investigation. The piezometer will be purged with clean, non-contaminating equipment. During the purge process, a portion of the purge water will be tested periodically for pH, turbidity, specific conductance, dissolved oxygen, and temperature using flow-through measurement cells and the results documented. Once the relevant parameters have stabilized in accordance with EM 200-1-3 and three consecutive turbidity readings have been less than 100 NTUs, Shaw will measure and record the reduction-oxidation potential of the groundwater, at which time the sample may be collected. If the relevant parameters do not stabilize and the water level cannot be maintained, the Shaw will propose to CELRN how they intend to proceed to ensure that sampling is of quality to fulfill one or more of the project data quality objectives. Piezometer groundwater samples will be collected using low-flow technology with a peristaltic pump and PTFE tubing (e.g. Teflon®) unless this technology is not appropriate for a given analyte.

Groundwater samples collected from the former Sellite Building/Unloading Area will be analyzed for nitroaromatics, SVOC, TAL metals (filtered and unfiltered) and water quality parameters.

No raw explosive material is expected to be encountered during soil sampling activities. Should sampling personnel encounter raw explosives, Shaw will stop sampling and will contact CELRN to discuss procedures for disposal of the raw explosive material. Shaw will obtain all necessary utility clearances and permits from NASA.

All boring locations will be sketched and surveyed to the nearest 1 foot; land elevations will be surveyed to within + 0.01 foot referenced to the National Geodetic Vertical Datum of 1929.Any site clearing that may be necessary for equipment access will be coordinated with NASA.

Task 4.0 – Sediment Sampling

Six (6) sediment samples will be collected along the ditch at the former Sellite Building and the Unloading Area. Sample locations will encompass the entire length of the ditch, including an up gradient location. The sediment sampling locations will be presented in the site specific field sampling plan and the appropriate figure (s). The locations and figures identified in the field sampling plan will be reviewed and verified as indicated in the Quality Assurance (QA)/Quality Control (QC) Review section of this QCP. Each sediment sample will be analyzed for TCL VOCs, nitroaromatics, TCL PCBs, and TAL Metals.

Task 5.0 – Monitoring Well Installation

Six (6) overburden/shale and six (6) limestone bedrock monitoring wells will be installed at the former Sellite Building and the Unloading Area. The specific locations of each well will be determined based water level data and the analytical results of the piezometer well samples. Water level measurement data collected from the piezometer wells will determine if the existing overburden/shale monitoring wells located downgradient of the Unloading Area may be used. Due to the age of the existing wells, redevelopment will be required prior to sampling. The decision to use an existing overburden/shale well in lieu of installing a new well will be made in conjunction with the USACE. Coordination and the locating of all underground utilities in the vicinity of the borehole sites will be scheduled prior to drilling activities.

A qualified geologist or geotechnical engineer will be on site for all drilling, installation, development, and testing operations. Well installation and drilling methods will be in accordance with the procedures and requirements described in EM 1110-1-4000, *Monitor Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites*, and applicable State regulations and requirements. Where necessary, Shaw will use "double casing" as described in Section 3-10 of EM 1110-1-4000 to install a well through a contaminated upper zone. The plan for meeting applicable procedures and requirements will be included in the SAP Addendum if not covered in the approved Site-Wide SAP (*Work Plan for the HTW Investigation, Plum Brook Ordnance Works, Plum Brook Station/NASA,* October 1994). Variation from the 1998 November EM 1110-1-4000 guidelines will be proposed for approval in the SAP Addendum.

Shaw will establish coordinates and elevations according to EM 1110-1-4000 for each new well. A notch will be filed into the top of the well riser pipe and marked to serve as a vertical and horizontal measurement point. The coordinates will be to the closest 1 foot

and referenced to the State Plane Coordinate System. Elevations will be surveyed to within $\pm$ 0.01 feet referenced to the National Geodetic Vertical Datum of 1929.

Upon completion of all drilling activities, the sites will be restored to the extent practical by grading the areas to remove any ruts, and reseeding the native grasses.

Task 6.0 – Monitoring Well Sampling

Two rounds of groundwater samples will be collected from each of the new monitoring wells installed at the former Sellite Building and the Unloading Area; one in the spring and one in the fall. Each of the samples from the six (6) overburden/shale and six (6) bedrock wells at the former Sellite Building and the Unloading Area will be analyzed for TCL VOCs, TCL SVOCs, TAL Metals (filtered and unfiltered), nitroaromatics and water quality parameters.

Purging and sample collection will be in accordance with the requirements set forth in EM 1110-1-4000 and EM 200-1-3. In addition to the primary water samples, certain field control samples will be prepared as described in succeeding paragraphs. Shaw will coordinate with the primary and QA laboratories as to the volumes of sample necessary to satisfy all internal laboratory QC requirements. Any laboratory performing work for the USACE will comply with ISO/IEC Guide 25, *General Requirements for the Competence of Calibration and Testing Laboratories, 1990 Edition and Updates*. All samples will be collected and analyzed in conformance with applicable EPA and USACE requirements, using techniques and equipment described in the approved SAP Addendum or Site-Wide SAP.

Before a sample is collected from a well, the water level will be measured and recorded for that well and, if applicable, any associated nested well. The well will be purged with a clean, non-contaminating equipment under the guidance of the CELRN approved low-flow purge and sample procedure from the Site Wide SAP.

Periodically during the purge process a portion of the purged water will be tested for pH, turbidity, specific conductance, dissolved oxygen, and temperature. Shaw will record these measurements on the well sampling form along with other appropriate sampling information. Once the relevant parameters have stabilized (as defined by EM 200-1-3, page C-10) and three consecutive turbidity readings are than 100 NTUs, the reduction-oxidation potential of the groundwater will be measured and recorded, at which time the sample may be collected. If the relevant parameters do not stabilize and the water level

cannot be maintained, then Shaw will propose to CELRN how they intend to proceed.

If the well does not recharge fast enough to permit even low-flow purging, Shaw will propose to CELRN how they intend to proceed. Flexible delivery tubing required for low-flow sampling will be constructed of a PTFE material such as Teflon. The groundwater sampling equipment will be dedicated or cleaned between each well use to prevent cross-contamination. Only low-flow sampling will be used unless the well does not contain enough water volume to allow for low flow sampling, in which a case a bailer will be used. If samples are obtained using a bailer, the bailer will be a bottom emptying device constructed of Teflon, PVC, or stainless steel. Tipping the bailer to obtain a sample from the top will not be done. The Shaw risk assessor will be advised if any groundwater samples are collected using a method other than low flow sampling.

Task 7.0 – Garage Maintenance Area (Locomotive Building) Sump Sampling

Three (3) samples from the maintenance pit and sump at the Garage Maintenance Area (Locomotive Building) will be collected to confirm the presence of contamination. An excavator and vacuum truck will be used to remove the gravel down to 4 ft below the top of the maintenance pit prior to sample collection. Based on previous sampling, the upper 4 feet of material in the pit is not contaminated and will be segregated from deeper material. Three samples (2 samples from the pit floor and 1 sample from the sump) will be collected and analyzed for TCL VOCs, TCL SVOCs, PCBs, TAL metals and nitroaromatics. A visual inspection will be conducted to evaluate the condition of the maintenance pit and sump at the time the sampling event. Any materials collected and/or removed from the pit below a depth of 4 feet will be drummed, tested and disposed appropriately. If needed, additional inert solid material (sand, gravel, etc) will be used to fill the pit to account for any material removed. Upon completion of sampling and the visual inspection, the segregated clean material removed from the upper four feet of the maintenance pit will be used as fill material.

Task 8.0 – Analytical Requirements

A total of 135 samples will be collected for laboratory analysis as described in the previous sections. In addition, the following quality assurance/quality control (QA/QC) samples will be collected and analyzed (relative quantities in parentheses):

- Equipment rinsates ($\leq$ 5%)

- Source water (1)
- Blind duplicates (≤ 10%)
- Split samples (≤ 10%)
- Matrix spike/matrix spike duplicate samples (≤ 10%).

All details of sampling shall conform to the CELRN-EC-E approved SWSAP, and to applicable USEPA (SW-846) and USACE requirements (ER 1110-1-263, 1 April 1996). Details include sample volumes, composition and size of containers, methods of preservation, identification and labeling, packing, transportation and shipment.

Laboratory performance will be verified and documented that the work on this project is compliant with Department of Defense Quality Systems Manual (DOD QSM) Revision 4.1. The most recently promulgated methods from EPA's SW-846 *Test Methods for Evaluating Solid Wastes (SW-846)* will be used with the exception of SW-846 method 8330 for nitroaromatics. For comparability purposes, multi incremental sampling will not be required.

Shaw is responsible for collecting, packaging, coordinating and shipping QA samples to the quality assurance laboratory in accordance with the procedures found in the Site-Wide SAP. All shipments will include a temperature blank. The primary samples will have project-specific QC that will be used only for this project. When sample shipments arrive at the laboratory a cooler receipt form will be completed and signed by the sample custodian. Copies of the completed chain of custody and cooler receipt forms will be included in the Site Delineation Report.

Analytical data generated by the laboratory will be extensively reviewed prior to report generation to assure the validity of the reported data. The data from all site samples, with the exception of water quality parameters, total organic carbon, and IDW samples, will be validated by qualified Shaw personnel who have no responsibility for sample collection or analysis. Validation will follow the logic and review sections included in the US Environmental Protection Agency Contract Laboratory Program - National Functional Guidelines for Superfund Organic Methods Data Review, June 2008 (EPA 540/R-08/01) and the US Environmental Protection Agency Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Data Review, January 2010 (EPA 540/R-10/011).

Shaw will report all data reduction procedures including the methods or equations of concentration calculations, reporting units of concentration; moisture related data and the

procedures used for calculating PARCC parameters. The data will be reported in a "CLP like" format and will be of sufficient quality for a Chemical Quality Assurance Report to be submitted. Shaw will provide CLP-like data packages consisting of all elements required in CLP definitive level data deliverables. Shaw will also provide an additional electronic data deliverable for the chemical data, consisting of a SEDD as defined in the USEPA Contract Laboratory Program requirements. Shaw will prepare a table which relates all QA samples to their corresponding field and QC samples sent to the primary laboratory.

Task 9.0 –Investigation Derive Waste Disposal

After receiving characterization data for the IDW, Shaw will review and prepare a letter proposing an appropriate disposal option. Shaw will arrange for disposal of the IDW through a subcontractor in accordance with all local, state and federal laws regulatory standards.

Task 10.0 – Geographic Information System Deliverable

Information collected during this investigation will be added to the database developed during previous investigations. This database includes information related to the installation of groundwater monitoring wells (both overburden and bedrock wells) by Morrison Knudsen Corporation, Dames & Moore, and IT Corporation. This database also includes analytical (chemical) results obtained from the previous investigation of soil and groundwater collected by Dames & Moore and IT Corporation. The deliverable package, including Metadata, will be formatted as specified in the previously provided Data Standard for Corps of Engineers Environmental Restoration Sites and the Tri Services Spatial Data Standards (TSSDS). The TSSDS are available at the following link: *http://fwgcom.wes.army.mil/projects/standards/tssds/*. Shaw will be responsible for correcting any added files with transcription errors.

The information collected during this investigation will be entered into a Geographic Information System (GIS) Data Base. The GIS data will be too transferred to the Huntington District Corps of Engineers (CELRH), coordinating with CELRH (Rick Meadows) as to the appropriate data and supporting documentation formats.

Task 11.0 Preparation and Submittal of Site Characterization Report

After the analytical results for the soil, groundwater piezometer, and groundwater monitoring wells have been validated, Shaw will prepare a Site Characterization Report (Volume I of the RI) for each site. Data summaries for each medium will include a data summary of all sample identification numbers, sample locations, sample dates, detected

chemical concentrations, method detection limits, qualifiers, maximum detected concentration column, background screening value (if applicable) and risk-based screening values. At this phase, screening values are not considered judicial or regulatory limits, but are included to provide perspective to the data. The screening levels will be the same levels as to be used in a data screening portion of a human health risk assessment (unless subsequently updated prior to the risk assessment). The investigation results will be presented in a report, which includes a narrative that details the nature of work performed during the investigation, problems encountered, and conclusions and recommendations. When Method Detection Limits (MDLs) for individual analytes and sample location are higher than the appropriate screening value, they will be identified in the report.

Figures will be prepared that show sampling locations (including depths) for each sample collected. Additionally, figures will be prepared for sampling results indicating those values that exceed screening criteria and for reference purposes only, and a table showing PBOW background concentrations of inorganic analytes. The locations and figures identified during the field sampling effort will be reviewed and verified as indicated in the Quality Assurance (QA)/Quality Control (QC) Review section of this QCP. Each sediment sample will be analyzed for TCL VOCs, nitroaromatics, TCL PCBs, and TAL Metals.

The Site Characterization Report will be submitted as Volume I of the RI report. Shaw will submit draft and final versions of the Site Characterization Report. A draft version will be submitted to all reviewing parties, including OEPA, CEHNC-CX, and USAPHC (Prov). Shaw will respond to all comments with official response to comments submitted to CELRN and will revise the report as per agency comments.

Task 12.0 – Baseline Human Health Risk Assessment

A Baseline Human Health Risk Assessment (BHHRA) Work Plan and Report will be prepared for the former Sellite Building and the Unloading Area, which are consistent with current USEPA, USACE, and OEPA guidance, and are also consistent with the standard practice used in the other BHHRA work plans and report prepared for other PBOW sites. Work plans and reports from these other sites (e.g., Powerhouse 2 Ash Pits) will be used as go-by's to ensure consistency in risk assessment.

The BHHRA work plan will summarize information about the PBOW site background, history, and characteristics. The work plan will provide a detailed approach in completing a BHHRA that satisfies regulatory and USACE requirements and covers the

risk scenarios for current and potential future receptors. The work plan will include detailed methodology and algorithms for human health risk assessment including, but not limited to, data evaluation, selection of chemicals of potential concern, exposure assessment, toxicity assessment, risk characterization, uncertainty analysis, preliminary risk-based remediation goals derivation, and findings reporting. The work plan will be comprehensive enough for the former Sellite Building and the Unloading Area media.

The BHHRA will evaluate the risks associated with exposure to contaminants in the former Sellite Building and the Unloading Area soil, sediment and groundwater. It will include a site conceptual exposure model, selection of chemicals of potential concern (COPC), exposure assessment, toxicity assessment, risk characterization, uncertainty analysis, risk-based remediation goals, and recommendations/conclusions. The BHHRA report will be submitted as Volume II of the RI report.

Shaw will submit draft and final versions of the BHHRA work plan and report. A draft version of each will be submitted to all reviewing parties, including OEPA, CEHNC-CX, and USAPHC (Prov). Shaw will respond to all comments and will submit official response to comments to CELRN. Shaw will revise the draft work plan and report per agency comments.

An independent review of documents and submittals, as well as other tasks described in QA/QC Review section of this QCP, shall be performed to verify that work is conducted in an acceptable manner and meets all the requirements detailed in the SOW.

Task 13.0 – Screening Level Ecological Risk Assessment

A Screening Level Ecological Risk Assessment (SLERA) Work Plans and Reports will be prepared for the WWTP2/TNTC sewer line which are consistent with current USEPA, USACE, and OEPA guidance, and are also consistent with the standard practice used in the other SLERA work plans and report prepared for other PBOW sites. Work plans and reports from these other sites (e.g., Powerhouse 2 Ash Pits) will be used as go-by's to ensure consistency in risk assessment.

The SLERA work plans will summarize information about the PBOW site background, history, and characteristics. The work plans will provide a detailed approach in completing a SLERA that satisfies regulatory and USACE requirements and covers the exposure pathways for ecological receptors. The work plans will include detailed methodology and algorithms for subtasks of the SLERA and will be comprehensive enough for the former Sellite Building and the Unloading Area media

The SLERA will evaluate the risks associated with exposure to contaminants in the former Sellite Building and the Unloading Area soil, sediment and groundwater. It will include an ecological problem formulation, exposure assessment, effects evaluation and development of toxicity reference values, risk characterization, uncertainty analysis, and summary/conclusions/recommendations. The SLERA report will be submitted as Volume III of the RI.

A subtask of the problem formulation will include two site reconnaissance walkovers to be performed by expert ecologists/wildlife biologists with strong skills in the identification of flora and fauna of northern Ohio. These walkovers will be used to compile a vegetation community map of the former Sellite Building and the Unloading Area and also species checklists. One walkover will be performed in late spring (May/June) and the other in early fall (September/October). The checklists and community map will be appended to the SLERA report.

Shaw will submit draft and final versions of the SLERA work plan and report. A draft version of each will be submitted to all reviewing parties, including OEPA, CEHNC-CX, and USAPHC (Prov). Shaw will respond to all comments and will submit official response to comments to CELRN. Shaw will revise the draft work plan and report per agency comments.

An independent review of documents and submittals, as well as other tasks described in QA/QC Review section of this QCP, shall be performed to verify that work is conducted in an acceptable manner and meets all the requirements detailed in the SOW.

Task 14.0 – Project Management

Project management includes labor necessary to manage the project and includes home office support services such as procurement, contracting, invoicing, and coordination.

PROJECT SCHEDULE AND MILESTONES

The project schedule and milestones are presented in Figure 1.

KEY SHAW PROJECT PERSONNEL

- **Project Manager** - Mr. Steven T. Downey will serve as Shaw's Project Manager.
- **Technical Lead** - Mr. Michael Gunderson will serve as the Technical Lead.
- **QA Manager** - Mr. Kenneth Martinez will serve as the Project QA Manager.
- **H&S Officer** – Mr. Doug Russell will serve as Shaw's H&S Officer
- **Project Chemist** -Mr. Eddie Weaver will serve as the Project Chemist.

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) REVIEW

This section of the QCP summarizes the Shaw internal technical and external peer review. The Shaw QA program provides controls for the formal verification (checking) of documents such as calculations and the presentation of information in the form of drawings, logs, and tables. Review and necessary approvals are also cited for quality-related documents; however, during the course of a project or proposal, verification of technical decisions and concepts (such as interpretation of data and evaluation of results) is required in order that the project or proposal can proceed on a sound conceptual basis. The review approach may be needed to address the following questions:

- During the project planning stage, have appropriate steps been implemented to satisfy the goals and objectives of the project?
- Are data of sufficient quality and properly interpreted so that conclusions can be justified and demonstrated?
- Are design parameters reasonable for the computations performed? What is the effect of variations of the assumptions upon the results?
- Do the results presented by Shaw in the form of a report, or other document, adequately represent the work performed and the conclusions reached? Do the results fulfill the objectives of the project?

The internal technical review (ITR) process is used to verify these steps. Documents to be written during a project and indicated in the proposal will be subjected to peer review. The Shaw PM will complete a matrix of these documents on a delivery order basis and use it to obtain the required reviews.

A technical reviewer is selected based upon the following criteria:

- The reviewer must be independent of the project. The reviewer must be sufficiently informed regarding the project, but should not be making decisions that determine or affect the course of the project. The peer review process is an "outside" review of the project.
- The reviewer must be a person knowledgeable in the specific area of work, preferably a senior technical associate. Technical reviewers will be part of the Shaw organization.

At the conclusion of a technical peer review, the reviewer(s) will prepare written review comments, sign off on the Discipline Sign-Off Review form (Figure 2) and forward to the PM; a copy of these review documents will also be placed in the project files. Technical review comments will be resolved and incorporated into the document as appropriate. ITR comments are available for USACE inspection upon request.

External peer review will be performed on all draft project deliverables prior to issuance as final documents. It is anticipated that the external peer review will be performed, as a minimum, by the USACE and the OEPA. A formal response to peer review comments will be issued to all reviewing parties, documenting revisions made where appropriate to the draft deliverables; this does NOT apply to the Report of Finding prepared under this delivery order. All responses to the peer review comments will be coordinated with the USACE for their concurrence prior to incorporation. Final deliverables will be submitted after incorporating any pertinent comments that arise from peer review of the draft documents. Table 1 summarizes the preparation and review process for the required project deliverables.

FIELD ACTIVITY QA REQUIREMENTS

Field investigation activities will follow the procedures specified in the SSAP to ensure that project quality requirements are satisfied. Field activity QA will be implemented by performing project-specific training; properly preparing for field work before mobilization; issuing variances, nonconformance reports, and corrective action reports; and documenting field quality control in the investigation reports.

Field team members, including Shaw personnel and subcontractor personnel, will receive project-specific training before mobilization to the job site by reading the applicable work plans and procedures. Upon mobilization to the site, but prior to commencing field activities, all site personnel will attend the project kickoff meeting, which will consist of a review of all project requirements and objectives to ensure that the project team is fully aware of the goals of the PBOW investigations. Before initiating each days field work, all team members will participate in a tailgate safety meeting (TSM) conducted by the Shaw Field Coordinator to address safety and quality issues pertinent to the activities to be performed. The TSM will be documented and

all personnel will sign the attendance record. Worker training will follow the requirements specified in Shaw SOPs.

Prior to mobilization to the site, the Shaw PM, assisted by the Shaw Field Coordinator and the Shaw Analytical Coordinator, will examine project field work preparation requirements to ensure that all necessary arrangements, including personnel assignments, work plans, site entry/drilling permits, training, schedule, equipment rentals, supplies, subcontractors, have been accomplished for execution of the field effort in an efficient and effective manner. The Shaw PM and QAM must approve the project preparation prior to mobilization.

Changes or variances to the SAP, SSHP, QAPP, and/or site-specific work plans may be initiated either in the office or in the field as may be necessary. All variances will be noted on the Field Activity Daily Log (FADL) and will be formally recorded on the Variance Log. Variances will be approved by the Shaw QAM and the Shaw PM prior to implementation of the change. Variances that will affect the project scope, cost, or schedule will be submitted to the USACE for approval prior to implementation.

Nonconforming equipment, items, activities, conditions, and unusual incidents that could affect compliance with project requirements will be identified, controlled, and reported in a timely manner. A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of any item unacceptable or indeterminate. The originator (any Shaw employee) of a nonconformance report will describe the finding on the Nonconformance Report provided for this purpose and will notify the Shaw PM and QAM. Each nonconformance will be reviewed and a disposition will be issued for the item, activity, or condition. The disposition of a nonconformance will be documented and approved by the Shaw organization responsible for issuing the nonconformance. The QAM will concur with the disposition of the nonconformance prior to closure of the Nonconformance Report.

In addition, the Shaw PM will notify the USACE Technical Coordinator within 48 hours of significant nonconformances that could impact the project cost, schedule, or scope of work and will indicate the corrective action taken or planned.

SUBCONTRACTOR QA/QC REVIEW

Shaw has assigned personnel to monitor and review work performed by subcontractors in conjunction with this investigation. Mr. Steven T. Downey will serve as the principal point-of-contact (POC).

The selection of qualified subcontractors, as required, will be accomplished in accordance with Shaw procurement and quality assurance (QA) procedures. Subcontractors such as drillers, geophysical specialists, surveyors, and environmental monitoring specialists, must satisfy

predefined qualifications developed by the PM and Shaw that is defined in the procurement bid packages. Each subcontractor bid submittal is reviewed by technical personnel, purchasing, and QA personnel to verify that the bidders are technically qualified and can satisfy the project objectives. Before starting work, Shaw will perform a quality check to ensure that the subcontractor(s) has fulfilled the procurement requirements necessary to begin activities. Subcontractors involved in environmental measurements will be monitored by the Shaw Field Coordinator to verify the use of calibrated equipment and qualified operators.

CUSTOMER INVOLVEMENT

Customer involvement will be ongoing throughout the duration of this investigation, and Shaw personnel will be available as needed for question, consultation, etc. Project personnel may be reached at the following telephone numbers:

Mr. Steven T. Downey Project Manager	(865) 694-7496	Fax (225) 987-3034
Mr. Michael Gunderson Technical Lead	(865) 694-7446	Fax (865) 690-3626
Mr. Kenneth Martinez Quality Assurance Manager	(865) 670-2656	Fax (865) 690-3626
Doug Russell H&S Officer	(865)-692-3584	Fax (865) 690-3626
Mr. Eddie Weaver Project Chemist	(865) 560-5274	Fax (865) 693-4944

Each work plan or other deliverable to be prepared in more than draft form will be submitted to the USACE Nashville District as specified in the SOW for review and comment. All review comments will be addressed and incorporated into the final submittals, if appropriate.

DOCUMENTATION OF PROJECT DECISIONS AND RECORDS MANAGEMENT

The Shaw Project Records Clerk is responsible for maintaining control and retention for project-related records. Record control includes receipt from external and internal sources, transmittal, and transfer to storage, and indication of record status. Retention includes receipt at storage areas, indexing and filing, storage and maintenance, and retrieval. Shaw will maintain the project repositories at 312 Directors Drive in Knoxville, Tennessee, for all project records, including correspondence. Records will be controlled and retained, as appropriate, in the office central files or laboratory files. The Project Records Clerk will assign control numbers to all outgoing documents and is responsible for properly filing the controlled records (except for those

related to accounting, purchasing, and drafting, which are retained in the respective department files). Shaw will also provide the USACE Nashville District with a copy of all telephone memos, written correspondence, and meeting minutes regarding information related to the project within ten (10) days of the event. Copies of all records will be retained by Shaw for a minimum of seven (7) years after the end of the contract period. In addition, project records deemed to be of importance by the USACE will be turned over to the USACE at the time of project close-out.

PROJECT CLOSE-OUT

At the completion of this investigation, a project close-out meeting will be conducted. This will be at a time and place to be determined by Nashville District personnel, and may take the form of a teleconference. The purpose of this meeting will be to exchange feedback, discuss lessons learned, and conduct a final product verification.

Shaw Environmental & Infrastructure, Inc.

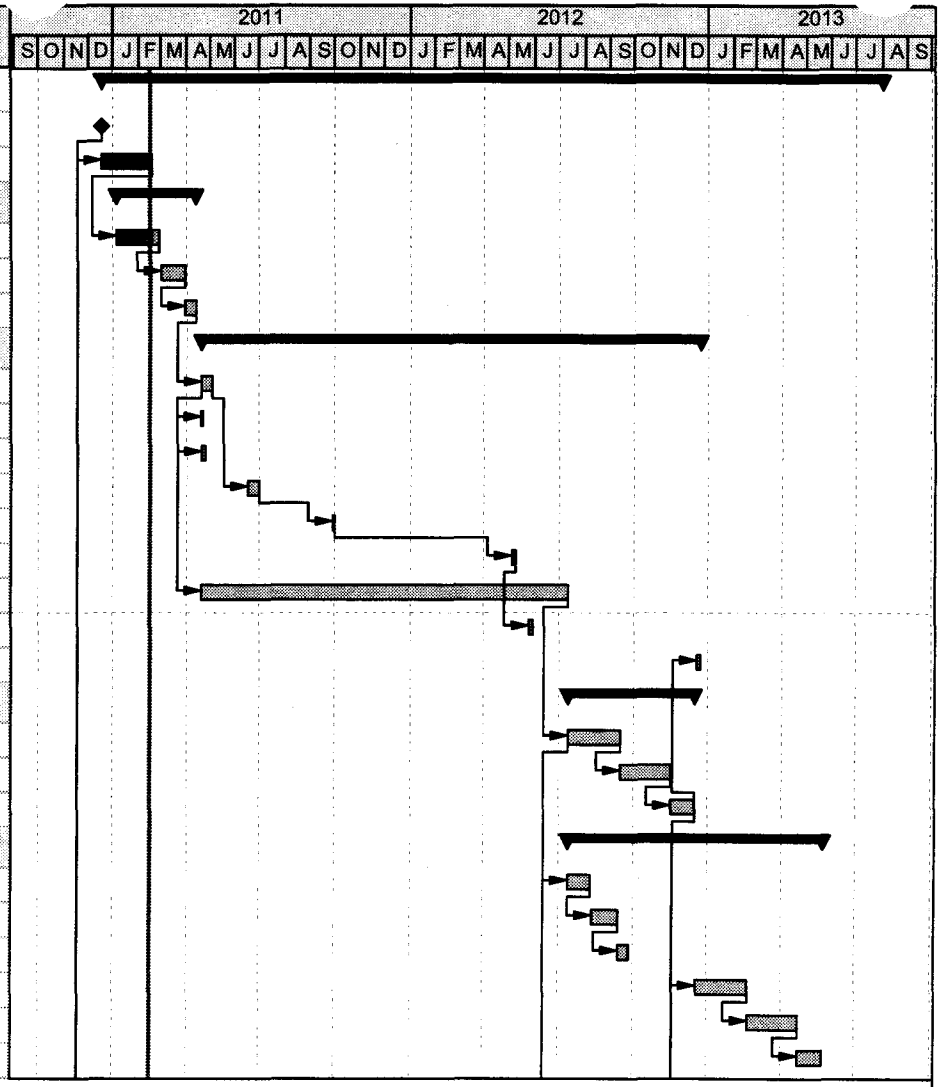
Table 1

Data Gap Investigation for the Garage Maintenance Area – Former Sellite Area and Unloading Area Former Plum Brook Ordnance Works, Sandusky, Ohio

Submittal Description/ Title	Document Preparation and Review Process					
	Principal Author(s)	Discipline	Peer Review	Discipline	Project Review	Discipline
SSAP	Jonathan Reagan Eddie Weaver	Soil Scientist Chemist	Eric Weaver David Kessler Tom Siard	Geologist Geologist Risk Assessor	Michael Gunderson Steve Downey Ken Martinez	Geologist Engineer QA Specialist
SSHP	Doug Russell	H&S Coordinator	Eric Weaver David Kessler	Geologist Geologist	Steven Downey Michael Gunderson Ken Martinez	Engineer Geologist QA Specialist
Site Characterization Report	Dave Kessler	Geologist	Eric Weaver Eddie Weaver	Geologist Chemist	Steven Downey Michael Gunderson Ken Martinez	Engineer Geologist QA Specialist
BHHRA	Tom Siard	Risk Assessor	Jonathan Lindberg Bill Anderson	Risk Assessor Engineer	Steven Downey Michael Gunderson Ken Martinez	Engineer Geologist QA Manager
SLERA	Jonathan Lindberg	Risk Assessor	Tom Siard Bill Anderson	Risk Assessor Engineer	Steven Downey Michael Gunderson Ken Martinez	Engineer Geologist QA Manager

NOTE: Where multiple authors are identified, one or more of those identified may be involved in the document preparation depending on availability. Should replacements be necessary, personnel of comparable experience and qualifications will be utilized.

Activity ID	Activity Name	Remaining Duration	Start	Finish
Data Gap Investigation, PBOW		623	17-Dec-10 A	31-Jul-13
A1000	Task Order Award / NTP	0	17-Dec-10 A	
A1010	Quality Control Plan (QCP)	1	17-Dec-10 A	16-Feb-11
SSHP & SSAP		39	04-Jan-11 A	12-Apr-11
A1020	Draft SSHP & SSAP	7	04-Jan-11 A	25-Feb-11
A1030	Review Draft SSHP & SSAP	22	28-Feb-11	29-Mar-11
A1040	Final SSHP & SSAP	10	30-Mar-11	12-Apr-11
Field Work		425	20-Apr-11	21-Dec-12
A1050	Direct-Push Investigation	10	20-Apr-11	04-May-11
A1060	Sediment Sampling	2	20-Apr-11	21-Apr-11
A1070	Locomotive Bldg. Sump Sampling	3	20-Apr-11	25-Apr-11
A1080	Monitoring Well Installation	10	17-Jun-11	30-Jun-11
A1090	Well Sampling #1 (Fall)	3	27-Sep-11	29-Sep-11
A1100	Well Sampling #2 (Spring)	3	04-May-12	08-May-12
A1110	Analytical	312	20-Apr-11	12-Jul-12
A1120	IDW	3	25-May-12	30-May-12
A1130	GIS	5	17-Dec-12	21-Dec-12
Site Characterization Report		108	13-Jul-12	14-Dec-12
A1140	Draft Site Characterization Report	44	13-Jul-12	13-Sep-12
A1150	Review Draft Site Characterization Re...	44	14-Sep-12	14-Nov-12
A1160	Final Site Characterization Report	20	15-Nov-12	14-Dec-12
BHHRA		218	13-Jul-12	22-May-13
A1170	Draft BHHRA Work Plan	20	13-Jul-12	09-Aug-12
A1180	Review Draft BHHRA Work Plan	22	10-Aug-12	11-Sep-12
A1190	Final BHHRA Work Plan	10	12-Sep-12	25-Sep-12
A1200	Draft BHHRA	44	17-Dec-12	18-Feb-13
A1210	Review Draft BHHRA	44	19-Feb-13	22-Apr-13
A1220	Final BHHRA	22	23-Apr-13	22-May-13



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Start ...
Summ...

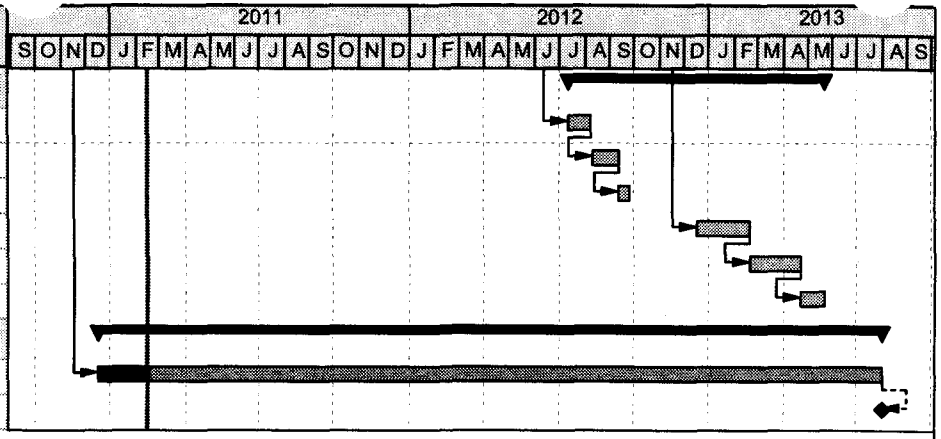
Figure 1

Mobile A/E Contract #W91278-10-D-0094

DX-01 Data Gap Investigation For The Garage Maintenance Area, PBOW

Shaw Environmental & Infrastructure Project Schedule

Activity ID	Activity Name	Remaining Duration	Start	Finish
SLERA		218	13-Jul-12	22-May-13
A1230	Draft SLERA Work Plan	20	13-Jul-12	09-Aug-12
A1240	Review Draft SLERA Work Plan	22	10-Aug-12	11-Sep-12
A1250	Final SLERA Work Plan	10	12-Sep-12	25-Sep-12
A1260	Draft SLERA	44	17-Dec-12	18-Feb-13
A1270	Review Draft SLERA	44	19-Feb-13	22-Apr-13
A1280	Final SLERA	22	23-Apr-13	22-May-13
Management & Support		623	17-Dec-10 A	31-Jul-13
A1290	Project Management	623	17-Dec-10 A	31-Jul-13
A1300	Project Completion	0		31-Jul-13*



Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Start ...
Summ...

Figure 1

Mobile A/E Contract #W91278-10-D-0094

DX-01 Data Gap Investigation For The Garage Maintenance Area, PBOW

Shaw Environmental & Infrastructure Project Schedule