QUALITY ASSURANCE PROJECT PLAN

FORMER YORK NAVAL ORDNANCE PLANT
1425 EDEN ROAD
YORK, PENNSYLVANIA

Prepared for:

Harley-Davidson Motor Company Operations, Inc.

York, Pennsylvania

June 2012

Prepared by:

Groundwater Sciences Corporation
2601 Market Place Street, Suite 310
Harrisburg, PA 17110-9340

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Stephen M. Snyder, P.G.
Senior Associate and Hydrogeologist
Groundwater Sciences Corporation

June 25, 2012

Jennifer S. Reese, P.G.
Senior Hydrogeologist
Groundwater Sciences Corporation

June 25, 2012

A PROJECT MANAGEMENT

A.1 Title and Approval Sheet

Title of Plan: Quality Assurance Project Plan (QAPP)
Former York Naval Ordnance Plant (fYNOP)
1425 Eden Road, Springettsbury Township, York, Pennsylvania

Implementing Organization: Harley-Davidson Motor Company Operations, Inc. (Harley-Davidson)

Effective Date: June 25, 2012

Approving Officials:

Harley-Davidson Facility Project Coordinator (FPC)	Name: Sharon R. Fisher, CHMM
	Signature:_____
USACE Baltimore District Representative	Name: Hamid Rafiee
	Signature:_____
Trust Fund 3rd Party Coordinator/ Project Coordinator	Name: Ralph T. Golia, P.G.
	Signature:_____
EPA Region III Remedial Project Manager	Name: Griff Miller
	Signature:_____
PADEP Representative	Name: Pamela Trowbridge, P.G.
	Signature:_____
GSC Project Director	Name: Stephen M. Snyder, P.G.
	Signature:_____
GSC Quality Assurance Manager and Health and Safety Manager	Name: Charles A. Rine, P.G.
	Signature:_____

A.2 Table of Contents

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*Appendix C and D are in portable document format (PDF) on compact disc (CD).

The format of this Quality Assurance Project Plan (QAPP) is consistent with the structure outlined in the following documents:

*EPA Requirements for Quality Assurance Project Plans (*EPA QA/R-5, March 2001)

Guidance for Quality Assurance Project Plans (EPA QA/G-5, December 2002)

EPA Region III Modifications to National Functional Guidelines for Organic Data Review Multi-Media, Multi-Concentration (OLM01.0-OLM01.9 September 1994)

Uniform Federal Policy for Quality Assurance Project Plans (EPA-505-B-04-900A, March 2005)

List of Acronyms and Abbreviations

ug/L	micrograms per liter
AMF	American Machine & Foundry Company
AMOED	AMO Environmental Decisions, Inc.
ASTM	American Society for Testing and Materials
°C	degrees Centigrade
COC	contaminants of concern
CPA	Central Plant Area
DOT	Department of Transportation
DQI	data quality indicators
DQO	data quality objectives

EDD	electronic data deliverable
FCO	field change order
FCR	field change request
FPL	facility project lead
FS	feasibility study
FSP	Field Sampling Plan
fYNOP	former York Naval Ordnance Plant
GPS	global positioning system
GSC	Groundwater Sciences Corporation
GWTS	groundwater extraction and treatment system
Harley-Davidson	Harley-Davidson Motor Company Operations, Inc.
HASP	Health and Safety Plan
ICP	inductively coupled plasma
IDW	investigative-derived wastes
Langan	Langan Engineering and Environmental Services, Inc.
LCS	laboratory control spike
LOR	letter of receipt
M&TE	measuring and testing equipment
mm	millimeter
MIP	Membrane Interface Probe
MOA	memorandum of agreement
MS/MSD	matrix spike/matrix spike duplicate
MSC	Medium Specific Concentrations
NCR	nonconformance report
NIOSH	National Institute for Occupational Safety and Health
NIR	notice of intent to remediate
NIST	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
PADEP	Pennsylvania Department of Environmental Protection
Part 2 SGWRI	Part 2 of the Supplemental Groundwater Remedial Investigation
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
PDA	personal digital assistant

PID	photoionization detector
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	quality control
QCR	quality control report
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RPD	relative percent difference
RSL	Regional Screening Levels
SAIC	Science Applications International Corporation
SARM	Standard Analytical Reference Materials
SDG	sample delivery group
SOP	standard operating procedures
SOW	scope of work
SRI	Supplemental Remedial Investigation
SSHO	site safety and health officer
SVOC	Semi-volatile Organic Compound
TCA	1,1,1-trichloroethane
TCE	trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds
WPL	West Parking Lot
YCIDA	York County Industrial Development Authority
YNOP	York Naval Ordnance Plant

A.3 Distribution List

This QAPP will be distributed to all project personnel involved in data collection and analysis. Each person on the distribution list will receive one copy of the QAPP unless otherwise requested. A distribution record of the QAPP will be maintained by the Groundwater Sciences Corporation (GSC) Project Director. The distribution record will contain a list of personnel and organizations who have received copies of the QAPP, the date of receipt, and the revision number that was received.

Table A-1. Personnel Responsibilities and QAPP Receipt

Name	Organization	Professional Title (Project Title)	Contact Information (Telephone/e-mail)	QAPP Receipt/ Date
Sharon R. Fisher, CHMM	Harley-Davidson Motor Company Operations, Inc.	Environmental Manager	(717) 852-6544 sharon.fisher@harley-davidson.com	
Ralph Golia, P.G.	AMO Environmental Decisions, Inc.	Project Coordinator	(215) 230-8282 rgolia@amoed.com	
Hamid Rafiee	United States Army Corp of Engineers	Environmental Engineer	(410) 962-7546 Hamid.rafiee@nab02.usace.army.mil	
Griff Miller	US Public Health Service, detailed to USEPA Region III	Remedial Project Manager	(215) 814-3407 Miller.Griff@epamail.epa.gov	
Pamela S. Trowbridge, P.G.	PA Dept. of Environmental Protection	Project Officer	(717) 705-4839 ptrowbridge@pa.gov	
Stephen M. Snyder, P.G.	Groundwater Sciences Corporation	Senior Associate (Project Director)	(717) 901-8187 ssnyder@groundwatersciences.com	
Charles A. Rine, P.G.	Groundwater Sciences Corporation	Senior Associate (Quality Assurance/Quality Control Manager)	(717) 901-8188 crine@groundwatersciences.com	
Jennifer S. Reese, P.G.	Groundwater Sciences Corporation	Senior Hydrogeologist (Project Manager)	(717) 901-8188 jreese@groundwatersciences.com	
Kaitlin B. Fleming	Groundwater Sciences Corporation	Staff Geological Scientist (Sample Manager)	(717) 909-8461 kfleming@groundwatersciences.com	
Alan G. Miller, Jr.	Groundwater Sciences Corporation	GIS Specialist(GSC Data Manager/Validator)	(717) 901-8194 amiller@groundwatersciences.com	
Knut Torgerson	Science Applications International Corporation	Software Systems Engineer (Database Administrator)	(703) 676-8921 torgersonk@saic.com	

A.4 Project Organization

The project organizational chart is attached as **Figure A-1**. This chart defines the key personnel and organizations, and shows their relationships and lines of communication. This organizational chart will be updated as necessary to reflect current project personnel and contractors. The functional responsibilities of key personnel are described in the following subsections.

A.4.1 Harley-Davidson Facility Project Lead

Harley-Davidson ensures the overall management and quality of the activities covered by this QAPP. Sharon R. Fisher, CHMM, is identified as the Harley-Davidson Facility Project Lead (FPL) for the One Cleanup program and will ensure that project goals and objectives are met in a high-quality and timely manner. Quality Assurance (QA) and nonconformance issues will be addressed by this individual in coordination with the Contractor's Project Director.

A.4.2 USACE Baltimore District Representative

The United States Army Corps of Engineers (USACE) Baltimore District representative for the site is Hamid Rafiee. As the representative of the former site owner being the Navy, Mr. Rafiee reviews all matters with the Harley-Davidson FPL and the Trust Fund Project Coordinator concerning investigation or remediation of environmental impacts from the Navy's past operations at the site.

A.4.3 Trust Fund 3rd Party Project Coordinator

The Trust Fund 3rd Party Project Coordinator, Ralph T. Golia, P.G. (AMO Environmental Decisions, Inc. [AMOED]), is the liaison regarding shared cleanup responsibility between Harley-Davidson and the federal government. The Trust Fund 3rd Party Project Coordinator activities involve interfacing with Harley-Davidson, USACE, Pennsylvania Department of Environmental Protection (PADEP), United States Environmental Protection Agency (USEPA) and Contractor personnel, and tracking related budgets and schedules.

A.4.4 EPA Region III Remedial Project Manager

The EPA Region III Remedial Project Manager for the project is Griff Miller. Mr. Miller works with the Harley-Davidson FPC and the PADEP representative to provide regulatory review and federal oversight for the project. Specifically, the EPA works directly with the PADEP to provide guidance for fYNOP under the One Cleanup program. Mr. Miller is the primary lead for EPA on the One Cleanup program at Harley-Davidson.

A.4.5 PADEP South Central Region Project Officer

The PADEP site representative is Pamela Trowbridge, P.G. Ms. Trowbridge provides regulatory oversight to the project and represents the Commonwealth on environmental issues at fYNOP. In addition, Ms. Trowbridge is the PADEP primary lead for the One Cleanup program initiative.

A.4.6 GSC Project Director

The GSC Project Director for the site (Stephen M. Snyder, P.G.) is responsible for the overall coordination of all project activities at fYNOP for GSC. Mr. Snyder reports to the Harley-Davidson FPL and coordinates with the Trust Fund Project Coordinator.

A.4.7 GSC Quality Assurance / Quality Control (QA/QC) Manager

The GSC QA/QC Manager (Charles Rine, P.G.) is responsible for the project QA/QC in accordance with the requirements of the project QAPP, other work plan documentation, and appropriate management guidance. The QA/QC Manager is independent from the project units generating data. In addition to maintaining the official, approved QA Plan, the GSC QA Manager, in coordination with the GSC Project Managers, will be responsible for participating in the project field activity readiness review; approving variances during field activities before work continues; approving, evaluating, and documenting the disposition of Nonconformance Reports (NCRs); overseeing and approving required project training; and designing audit/surveillance plans followed by supervision of these activities. The GSC QA/QC Manager reports to the GSC Project Director.

A.4.8 GSC Project Manager

The GSC Project Manager (Jennifer Reese, P.G.) is responsible for implementation and documentation of project QA/QC protocols during field activities. This will include, but not be limited to, documentation of QAPP instructions to field personnel; oversight of field sampling and analytical activities; documentation of field QC activities; and oversight of field documentation. The GSC Project Manager reports to the GSC Project Director.

A.4.9 GSC Health and Safety Manager

The GSC Health and Safety Manager (Charles Rine, P.G.) is responsible for ensuring that health and safety procedures designed to protect personnel are maintained throughout the field activities. This will be accomplished by strict adherence to the project Site Health and Safety Plan (HASP), which has been prepared as a separate document for Part 2 of the Supplemental Groundwater Remedial Investigation (Part 2 SGWRI). This individual, in conjunction with the Site Safety Officer, will have the authority to halt fieldwork if health or safety issues arise that are not immediately resolvable in accordance with the project HASP. The Health and Safety Manager reports directly to the Project Manager.

A.4.10 GSC Laboratory Coordinator

The GSC Laboratory Coordinator (Jennifer Reese, P.G.) is responsible for coordination of sample shipment to the laboratory and subsequent chemical analysis and reporting performed by the subcontract laboratories, in accordance with the requirement defined in the QAPP. This individual will be responsible for obtaining required sample containers from the laboratories for use during field sample collection; resolving questions the laboratory may have regarding QAPP requirements and deliverables; and coordination of data reduction, review, and documentation activities related to sample data package deliverables received from the laboratory. The GSC Laboratory Coordinator reports directly to the GSC Project Director.

A.4.11 GSC Sample Manager

The GSC Sample Manager (Kaitlin Fleming) is responsible for coordination of received data from the subcontracted laboratory, in accordance with the requirement defined in the QAPP. This

individual will be responsible for ensuring that chain-of-custody records are properly maintained and coordinating the management of the laboratory data (electronic and paper copies) for transfer into the project database maintained by Science Applications International Corporation (SAIC). The GSC Sample Manager reports directly to the GSC Project Manager and the GSC Laboratory Coordinator.

A.4.12 GSC Data Manager

The GSC Data Manager (Alan Miller) is responsible for entering the electronic laboratory data into the GSC system. This includes comparison of electronic data submittals to the chain-of-custody, converting electronic data deliverables into an access database, and entering location identifiers for sampling points. The GSC Data Manager reports directly to the GSC Project Director and coordinates with the GSC Sample Manager.

A.4.13 SAIC Data Manager

The SAIC Database Administrator (Knut Torgerson) is responsible for entering the electronic laboratory data into the ARC IMS database and the coordination of the fYNOP website. The SAIC Database Administrator reports directly to the GSC Project Director and coordinates with the GSC Data Manager.

A.4.14 GSC Data Validator

The GSC Data Validator (Alan Miller) is responsible for verification of laboratory data quality, as required by the project. This individual will conduct data validation procedures on selected data packages, in accordance with GSC data validation procedures. The GSC Data Validator reports directly to the Project Manager and coordinates with the Sample Manager.

A.4.15 GSC Field Managers

The Field Managers are responsible for implementing field activities in accordance with project-specific work plans and the QAPP. These individuals are responsible for ensuring proper technical performance of field operations and sampling activities; adherence to required sample custody and other related QA/QC field procedures; coordination of field personnel and

subcontractor activities, including the coordination of the management of investigation-derived wastes (IDW); and checks of field documentation, if required. The Field Managers report directly to the GSC Project Managers, except in regard to QA/QC matters that are reported directly to the GSC QA Manager.

A.4.16 GSC Field Personnel

In addition to the Field Managers, other field personnel participating in the implementation of field activities are anticipated to be field staff and sampling technicians. These individuals, in coordination with field subcontractor personnel, will be responsible for performance of excavation activities, drilling operations, collection of soil, groundwater and surface water samples, etc., and preparation of field logbooks and other required documentation. These individuals will be responsible for performing field activities in accordance with the work plan(s) and QAPP and will report directly to the GSC Field Managers.

A.4.17 Subcontracted Laboratory Support

The subcontracted laboratory for this project is TestAmerica of Pittsburgh, Pennsylvania. The TestAmerica main point of contact for the work at Harley-Davidson is Jill Colussy. The responsibilities of key personnel for the laboratory are described in the TestAmerica-Pittsburgh Laboratory QA Plan. The subcontracted laboratory shall report to the GSC Laboratory Coordinator or his or her designee. The contact information for TestAmerica is:

TestAmerica-Pittsburgh
301 Alpha Drive
Pittsburgh, PA 15238
(412) 963-7058
(412) 963-2468 (Fax)

A.5 Problem Definition / Background

This QAPP has been prepared by GSC for activities to be performed for the Part 2 SGWRI and related work at the fYNOP (currently the Harley-Davidson facility in York, Pennsylvania). Pertinent information from the previous QAPP (SAIC, 2009) has been incorporated into this document.

The fYNOP is located in Springettsbury Township in York County, Pennsylvania, situated on approximately 230 acres. As shown on **Figure A-2**, the facility is bordered on the south by Route 30; on the west by Eden Road, a railroad line and northward flowing Codorus Creek; and on the east and north by residential properties. Site features and areas of concern are illustrated on **Figure A-3** which calls out the West Parking Lot (WPL), former Central Plant Area (CPA), and numerous other areas of the Site. The eastern third of the site is undeveloped woodlands.

The Site was initially developed in 1941 by the York Safe and Lock Company, a United States Navy contractor, for the manufacture, assembly, and testing of 40 millimeter (mm) twin and quadruple gun mounts, complete with guns. In 1944, the Navy took possession of the York Safe and Lock Company facility. The Navy owned and operated the facility as the York Naval Ordnance Plant (YNOP) until 1964, switching operations after World War II to overhaul war service weapons and to manufacture rocket launchers, 3-inch/50-caliber guns, 20-mm aircraft guns, and power drive units for 5-inch/54-caliber guns. In 1964, the Navy sold the YNOP to American Machine and Foundry Company (AMF), who continued similar manufacturing. In 1969, AMF merged with Harley-Davidson. In 1973, Harley-Davidson moved its motorcycle assembly operations to the AMF York facility. In 1981, AMF sold the York facility to Harley-Davidson. Harley-Davidson has continued motorcycle assembly operations at the York facility since 1981.

Currently, Harley-Davidson is in the process of transferring ownership of the western portion of the Site to the York County Industrial Development Authority (YCIDA). The Site has been divided into the 58 acre West Campus, the portion being transferred, and the 172 acre East Campus, the portion which remains as the Harley-Davidson York, PA motorcycle manufacturing facility.

Groundwater investigations beginning in 1986 revealed the presence of volatile organic compounds (VOCs) in groundwater directly under the Site. The interim remedy for addressing the VOCs in groundwater included groundwater capture via extraction wells and treatment of the groundwater using air stripping in association with thermal treatment or carbon adsorption to control off-gasses, followed by on-Site discharge of the treated groundwater back into an unnamed tributary of Codorus Creek, locally called Johnsons Run. The groundwater extraction and treatment system (GWTS) was constructed in 1990 and has continued operations to date. The status and effectiveness of the GWTS is reported to the PADEP and USEPA via annual reports. The discharge

point for treated groundwater was moved from Johnsons Run to the Codorus Creek after National Pollutant Discharge Elimination System (NPDES) renewal permitting in 2007. The location of the discharge point is shown on **Figure A-3**.

Harley-Davidson entered into a Settlement Agreement with the Department of Defense and the Department of the Navy (as facilitated by USACE) on January 24, 1995. That agreement established a cost-sharing arrangement between Harley-Davidson, as the present site owner, and the United States, as the past owner, for costs incurred in the response to environmental contamination at the facility. A Trust Fund was established to handle the cost sharing of those response actions.

On May 20, 2002, fYNOP committed to EPA's "Facility Lead Program" under the RCRA Corrective Action Program through a letter of commitment to EPA. Subsequently, fYNOP has entered into the One Cleanup program established by the EPA (Region III) and the PADEP, which was outlined in a Memorandum of Agreement (MOA) dated April 24, 2004. Under the MOA, both agencies agreed to work with fYNOP to complete RCRA Corrective Actions for the facility and meet Act 2 cleanup standards in accordance with Act 2 and Chapter 250 of Pennsylvania's Land Recycling and Environmental Remediation Standards Act. The One Cleanup program initiative began on February 7, 2005, when fYNOP submitted a Notice of Intent to Remediate (NIR) to PADEP. Official public information about the facility can be found at the public web-link, http://yorksiteremedy.com/.

An investigation of vapor and indoor air pathway migration at the site was investigated and evaluated by Langan Engineering and Environmental Services, Inc. (Langan) (Langan, 2003). The results of the indoor air and vapor migration investigation were presented in a draft Supplemental RI Report prepared by Langan titled "Indoor Vapor Pathway Screening Assessment" (Langan, 2005). In 2007 an off-site soil vapor intrusion investigation was performed north of the NPBA. All results were below PADEP soil gas screening criteria.

In September of 2005, USEPA completed a letter called Documentation of Environmental Indicator Determination. The findings of that letter indicated the following:

"Based on a review of the formation contained in this EI Determination, 'Current Human Exposures' are expected to be 'Under Control' at the Harley-Davidson Motor Company facility,

USEPA ID # PAD 001 643 619, located at 1425 Eden Road, York, Pennsylvania under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility."

In 2007, a supplemental remedial investigation was initiated by SAIC. The results of that study were reported in the "Draft Supplemental Remedial Investigations Soils Report" dated December 2009 by SAIC, and in the "Supplemental Remedial Investigation Groundwater Report (Part 1)" dated September 2011, by GSC. The objective of the Supplemental RI (SRI) was to evaluate potential sources of soil and groundwater impacts, determine the fate and transport characteristics of known contaminants of concern (COCs), and evaluate the risk that the COCs pose to human health and the environment. Results of the soils SRI indicated that all the shallow soils with COC concentrations exceeding the Medium Specific Concentrations (MSCs) are covered with impermeable membranes, buildings, or paved parking areas. In March of 2012, a human health risk assessment for the two campuses was completed by GSC and submitted for regulatory review.

Previous remedial activities at the site have indicated that the primary COCs in groundwater due to concentration, frequency, and potential for off-site migration are chlorinated solvents, include tetrachloroethene (PCE), trichloroethene (TCE), and 1,1,1-trichloroethane (TCA), as well as the degradation products of those compounds. Lesser frequencies of hexavalent chromium, lead, and cyanide have also been detected in selected site groundwater monitoring wells. The distribution of these constituents in groundwater suggests that they have originated from multiple sources.

A.6 Project / Task Descriptions

The Part 2 SGWRI focuses on further evaluation of potential sources of soil and groundwater impacts and the vertical extent of those impacts. The scope of work is designed to provide additional characterization data to define the extent of contamination at the facility, hydraulic characteristics of the karst aquifer, fate and transport of the COCs, source area locations, and to evaluate proposed modifications to the interim groundwater extraction system. The results of Parts 1 and 2 of the Supplemental Remedial Investigation will be used for the feasibility study and the path forward for eventual closure of the fYNOP site under the PADEP/USEPA One Cleanup program.

The investigation is broken into four phases:

- **Phase 1 Pre-Drilling Tasks** – There are a number of general regional and off-Site studies which do not involve drilling that will be performed first. The results of this information will be used to determine the need for off-Site drilling and to plan subsequent investigations.

- **Phase 2 Drilling Tasks** – Drilling will start with on-Site well installation in suspected source areas, and may be ongoing while some of the off-Site regional studies are being conducted. Off-Site drilling would follow the completion of on-Site drilling in most cases. Multiple rig types may be used.

- **Phase 3 Testing and Monitoring** – Stream studies, weir installation, rounds of surface and groundwater sampling for chemical analysis, borehole testing, and tracer testing will be conducted after the installation of wells. A long term monitoring program (on the order of six months to one year) in which wells and streams will be instrumented will be conducted. Groundwater extraction wells will be turned off and back on while responses are recorded in the deepest wells.

- **Phase 4 Data Analysis and Report** – Findings and conclusions will be compiled using text, tables, graphs and maps and presented as a supplemental investigation report for the remedial investigation.

A generalized schedule is shown on **Figure A-4.**

A.7 Quality Objectives and Measurement Performance Criteria

The general quality objectives of this project are to characterize groundwater, soil, and other media, and to collect hydrogeologic data of sufficient quality, quantity, and precision to describe the subsurface conditions at the site, determine the nature and extent of contamination, and assist with remedial decisions. The QA program will incorporate quality control (QC) procedures for field sampling and field measurements, chain of custody, laboratory analyses, and reporting to ensure generation of sound analytical results and physical data.

A.7.1 Quality Objectives and Quality Control Measures

The overall project objective is to complete the RI to allow implementation of the feasibility study (FS) and selected final remedy(ies) at the fYNOP site. Various site- or area-specific investigations or cleanups may be implemented during this process. During the course of these activities, the project must develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide information for evaluation, assessment, and remediation. Data must be technically sound and legally defensible. Procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal QC, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP and / or in the Field Sampling Plan (FSP) and its addendums. The purpose of this section is to address the objectives for data accuracy, precision, completeness, representativeness, and comparability.

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data required to support decisions made during investigation activities and are based on the end uses of the data being collected.

A.7.1.1 Project Objectives

Site- or area-specific work plans will identify specific task objectives as they relate to investigation action levels and remediation. General analytical objectives are:

- To provide data of sufficient quality and quantity to support ongoing supplemental remedial investigation efforts.
- To provide data of sufficient quality and quantity to support area-specific remediation goals (when applicable).
- To provide data of sufficient quality to meet applicable Commonwealth of Pennsylvania and Federal (EPA, Region III) risk-based goals, as required under the One Cleanup program.
- To ensure samples are collected using approved techniques and are representative of existing site conditions.

- To use QA/QC procedures for both field and laboratory methods that meet the EPA, PADEP, and One Cleanup program guidance document requirements.

A.7.1.2 Quality Assurance Objectives for Measurement Data

An analytical DQO summary for these activities is presented in **Tables A-2, A-3, and A-4**. QC parameters stated in the specific SW-846 methods (i.e., percent recoveries) will apply for each chemical listed. These Tables also serve as the suite of parameters that will be analyzed for metals, VOCs and SVOCs.

A.7.1.3 Level of Quality Control Effort

To assess whether QA objectives have been achieved, analyses of specific field and laboratory QC samples will be required. These QC samples include trip blanks, field duplicates, laboratory method blanks, laboratory control samples, laboratory duplicates, rinse blanks, and matrix spike/matrix spike duplicate (MS/MSD) samples.

Trip blanks and field equipment rinse blanks will be submitted for analysis, along with field duplicate samples, to provide a means to assess the quality of the data resulting from the field sampling program. Trip blanks (employed for VOC analysis only) are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage. Rinse blanks are used to assess the effectiveness of field decontamination processes in conjunction with field blanks of the site potable water source used for decontamination. Criteria and evaluation of blank determinations are provided in Section B.5.2. Field duplicate samples are analyzed to determine sample heterogeneity and sampling methodology reproducibility.

Laboratory method blanks and laboratory control samples are employed to determine the accuracy and precision of the analytical method implemented by the laboratory. Matrix spikes provide information about the effect of the sample matrix on the measurement methodology. Laboratory sample duplicates and MSDs assist in determining the analytical reproducibility and precision of the analysis for the samples of interest.

The general level of QC effort will be at least one field duplicate for every 20 investigative samples and at least one per matrix if there are less than 20 samples collected for a given matrix. One VOC

analysis trip blank consisting of analyte-free water will be included along with each shipment of VOC soil or water samples.

MS/MSD samples are investigative samples. Soil MS/MSD samples require no extra volume for semi-volatile organic compounds (SVOCs) or metals. However, soil VOC samples may require additional samples to be collected for these purposes. Aqueous MS/MSD samples must be collected at triple the volume for SVOC, pesticide/PCB, and metals parameters. One MS/MSD sample will be analyzed for at least every 20 samples submitted to the laboratory per sample matrix (i.e., groundwater, soil).

The level of QC effort for testing and analysis of parameters will conform to accepted methods, such as EPA SW-846 protocols (USEPA, 1993), American Society for Testing and Materials (ASTM) protocols, and National Institute for Occupational Safety and Health (NIOSH) protocols. The QC effort for in-field measurements - including temperature, conductivity, pH, and organic vapor concentrations - will include daily calibration of instruments using traceable standards and documented instrument manufacturer procedures. Field instruments and their method of calibration are discussed further in Section B.7 of this QAPP.

The following specific QC measures apply to samples collected and measurements made as part of the required field activities. These QC measures include both field and laboratory requirements and are listed in **Table A-5**.

Specific QA/QC analysis and objective summaries including analytical parameter listings, method references, QA/QC limits, and intended use of the data are presented in **Table A-4**.

A.7.2 Data Quality Indicators

Performance acceptance criteria are expressed in terms of six data quality indicators (DQIs): precision, bias, representativeness, comparability, completeness, and sensitivity. An explanation of each DQI, together with the acceptance criteria for each DQI is presented in the following subsections.

A.7.2.1 Precision

Precision is a measure of mutual agreement among individual measurements of the same property under prescribed similar conditions. Precision is independent of the error (accuracy) of the analyses and reflects only the degree to which the measurements agree with one another, not the degree to which they agree with the "true" value for the parameter being measured.

Precision of the measurement data for this project is based on control sample analyses (for repeatability) and results of field duplicate samples (for sampling replicability). A field duplicate is defined as a sample that is divided into two equal parts for the purpose of analysis. Discretely sampled field duplicates are useful in determining sampling variability, and field duplicates will be used as a quality control measure to monitor precision relative to sample collection activities. Field duplicate frequency will be five percent of the original sample number or as specified in the applicable work plan. Field duplicates will be collected for groundwater and soil vapor only and will be analyzed for the same parameters as the original sample.

Precision for laboratory and field measurements will be expressed as the relative percent difference (RPD) between two duplicate determinations:

$$RPD = \frac{|X_1 - X_2|}{(X_1 + X_2)/2} \times 100\ \%$$

where X_1 and X_2 represent the individual values found for the target analyte in the two duplicate analyses. Acceptance criteria for laboratory precision will be as specified in the analytical method. RPDs will be compared to the laboratory-established RPD for the analysis. The analyst or his/her supervisor must investigate the cause of data outside stated acceptance limits. Follow-up action includes recalibration, reanalysis of QC samples, sample reanalysis, or flagging the data as suspect if problems cannot be resolved.

Precision of duplicates may depend on sample homogeneity. Acceptance criteria for field duplicate samples is stated in **Tables A-2, A-3 and A-4**.

A.7.2.2 Bias

Bias is the systematic or persistent distortion of a measurement process causing errors in one direction. Depending on the analytical method, analytical bias will be evaluated by analysis of laboratory control spike / laboratory control spike duplicate (LCS/LCSD) or MS/MSD samples. The laboratory will perform a LCS/LCSD or MS/MSD for each analytical batch, as appropriate.

Acceptance criteria for LCS/LCSD and MS/MSD measurements will be expressed as a percent recovery and are specified in the analytical method and in the EPA Region 2 *Standard Operating Procedures for the Validation of Organic Data* (HW-24, Rev. 1, June 1999). Various blank samples (such as laboratory method blanks and field equipment rinse blanks) will also be used to assess contamination of samples that may bias results high.

A.7.2.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. The extensive historical chemical concentration data available for the Site, coupled with the broad geographic and temporal distribution of these data is such that the monitoring plans being developed for the Site are believed to accurately reflect the state of the whole system.

The characteristics of representativeness are usually not quantifiable. Subjective factors to be taken into account are as follows:

1. Degree of homogeneity of a site.
2. Degree of homogeneity of a sample taken from one point in a site.
3. Available information on which a sampling plan is based.

Field duplication, as defined above under precision, is also used to assess representativeness. Two samples collected at the same location and at the same time are considered to be equally representative of this condition at a given point in space and time. To maximize representativeness of results, sampling techniques, sample size, and sample locations are carefully chosen so they provide laboratory samples representative of the Site and the specific area. For this project, the only

quantitative measure of representativeness will be the field duplicate results as discussed in Section A.7.2.1.

A.7.2.4 Comparability

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability is ensured through the use of established and approved sample collection techniques and analytical methods, consistency in the basis of analysis (wet weight vs. dry weight, volume vs. mass, etc.), consistency in reporting units, and analysis of standard reference materials.

Data comparability is achieved by using standard units of measure. The use of standard methods to collect and analyze samples, along with instruments calibrated against Standard Analytical Reference Materials (SARM), which are National Institute for Standards and Technology (NIST)-traceable standards, also ensures comparability.

Comparability also depends on the other data quality characteristics. Only when data are judged to be representative of the environmental conditions, and when precision and accuracy are known, can data sets be compared with confidence.

A.7.2.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under normal conditions.

Data completeness is a measure of the extent to which the database resulting from a measurement effort fulfills objectives for the amount of data required. Completeness is defined as the valid data percentage of the total tests requested:

$$Completeness(\%) = \left(\frac{number\ of\ valid\ analyses\ per\ method}{number\ of\ requested\ analyses\ per\ method} \right) \times 100$$

Valid analyses are defined as those where the sample arrived at the laboratory intact, properly preserved, in sufficient quantity to perform the requested analyses, and accompanied by a completed chain of custody. Furthermore, the sample was analyzed within the specified holding time and in such a manner that analytical QC acceptance criteria were met.

Completeness for the entire project also involves completeness of field and laboratory documentation, whether all samples and analyses specified in this plan have been processed and the procedures specified in the work plans and laboratory QAPPs and Standard Operating Procedures (SOPs) have been implemented.

For this project as a whole, a completeness value of 90 percent is considered acceptable. Failure to achieve this goal may necessitate resampling and reanalysis.

A.7.2.6 Sensitivity

Sensitivity is essentially the lowest detection limit of the method or instruments for each of the measurement parameters of interest. Technically, it is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest.

Quantitation limits are based on the extent to which the laboratory or field equipment, and/or analytical process itself can provide accurate, minimum data measurements of a reliable quality for specific constituents in actual field samples. The actual quantitation limit for a given analysis varies depending on instrument sensitivity, preparation, method efficiency, and matrix effects. The minimum project requirements are considered when establishing the quantitation limits appropriate for each project. The minimum project requirements for this project are the current medium specific concentrations for the PADEP Land Recycling Program, revised January 8, 2011.

Tables A-6 through A-10 list the target analytes, analytical methods and project reporting levels (for samples not requiring serial dilution) for analysis of samples.

A.8 Special Training / Certification

All field personnel are trained scientists, engineers, or environmental sampling technicians. The GSC Project Director, Project Manager, and Quality Assurance Manager are registered professional geologists. The GSC QA Manager is also a certified organic data validator. All project personnel have received the necessary initial 40-hour OSHA HAZWOPER training, 8-hour supervisor training, and 8-hour annual refresher training required by 29 CFR 1910.120. In addition, the GSC QA Manager has received RCRA hazardous waste management training. Training certificates are kept on file at GSC's Harrisburg, Pennsylvania office. No other special training or certifications are necessary to perform activities described in the work plans listed in Section A.6.

The analytical laboratory, TestAmerica of Pittsburgh, Pennsylvania is NELAC certified for Pennsylvania. The surveying contractor shall be a registered Land Surveyor in Pennsylvania.

A.9 Documents and Records

A document control procedure will be used to identify the most current version of the QAPP and to help ensure that only the most current version of the QAPP is used by all project participants. Each page of this QAPP uniquely identifies the revision number and date of the plan, and the page number in relation to the total number of pages. The version number will be the designated "Revision No." shown in the upper right hand corner of each page of the QAPP. The first version of the QAPP will be Revision No. 0. Updates to the QAPP will be assigned a new incremental revision number; e.g., the first update will be Revision No. 1. This revision number will be reflected on all pages of the QAPP, regardless of how many pages are actually affected by the revision.

GSC has established a document management system that includes the following elements:

1. Assignment of specific project and task numbers to each document generated by GSC.

2. Maintenance of both hardcopy and electronic copies of reports and work plans submitted to regulatory agencies.

3. Daily backup and off-site storage of critical electronic files.

4. Computer filing systems based on the project number and type of data for ease of tracking and retrieval. These systems are further described in Section B.10.

Documentation associated with monitoring well drilling activities, soil sampling, and groundwater sampling is detailed in **Appendix A** of this QAPP. Documents include field log forms, drilling and well construction reports, and instrument calibration forms which will be maintained at the GSC office in good order.

Other records and documents that will be produced include weekly progress reports and interim and final reports. Reports to be produced are referenced in the work plans associated with this QAPP.

B DATA GENERATION AND ACQUISITION

B.1 Sampling Process Design (Experimental Design)

It is anticipated that investigations performed at the Harley-Davidson site will produce soil, soil gas, sediment, groundwater, and surface water and liquid/solid waste sample data of definitive quality and field measurements of screening quality. IDW samples may also be collected for analyses. Additional samples will be collected to complete field QC duplicate, field blank, and QA split sample analyses. Specific numbers of samples (including parameters and methods) will be incorporated into addendums to the work plan. Investigation samples will require VOC, SVOC, polychlorinated biphenyls (PCBs), metal, and other general chemical determinations, as represented in **Tables A-6** through **A-11**. Sampling procedures for the various media under investigation are discussed in the work plans, while relevant QA field sampling forms for GSC employees are included in **Appendix A**.

Identification of the primary field equipment and supporting materials to be used for these investigations is presented in the site-specific work plan. Several different types of field measurements will be performed during these investigations. Soil field measurements and observations will be used to determine soil classification and characteristics. Groundwater field measurements may determine groundwater characteristics (pH, specific conductance, temperature, etc.) and static groundwater levels. A description of the field instruments and associated calibration requirements and performance checks to be used for field measurements is presented in Section B.7 of this QAPP.

The locations of the sampling stations and sample media to be collected during these investigations, as well as the rationales for the selection of these stations, are presented in the FSP and its addendums.

B.1.1 General Information and Definitions

The following sections provide definitions and information about QA and QC sampling.

B.1.1.1 Contract Laboratory

The laboratories subcontracted to perform analysis of samples have been selected through Harley-Davidson's procurement and review process prior to initiation of sample collection.

B.1.1.2 QA and QC Samples

These samples are analyzed for the purpose of assessing the quality of the sampling effort and of the reported analytical data. QA and QC samples to be used for this project are duplicates, field equipment rinse blanks, trip blanks, and field blanks.

B.1.1.3 Field Duplicate QC Samples

These samples are collected by the sampling team for analysis by the contract laboratory. The identity of duplicate QC samples is held blind to the analysts, and the purpose of these samples is to provide site-specific, field-originated information regarding the homogeneity of the sampled matrix and the consistency of the sampling effort. These samples are collected concurrently with the primary environmental samples and equally represent the medium at a given time and location. Duplicate samples will be collected from each media addressed by a project and be submitted to the contractor laboratory for analysis.

B.1.1.4 Trip Blanks

These samples consist of containers of organic-free reagent water that are kept with the field sample containers from the time they leave the laboratory until the time they are returned for analysis. The purpose of trip blanks is to determine whether samples are being contaminated during transit or sample collection. For this project, one trip blank will be placed into each cooler used to store and ship samples designated for volatile organic analysis.

B.1.1.5 Field Equipment Rinse Blanks

These samples will be taken from the rinse water collected from equipment decontamination activities (when applicable). They will comprise samples of analyte-free water which have been rinsed over decontaminated sampling equipment, collected, and submitted for analysis of the parameters of interest. They are employed to assess the effectiveness of the decontamination

process, the potential for cross contamination between sampling locations, and incidental field contamination.

B.1.1.6 Field Blanks

When applicable, a sample from the site water supply used for equipment decontamination and other activities will be acquired and submitted for analysis with the primary samples. In addition, samples of on-site analyte-free water sources may also be submitted for analysis.

B.1.2 Sample Containers, Preservatives and Holding Times

Sample containers, sample preservation, and holding times for soils/solid samples and water samples collected during these investigations are described in **Tables B-1** and **B-2**, respectively. The specific number of containers required for this study will be estimated and supplied by the analytical facilities. Additional sample volumes will be collected and provided, when necessary, for the express purpose of performing associated laboratory QC (laboratory duplicates, MS/MSD).

Sample containers will be provided by the analytical support laboratories, which will also provide the required types and volumes of preservatives with containers as they are delivered to the project. Temperature preservation will be maintained at 4 degrees Centigrade (°C) (±2°C) immediately after collection and will be maintained at this temperature until the samples are analyzed. In the event that sample integrity—such as holding times, cooler temperatures, etc.—is compromised, resampling will occur as directed by the GSC Laboratory Coordinator. Any affected data will be flagged and qualified per data validation instructions and guidance.

B.1.3 Field Documentation

B.1.3.1 Field Logbooks

Sufficient information will be recorded in the logbooks to permit reconstruction of all field sampling and other activities conducted. Information recorded on other project documents will not be repeated in the logbooks except in summary form where determined necessary. Field logbooks will be kept in the possession of field personnel responsible for completing the logbooks or in a

secure place when not being used during fieldwork. Upon completion of the field activities, all logbooks will become part of the final project file.

B.1.3.2 Photographs

Digital photographs will be taken as part of the record. They will be labeled and date stamped using the digital database accompanying the photo file, and stored in appropriate folders on GSC's network.

B.1.3.3 Sample Numbering System

A unique sample numbering scheme will be used to identify each sample designated for laboratory analysis. The purpose of this numbering scheme is to provide a tracking system for the retrieval of analytical and field data on each sample. Sample identification numbers will be used on all sample labels or tags, field data sheets or logbooks, chain-of-custody records, and other applicable documentation used during the project. A listing of sample identification numbers will be maintained in the field logbook. The project database will be populated with sample numbers and information consistent with information found here and in the work plans.

The sample numbering scheme used for field samples will be employed for duplicate samples and other field QC such that they will not be readily discernible by the laboratory. A summary of the sample numbering scheme to be used for the project is presented in **Table B-3**.

B.1.3.4 Documentation Procedures

Labels will be affixed to all sample containers during sampling activities. Information will be recorded on each sample container label at the time of sample collection. The information to be recorded on the labels will be as follows:

- Contractor name;
- Sample identification number;
- Sample type (discrete or composite);

- Site name and sample station number;
- Analysis to be performed;
- Type of chemical preservative present in container;
- Date and time of sample collection; and
- Sampler's name and initials.

Sample logbooks and chain-of-custody records will contain the same information as the labels affixed to the containers. These records will be maintained and will record information related to the sampling effort and the process employed.

B.1.3.5 Field Variance System

Procedures cannot fully encompass all conditions encountered during a field investigation. Variances from the operating procedures, FSP, and/or HASP may occur. Variances that occur during the field investigation will be documented on a field change request (FCR) form or a NCR and will be noted in the appropriate field logbooks. Examples of the FCR and NCR forms are included in **Appendix B**. If a variance is anticipated (i.e., because of a change in the field instrumentation), the applicable procedure will be modified and the change noted in the field logbooks. These requested changes will be dealt with similar to addendums to the Field Sampling Plan. If substantial, they will be submitted for review by the fYNOP team.

B.1.4 Decontamination of Sampling Equipment

Non-dedicated sampling equipment that comes into contact with contaminated soil, waste, or groundwater will require decontamination. Typically, disposable sampling equipment will be used, and decontamination will not be needed for many sampling activities.

Down-hole tools used for drilling and sampling will be decontaminated between well or boring locations. Drilling equipment will be cleaned using a steam cleaner. The non-disposable tools used for soil and groundwater sampling will be cleaned with a brush, water, detergent, and a final deionized water rinse. Water level indicators and non-dedicated or disposable groundwater

sampling equipment will be decontaminated with deionized water between measurements/sampling locations. If possible, measurements and sampling should be conducted from wells which are least contaminated first, followed by those which have higher contaminant concentrations to avoid potential cross-contamination. Water from these decontamination efforts will be collected into a bucket or other suitable container and returned to the on-site groundwater treatment plant for treatment.

B.1.5 Sample Planning

Sample planning for Project Managers and Field Sampling Managers will use the following procedure:

- Identify the number of soil or water samples desired for the project.

- Refer to Section B.1 of the QAPP for information about blanks, duplicates, or MS/MSD samples needed. Typically one field duplicate and one MS/MSD sample are required for every 20 field samples, and one aqueous VOC trip blank for each daily shipment of samples).

- Refer to **Tables A-6 through A-11** to determine the acceptable laboratory methods for each analysis and the corresponding reporting limits needed. The QAPP provides the reporting limits for the standard analyses run at Harley-Davidson. If the project objectives require different reporting limits, the laboratory and Harley-Davidson should be contacted for approval of special conditions.

- Send e-mail to the TestAmerica point of contact, currently Jill Colussy [Jill.Colussy@testamericainc.com], to request bottles, coolers, and preservatives for the project. Copy e-mail to GSC QA Manager and GSC Sample Manager. Identify the number of samples, matrix (soil or aqueous), analytical methods needed (or simply refer to the QAPP list), when the samples are going to be collected and shipped, if there are holding time issues, or if Saturday receipt of samples is needed. Have bottles shipped to the GSC Field Sampling Manager at the Harrisburg office address:

Groundwater Sciences Corporation
2601 Market Place Street, Suite 310

Harrisburg, PA 17110-9340

B.1.6 Database System

GSC will utilize the database system developed by SAIC for handling fYNOP laboratory and field data. This database is administered by the SAIC Software Systems Engineer/Database Administrator (Knut Torgerson).

B.1.7 Preparation of Chain of Custody and Sample Labels

The user can decide between using the Access database to creating an electronic chain-of-custody and pre-printed labels ahead of time or decide to use the hard copy chain-of-custody (see forms in **Appendix A**). The electronic chain-of-custody can save time in the field and reduce errors, because one will only need to insert sample times and depths in the field. The electronic chain-of-custody will have the correct laboratory address, contact names and telephone numbers, and correct laboratory methods included. Use the Harley-Davidson sample nomenclature system identified in **Table B-3** of the QAPP when naming samples, which takes the form of XX-AAAA-mm-NNN-nn-z. Pay particular attention to the correct nomenclature of QC samples (duplicates, blanks, etc). Note that the "z" category is sample type (0 through 5), with an added category of "T" for Toxicity Characteristic Leaching Procedure (TCLP) analysis of waste samples. The method of filling out hard copies of chain-of-custody records in the field and filling out the sample bottle labels can still be used if desired. If this is done, the hard copy of the chain-of-custody must be converted to an electronic chain-of-custody at a later time by the Data Manager.

B.2 Sampling Methods

Sampling methods for various environmental media are presented in the FSP and its addendums. These sampling protocols in the FSP and its addendums describe sample collection procedures and the required sampling equipment. This section addresses sample collection data, and procedures for coordinating with the laboratory for sampling and for data management.

B.2.1 Sample Collection

Samples and field data will be collected using the following procedure:

- Record sampling information in the field logbook per guidance in Section B.3.1.2 of this QAPP.

- Well purging parameters will be entered into a hand-held personal digital assistant (PDA) device in the field, which can be downloaded into the database. Training will be conducted on the device prior to its use in the field.

- Sample locations and depths must be documented properly in the field. In the case of a grab sample not from an established station (for instance, an existing well), the location coordinates can be obtained using a hand-held global positioning system (GPS) device.

- New well locations and reference elevations will be surveyed. Groundwater samples will include a depth-to-water reading. Soil sampling depths should include an upper and lower depth range (nearest foot), which then becomes part of the sample nomenclature. Field notes should include a sketch and triangulation measurements from the sampling location to the nearest recognizable map points (corner of building, nearest well, etc.).

- Sample location information (GPS coordinates, hand measurements, or mapped locations) will be forwarded to the Data Manager after each sampling event in order to populate the database.

Tables B-1 and **B-2** specify the container requirements for soil and aqueous samples.

B.2.2 Submittal of Samples to Analytical Laboratory

Sample will be submitted to the analytical laboratory

- Double check to make sure that bottles are preserved properly, labeled properly, and that the number of containers listed on the electronic chain-of-custody is the same number of bottles provided in the container.

- Make sure that bottles are wrapped securely (bubble wrapping for glass jars) so that breakage does not occur during shipment.

- Make sure that enough ice is used to keep the samples at 4-degrees Celsius during shipment. Bagged ice dispensers are available at several locations throughout the Harley-Davidson facility.

- Make sure that a bag liner is used in the cooler and the outside drain valve is taped shut.

- Make sure that a copy of the chain-of-custody is placed inside a zip-lock bag and taped to the top of the inside of the cooler.

- Make sure that the cooler is securely taped shut (wraps at two locations) and that signed custody seals are placed at opposite corners across the taped joints.

- Cooler shipping arrangements can be made using the TestAmerica sample courier or by shipping overnight via FedEx. If using FedEx, try first to obtain a FedEx shipping number from TestAmerica before using a GSC shipping number. Make sure that the FedEx label is properly filled out with the laboratory address and project number.

B.2.3 Submittal of Chain of Custody and Sample Locations

- Submit electronic chain-of-custody or paper copy of hand-written chain-of-custody to the GSC Data Manager, and a copy to the GSC Sample Manager.

- Submit sample location information to the GSC Data Manager. Provide real world coordinates (in PA State Plane NAD 83, South, in feet). In lieu of coordinates, provide map or measurements for location of sample points.

- Once chain-of-custody is received from samplers convert to eCOC and submit eCOC and coordinates to SAIC Data Manager (Knut Torgerson).

B.2.4 Verification of Requested Analytical Testing

- The Analytical Laboratory point of contact will send an e-mail to the GSC Sample Manager to verify whether the requested analysis and samples are correct (sample confirmation).

- The GSC Sample Manager will compare the information on the sample confirmation e-mail with the electronic chain-of-custody to determine if the laboratory is conducting the correct analysis. The GSC Sample Manager may need to confirm any discrepancies with the Field Manager or the Project Manager before replying to the laboratory.

- The GSC Sample Manager will reply to the laboratory point of contact to confirm the requested analytical work or make corrections to sample nomenclature or analytical requirements as necessary. The GSC Sample Manager will copy the Field Manager or Project Manager with this e-mail confirmation.

B.2.5 Receipt of Data Package from Laboratory

Upon completion of the analytical work, data packages from the laboratory should include a hard copy of the data and a disc which contains a .pdf of the entire data package, along with an electronic data deliverable (EDD) file (in .csv format). Forward entire data package to the GSC Sample Manager for invoice checking, processing, and filing. The GSC Sample Manager forwards EDD file and .pdf copy to the GSC Data Manager. If data validation is to be performed, GSC Sample Manager will forward hard copies of the report to the GSC Data Validator.

B.2.6 Cross Check by GSC Data Manager

The GSC Data Manager puts a copy of the EDD and .pdf report on the GSC server. The data on the server are sorted by sample event, date submitted, and by Sample Delivery Group (SDG) number. The GSC Data Manager then reviews the EDD and checks data for formatting mistakes. The GSC Data Manager forwards the EDD data electronically to the SAIC Database Administrator in McLean, Virginia.

B.2.7 Data Entry by SAIC Database Administrator

The SAIC Database Administrator places the data into the web-based database called former York Naval Ordnance Plant (fYNOP) for viewing, or querying. To access this data, use the following web address: (https://www.fynop.com).

B.2.8 Data Package Validation by GSC Data Validator

- Once the eCOC and EDD has been inserted into the database the SAIC data manager will generate a completion and error/duplicate data report and submit to the GSC data manager for error resolution.

- The GSC Sample Manager forwards a hard copy of data package to the GSC Data Validator to conduct data validation per SAIC Technical Procedure TP-300-7 (Appendix D). Ten percent of representative data packages are selected from a data set for verification. In addition, all data are screened for holding time exceedances along with a review of all field blanks for blank contamination.

- The GSC Data Validator returns the completed validation summary and a list of data qualifiers to the GSC Sample Manager for filing or inclusion in the report.

- The GSC Data Validator or designee goes onto the fYNOP database to add qualifiers to the data package.

B.2.9 Data Ready for Use

When tabulating data, use the preferred format and color scheme when comparing to existing standards (MSCs or Regional Screening Levels [RSLs]). This color scheme is light turquoise for RSLs, light yellow for Direct Contact MSCs, and tan for Soil-to-Groundwater MSCs. Typically, only show detected VOC or SVOC compounds to limit table size. Show the detection limit (reporting limit) for all non-detects. Show any data validation qualifiers associated with the data.

B.3 Sample Handling and Custody

Sample maximum holding times from sample collection to extraction are listed on **Tables B-1 and B-2**. Samples will be labeled according to the scheme shown on **Table B-3**.

It is the policy and intent of this investigation procedure to follow EPA policy regarding sample custody and chain-of-custody protocols. The custody is in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including originals of laboratory reports and electronic files, are maintained under document control in a secure area. A sample or evidence file is under your custody when it is:

- In your possession;
- In your view, after being in your possession;
- In your possession and you place them in a secured location; or
- In a designated secure area.

Samples and will be handled using the following procedure:

- Double check to make sure that all bottles are preserved properly, labeled properly, and that the number of containers listed on the electronic chain-of-custody is the same number of bottles provided in the container.
- Make sure that bottles are wrapped securely (bubble wrapping for glass jars) so that breakage does not occur during shipment.
- Make sure that enough ice is used to keep the samples at 4-degrees Celsius during shipment. Bagged ice dispensers are available at several locations throughout the Harley-Davidson facility.
- Make sure that a bag liner is used in the cooler and the outside drain valve is taped shut.

- Make sure that a copy of the chain-of-custody is placed inside a zip-lock bag and taped to the top of the **inside** of the cooler.

- Make sure that the cooler is securely taped shut (wraps at two locations) and that signed custody seals are placed at opposite corners across the taped joints.

- Cooler shipping arrangements can be made using the TestAmerica sample courier or by shipping overnight via FedEx. If using FedEx, try first to obtain a FedEx shipping number from TestAmerica before using a GSC shipping number. Make sure that the FedEx label is properly filled out with the laboratory address and project number.

B.3.1 Sample Documentation

The sample packaging and shipment procedures summarized below will ensure that samples will arrive at the laboratory with the chain-of-custody intact. The protocol for specific sample numbering using case numbers and traffic report numbers (if applicable) and other sample designations will be followed.

B.3.1.1 Field Procedures

The field sampler is responsible for the care and custody of the samples until they are transferred or properly dispatched. As few people as possible should handle the samples. Each sample container will be labeled with a sample number, date and time of collection, sampler, and sampling location. Sample labels are to be completed for each sample. The Project Manager, in conjunction with the QA Manager, will review field activities to determine whether proper custody procedures were followed during the fieldwork and to decide if additional samples are required.

B.3.1.2 Field Logbooks

Samples will be collected following the sampling procedures documented in the work plan. When a sample is collected or a measurement is made, a detailed description of the location shall be recorded. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers. A sample identification number will be assigned before sample collection. Field duplicate samples

and QA split samples, which will receive an entirely separate sample identification number, will be noted under sample description. Equipment employed to make field measurements will be identified, along with their calibration dates.

B.3.1.3 Transfer of Custody and Shipment Procedures

Samples are accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record will document transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area. An example of the chain-of-custody form to be used for these investigations is provided in **Appendix A**.

All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler for return to project management and the project file.

Shipments will be made through FedEx, in compliance with applicable U.S. Department of Transportation (DOT) regulations for environmental samples. The Field Manager and Laboratory Coordinator will discourage the shipping of samples on Fridays unless it is absolutely necessary, and the laboratory has assured the project that personnel will be present on Saturdays to receive and enact necessary processing within the analytical holding times.

B.3.2 Laboratory Chain-of-Custody Procedures

Laboratory custody procedures will be described in the subcontract laboratory QA Plan (see **Appendix C**). This document identifies the laboratory custody procedures for sample receipt and log-in, sample storage, tracking during sample preparation and analysis, and laboratory storage of data.

B.3.3 Final Evidence Files Custody Procedures

The Project Manager is the custodian of the evidence file and will maintain the contents of evidence files for this investigation, including relevant records, reports, logs, field notebooks, pictures,

subcontractor reports, correspondence, laboratory logbooks, and chain-of-custody forms. The evidence file will be stored in a secure, limited-access area and under custody of the Field Manager during the field sampling effort.

Analytical laboratories will retain all original raw data information (both hard copy and electronic) in a secure, limited-access area and under custody of the Laboratory Project Manager.

B.4 Analytical Methods

The analytical methods to be used in the analysis of samples collected during activities are listed in **Tables A-6** through **A-11**. TestAmerica of Pittsburgh, Pennsylvania) has been selected as the principal laboratory to analyze groundwater and soil samples. Sample analyses will be performed in accordance with the laboratory's QA Plan which is presented in **Appendix C** of this QAPP. The laboratory will maintain appropriate certifications to perform the analyses required for field sampling plan and its addendums. The principal laboratory will not subcontract or transfer any portion of this work to another facility unless expressly permitted to do so in writing by the Project Manager and Laboratory Coordinator.

If at any time such certifications are revoked in whole or in part, the laboratory must notify the GSC Laboratory Coordinator immediately to facilitate transfer of pending analyses to an alternative laboratory approved by Harley-Davidson, USACE Representative, Trust Fund 3rd Party Coordinator, EPA Remedial Project Manager, and PADEP Representative.

If contaminant concentrations are high, or for matrices other than normal waters and soils, analytical protocols may be inadequate. In these cases, sample analysis may require modifications to defined methodology. Analytical method variations will be identified in investigation-specific addenda. These may be submitted for regulatory review and approval when directed by the laboratory coordinator.

These SOPs must be adapted from and reference standard EPA SW-846 methods or appropriate national standard and thereby specify:

- Procedures for sample preparation;

- Instrument start-up and performance check;
- Procedures to establish the actual and required detection limits for each parameter;
- Initial and continuing calibration check requirements;
- Specific methods for each sample matrix type; and
- Required analyses and QC requirements.

B.5 Quality Control

B.5.1 Field QC

Field QC will be assessed during sample collection and field measurement through precision, accuracy, and reproducibility.

B.5.1.1 Sample Collection

The assessment of field sampling precision and accuracy will be made by collecting field duplicates and trip blanks in accordance with the procedures described in subsections B.1.1.3 and B.1.1.4 and in addendums to the FSP.

Field performance and systems audits will be performed as described in Section C.1.

B.5.1.2 Field Measurement

QC procedures for most field measurements (pH, conductivity, temperature, headspace, etc.) are limited to checking the reproducibility of the measurement by obtaining multiple readings on a single sample or standard and by calibrating the instruments. Refer to Section B.7 of this QAPP and the FSP for more information regarding these measurements.

B.5.2 Laboratory Analytical QC

Analytical QC procedures for these investigations are specified in the individual method descriptions. These specifications include the types of QC checks normally required: method

blanks, LCS, MS, MSD, calibration standards, internal standards, surrogate standards, tracer standards, calibration check standards, and laboratory duplicate analysis. Calibration compounds and concentrations to be used and the method of QC acceptance criteria for these parameters have been identified in the laboratory methods.

To ensure the production of analytical data of known and documented quality, laboratories associated with these investigations will implement method QA and QC checks.

Laboratory performance and systems audits will be performed as described in Section C.1.

B.5.2.1 QA Program

Subcontracted analytical laboratories will have a written QA program that provides rules and guidelines to ensure the reliability and validity of work conducted at the laboratory (see **Appendix C** for QA program at TestAmerica). Compliance with the QA program is coordinated and monitored by the laboratory's QA department, which is independent of the operating departments. For these investigations, selected support laboratory QA plans will be referenced and implemented in their entirety.

The stated objectives of the laboratory QA program are to:

- Properly collect, preserve, and store samples;
- Maintain adequate custody records from sample collection through reporting and archiving of results;
- Use properly trained analysts to analyze samples by approved methods within holding times;
- Produce defensible data with associated documentation to show that each system was calibrated and operating within precision and accuracy control limits;
- Accurately calculate, check, report, and archive data using the Laboratory Information Management System; and
- Document the above activities so that data can be independently validated.

Laboratory procedures are documented in writing as SOPs, which are edited and controlled by the QA department. Internal QC measures for analysis will be conducted with their SOPs and the individual method requirements specified.

B.5.2.2 QC Checks

Implementation of QC procedures during sample collection, analysis, and reporting ensures that the data obtained are consistent with their intended use. Both field QC and laboratory QC checks are performed throughout the work effort to generate data confidence. Analytical QC measures are used to determine if the analytical process is in control, as well as to determine the sample matrix effects on the data being generated.

Specifications include the types of QC required (duplicates, sample spikes, surrogate spikes, reference samples, controls, blanks, etc.), the frequency for implementation of each QC measure, compounds to be used for sample spikes and surrogate spikes, and the acceptance criteria for this QC.

The laboratory will provide documentation in each data package confirming that both the initial and ongoing instrument and analytical QC functions have been met. Nonconforming analysis will be reanalyzed by the laboratory, if sufficient sample volume is available. It is expected that sufficient sample volumes will be collected to provide for reanalysis, if required.

B.5.2.2.1 Analytical Process

Laboratory analytical process QC will be in accordance with USEPA SW-846 and will include the use of the following criteria, where applicable to the analytical method.

B.5.2.2.1.1 Method Blanks

A method blank is a sample of a non-contaminated substance of the matrix of interest (usually distilled/deionized water or silica sand) that is then subjected to the sample preparation (digestion, distillation, extraction) and analytical methodology applied to the samples. The purpose of the method blank is to check for contamination from within the laboratory that might be introduced

during sample preparation and analysis that would adversely affect analytical results. A method blank must be analyzed with each analytical sample batch.

Analytical sensitivity goals are identified in **Tables A-6** through **A-11** as project reporting levels. Method blank levels should be below these levels for all analytes; criteria are established at 2X these levels.

B.5.2.2.1.2 Laboratory Control Samples

The LCS contains known concentrations of analytes representative of the contaminants to be determined and is carried through the entire preparation and analysis process. Commercially available LCSs or those from EPA may be used. LCS standards that are prepared in-house must be made from a source independent of that of the calibration standards. Each LCS analyte must be plotted on a control chart. The primary purpose of the LCS is to establish and monitor the laboratory's analytical process control. An LCS must be analyzed with each analytical sample batch.

B.5.2.2.2 Matrix and Sample-Specific QC

Matrix and sample-specific QC will be in accordance with USEPA SW-846 and will include the use of the following criteria, where applicable.

B.5.2.2.2.1 Laboratory Duplicates

Laboratory duplicates are separate aliquots of a single sample that are prepared and analyzed concurrently at the laboratory. This duplicate sample should not be a method blank, trip blank, or field blank. The primary purpose of the laboratory duplicate is to check the precision of the laboratory analyst, the sample preparation methodology, and the analytical methodology. If there are significant differences between the duplicates, the affected analytical results will be reexamined. One in 20 samples will be a laboratory duplicate, with fractions rounded to the next whole number.

B.5.2.2.2.2 Surrogate Spikes

A surrogate spike is prepared by adding a pure compound to a sample before extraction. The compound in the surrogate spike should be of a similar type to that being assayed in the sample. The purpose of a surrogate spike is to determine the efficiency of recovery of analytes in the sample preparation and analysis. The percent of recovery of the surrogate spike is then used to gauge the total accuracy of the analytical method for that sample.

B.5.2.2.2.3 Isotopic Tracers

An isotopic tracer is prepared by adding a unique isotope of the same or similar element to a sample before preparation and analysis. The purpose of this isotopic tracer is to determine the efficiency of recovery of the targeted isotope or isotopes in the sample preparation and analysis. The percent of recovery of the tracer is then used to gauge the total accuracy of the analytical method for that sample and to compensate for the quantification of the analyte of interest.

B.5.2.2.2.4 Matrix Spike and Matrix Spike Duplicates

An MS is an aliquot of a sample spiked with known quantities of analytes and subjected to the entire analytical procedure. It is used to indicate the appropriateness of the method for the matrix by measuring recovery or accuracy. Accuracy is the nearness of a result or the mean of a set of results to the true or accepted value. An MSD is a second aliquot of the same sample with known quantities of compounds added. The purpose of the MSD, when compared to the MS, is to determine method precision. Precision is the measure of the reproducibility of a set of replicate results among themselves or the agreement among repeat observations made under the same conditions. MSs and MSDs are typically performed per 20 samples of similar matrix.

B.5.2.2.2.5 Method-Specific QC

The laboratory must follow specific quality processes as defined by the method. These will include measures such as calibration verification samples, instrument blank analysis, internal standards implementation, tracer analysis, method of standard additions utilization, serial dilution analysis, post-digestion spike analysis, chemical carrier evaluation, etc.

B.6 Instrument / Equipment Testing, Inspection, and Maintenance

Preventive maintenance and inspection of laboratory instruments are addressed in the laboratory QA documents in **Appendix C**. Preventive maintenance of field measuring instruments and field sampling devices will be accomplished by daily inspection of the instruments and devices being used and in accordance with the manufacturer's recommended procedures. Problems will be noted and necessary repairs will be made as soon as possible and before the integrity of subsequent field activities can be impacted.

B.6.1 Field Instruments and Equipment

The field equipment for this project may include temperature probes, pH meters, conductivity meters, dust meters, organic vapor detectors (i.e., photoionization detector [PID]), borehole water quality sensors, Membrane Interface Probe (MIP) sensors, water level transducers, heat pulse flow meters, and geophysical equipment. Specific preventive maintenance procedures to be followed for field equipment are those recommended by the manufacturers. These procedures are included in the user's manual provided with each instrument.

Field instruments will be checked and/or calibrated before they are shipped or carried to the field. Each field instrument will be checked daily against a traceable standard or reference with a known value to ensure that the instrument is in proper calibration. Instruments found to be out of calibration will be recalibrated before use in the field. If the instrument cannot be calibrated, it will be returned to the supplier or manufacturer for recalibration, and a backup instrument will be used in its place. Calibration checks and calibrations will be documented on the Field Meter/Calibration Log Sheets in the Measuring and Testing Equipment (M&TE) Logbook. Maintenance conducted on field equipment must be documented in the M&TE Logbook.

Critical spare parts such as tapes, papers, pH probes, electrodes, and batteries will be kept on-site to minimize downtime of malfunctioning instruments. Backup instruments and equipment should be available on-site or within one-day shipment to avoid delays in the field schedules.

B.6.2 Laboratory Instruments

Each investigation-associated laboratory will conduct a routine preventive maintenance program as part of its QA/QC Program to minimize the occurrence of instrument failure and other system malfunctions. Laboratory instruments will be maintained in accordance with manufacturers' specifications and the requirements of the specific method employed. This maintenance will be carried out on a regular scheduled basis and will be documented in the laboratory instrument service logbook for each instrument. Emergency repair or scheduled manufacturers' maintenance will be provided under a repair and maintenance contract with factory representatives.

B.7 Instrument / Equipment Calibration and Frequency

B.7.1 Field Instruments/Equipment

Instruments and equipment used to measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturers' specifications. Field instruments for this purpose will have unique identifiers, and each instrument will be logged in the M&TE Logbook before use in the field. The site safety and health officer (SSHO) or designee will be responsible for performing and documenting daily calibration/checkout records for instruments used in the field.

Equipment to be used during the field sampling will be examined to certify that it is in operating condition. This will include checking the manufacturer's operating manual and instructions for each instrument to ensure that maintenance requirements are being performed. Field notes from previous sampling events will be reviewed so that records of prior equipment problems will not be overlooked, and necessary repairs to equipment will be carried out. Spare parts or duplication of equipment will be available during the sampling effort.

Calibration of field instruments is governed by the specific SOP for the applicable field analysis method, and it will be performed at the intervals specified in the SOP. If no SOP is available, calibration of field instruments will be performed at intervals specified by the manufacturer or more frequently, as conditions dictate. Calibration procedures and frequency will be recorded in a field

logbook. If calibration is found to be off, any measurements taken with that equipment since the previous calibration will be marked as qualified/suspect.

Field instruments may include a pH meter, temperature probe, combustible gas monitor, particulate aerosol monitor, specific conductivity meter, and PID for organic vapor detection. If an internally calibrated field instrument fails to meet calibration/checkout procedures, then it will be returned to the manufacturer for service, and a backup instrument will be calibrated and used in its place. Field instrument uses, detection levels, and calibration are summarized in **Table B-4**.

Detailed instructions on the proper calibration and use of each field instrument follow the guidelines established by the manufacturer. The technical procedures for each instrument used on this project include the manufacturer's instructions detailing the proper use and calibration of each instrument.

B.7.1.1 pH Meter Calibraton

The pH meter will be calibrated according to the manufacturer's instructions using traceable standard buffer solutions before work in the field commences. Calibration will consider the following: that the temperature of sample and buffer solutions is equivalent; that at least two buffer solutions are utilized to calibrate the instrument; that readings are allowed to stabilize for a consistent period of time; that the electrode is properly rinsed between readings; and that the pH meter is recalibrated every time it is turned off and turned back on, or if it starts giving erratic results.

Before use in the field, calibration of the pH meter will be checked against two standard buffer solutions. Calibration procedures, lot numbers of buffer solutions, and other pertinent calibration or checkout information will be recorded in the M&TE Logbook for the project. The calibrations performed, standard used, and sample pH values are to be recorded in the field notebook. Appropriate new batteries will be purchased and kept with the meters to facilitate immediate replacement in the field, as necessary.

B.7.1.2 Temperature Calibration

Temperature measurements are carried out using a temperature probe. Mercury thermometers must be inspected before use to ensure that there is no mercury separation. Thermometers should be rechecked in the field before and after each use to see if the readings are logical and the mercury is still intact. Temperature probes should be checked biannually for calibration by immersing them in a bath of known temperature until equilibrium is reached. Temperature probes should be replaced if found to have more than 10 percent error even if recalibration is successful. The reference thermometer used for bath calibration should be NIST traceable. Temperatures will be recorded in the M&TE Logbook, the Sample Logbook, or the Cooler Logbook, as appropriate.

B.7.1.3 Conductivity Meter Calibration

The conductivity cells of the specific conductivity meter will be cleaned according to manufacturer's recommendations and specifications and calibrated against known conductivity standard solutions before each sampling event. The instrument will be checked daily with NIST-traceable standard solutions. If the instrument is more than 10 percent out of calibration when compared with standard solutions, the instrument will be recalibrated. If this cannot be done in the field, the instrument will be returned to the manufacturer or supplier for recalibration, and a backup instrument will be used in its place. Daily calibration readings and other relevant information will be recorded daily in the M&TE Logbook.

Daily checks should be as follows:

- Fill a sample cup with the conductivity calibration standard solution.
- Set temperature knob for temperature of standard solution.
- Turn to appropriate scale and set the instrument for the value of calibration standard.
- Record reading obtained in the M&TE Logbook.
- Rinse out the cup with distilled water.

B.7.1.4 Organic Vapor Detector

Organic vapor detectors will be checked daily according to the manufacturer's instructions. PIDs will be calibrated daily with a gas of known concentration. Daily calibration information will be recorded in the M&TE Logbook.

B.7.1.5 Particulate Aerosol Monitor

Particulate (dust) aerosol monitors in use will be checked daily according to the manufacturer's instructions. Zeroing should be performed in a clean climate-controlled room or utilizing one of the accessories provided by the manufacturer. All other calibrations cannot be performed in the field and require factory modifications. Daily calibration information will be recorded in the M&TE Logbook.

B.7.1.6 Combustible Gas Monitor

The combustible gas monitor provides field readings on explosive gases in the atmosphere and the percent of oxygen in the atmosphere. Many different combinations of sensors are available. The unit should be intrinsically safe, have an audible alarm when dangerous conditions are encountered, and be capable of operating for a full work shift without recharging of the battery. Calibration of these units is usually performed at the factory.

B.7.1.7 Membrane Interface Probe

MIP equipment calibration shall conform to manufacturer's specifications and ASTM Designation D 7352-07 (Standard Practice for Direct Push Technology for Volatile Contaminant Logging with MIP.

B.7.2 Laboratory Instruments

Calibration of laboratory instruments will be based on approved written procedures as documented in the laboratory QA manual (see **Appendix C** for TestAmerica). Records of calibration, repairs, or replacement will be filed and maintained by laboratory personnel performing QC activities. These records will be filed at the location where the work is performed and will be subject to QA audit. Procedures and records of calibration will follow the laboratory-specific QA Plans.

In cases where analyses are conducted according to the SW-846 protocols, the calibration procedures and frequencies specified in the applicable methods will be followed. For analyses governed by SOPs, refer to the appropriate SOP for the required calibration procedures and frequencies. Analytical calibrations and method QC will be consistent with the TestAmerica Quality Assurance Manual, February 22, 2010 (see **Appendix C**).

Records of calibration will be kept as follows:

- Each instrument will have a record of calibration with an assigned record number.
- A label will be affixed to each instrument showing identification numbers, manufacturer, model numbers, date of last calibration, signature of calibrating analyst, and due date of next calibration. Reports and compensation or correction figures will be maintained with instrument.
- A written stepwise calibration procedure will be available for each piece of test and measurement equipment.
- Instruments that are not calibrated to the manufacturer's original specification will display a warning tag to alert the analyst that the devices should not be used.

B.8 Inspection / Acceptance of Supplies and Consumables

Supplies and consumables, including standard solutions, sample bottles, calibration gases, reagents, hoses, deionized and potable water, and electronic storage media (CDs and magnetic diskettes) will be obtained from reputable distributors and manufacturers. Supplies and consumables will be inspected upon receipt by the end user (such as the field sampling technician, project scientist or engineer), and the expiration date of the consumables (e.g., calibration gases, standard solutions, reagents) will be checked when applicable. If supplies or consumables are damaged or expired, they will not be accepted for use and will be replaced.

B.9 Non-direct Measurements (Secondary Data)

Existing data, also known as secondary data, will be assessed to determine whether the quality of the data is sufficient for the current project objectives and intended use. This secondary data consists primarily of physical and chemical data collected prior to the implementation of this QAPP. The secondary physical data includes historical well logs, survey coordinates and elevations. The secondary chemical data includes historical reports and databases containing groundwater chemistry data and concentration contour maps from 1986 through 2011.

Secondary data will be identified in the reports where it is used and will be cited in the reference sections of these reports.

B.10 Data Management

B.10.1 Laboratory Data

The laboratory will prepare and submit analytical and QC data reports to the project in compliance with the requirements of this QAPP, including data forms listed in **Table B-5**. The laboratory EDD may be delivered either as an Excel® spreadsheet or as a comma- or tab- delimited file readable by Excel®. The file name must include the SDG number or equivalent. For example, if multiple files were submitted for the same SDG, the file name could be the SDG number followed by a sequential number for each file in the SDG. A file cannot contain more than one SDG. Multiple analytic fractions may be present in the file. The first row of the file should contain the field names. The expected field names and comments about them are listed in **Table B-5**. Fields do not have to be present in the order specified, and additional fields may be included; however, columns must be present for all fields identified below. An acceptable configuration is presented in **Table B-6** with all QA/QC sample data being provided in a companion ASCII file.

The subcontract analytical laboratory will prepare and retain full analytical and QC documentation. Such retained documentation will include hard copies and other storage media (i.e., CD or hard drive). As needed, the subcontract analytical laboratory will make available retained analytical data information.

B.10.2 Records Retention

Project records and files should be retained in compliance with EPA policy. For retention of RCRA Corrective Action, the retention period should be for up to five years following the closure of the RCRA unit. These files may be destroyed 10 years following the closure of those units. Records pertaining to the treatment, storage, or disposal facilities at Harley-Davidson must be retained until the facility closes. NPDES compliance records need only to be retained for a period of three years (five years for sewage sludge records).

C ASSESSMENT AND OVERSIGHT

The elements in this section address the activities for assessing the effectiveness of project implementation and associated QA and QC activities. The purpose of assessment is to ensure that the QAPP is implemented as prescribed.

C.1 Assessments and Response Actions

Internal and external audits will be conducted to monitor the performance of the total measurement system.

C.1.1 Field Performance and Systems Audits

Field performance audits will be conducted continuously as field data are generated, reduced, and analyzed. Numerical analyses, including manual calculations, will be documented. Records of numerical analysis will be legible, reproducible, and sufficiently complete so that they may be logically reconstructed.

Other indicators of the level of field performance will be the analytical results of the blank and duplicate samples as described in B.1.1. Each blank analysis is an indirect audit of the effectiveness of measures, such as decontamination procedures, taken in the field to ensure sample integrity. The results of the field duplicate analyses are an indirect audit of the ability of the field team to collect representative sample aliquots of each matrix type.

A field systems audit of sampling activities will be conducted by the QA Manager and/or Project Manager, as deemed appropriate by the Program Manager. During this audit, the auditor will compare observed field practices with standard procedures and protocols. The following elements will be evaluated during the field systems audit:

1. Overall level of organization and professionalism.
2. Performance of activities and analyses in accordance with the QAPP.
3. Level of activity and sample documentation.
4. Working order of instruments and equipment.

5. Level of QA conducted by field sampling team.
6. Contingency plans in case of equipment failure or other event which prevents the planned activity from proceeding.
7. Decontamination procedures.
8. Level of efficiency with which the field sampling team conducts planned activities at one location and proceeds to the next location.
9. Sample packaging and shipment.

Following completion of the field systems audit, deficiencies will be discussed with the field personnel, and corrective actions will be identified and implemented. The field sampling team will be informed immediately of deficiencies that could affect the integrity of the samples being collected so that corrective actions can be implemented immediately.

C.1.2 Laboratory Performance and Systems Audits

In addition to the requirements for continued NELAP approval, laboratory performance audits will be conducted by the GSC QA Manager as deemed appropriate by the Program Manager and will include the following:

1. Verification of written procedures.
2. Level of understanding of analysts.
3. Unannounced inspection of the sample handling group.
4. Review of a portion of the analytical data and calculations.

Corrective action will be taken for deficiencies noted during the laboratory performance audit.

Laboratory systems audits are qualitative audits of the measurement systems and ensure that the systems are properly maintained and implemented. In the event that a major defect is discovered as a result of these audits, a follow-up inspection will be conducted after sufficient time has passed for correction of the deficiency, but not more than 90 days, or when evidence of correction of the

deficiency has been presented by the laboratory. Laboratory systems audits will be performed annually in conjunction with the performance audit and will include a review of the following:

1. Analytical and support instrumentation maintenance and calibration logs.
2. Refrigerator temperature records.
3. Distilled/deionized water supply records.
4. Sample tracking system.
5. Standards tracking system.
6. Reagent chemical log-in, tracking, and disposal.
7. Following the sample chain of custody from time of sample receipt through analytical steps, to data reduction, internal laboratory validation, and generation of analytical report.
8. Examination of maintenance and calibration log books to ensure that maintenance and calibration are performed on a scheduled basis.
9. Examination of procedures and records for data calculation, transfer, and validation.
10. Spot-check of calibration, QC, and sample data from selected instruments for selected days, to ensure acceptable precision, accuracy, and completeness.
11. Inspection of storage areas, glassware preparation areas, and distilled/deionized water system records and procedures.
12. Examination of QA procedures and records, including standard and spike solution log books and storage areas, control charts, and QA manuals.

C.1.3 Corrective Actions

Corrective actions are those measures taken to rectify a laboratory or field measurement system that is out of compliance with the approved work plan, internal protocols or procedures. Corrective action may be initiated by any person performing work in support of the Site investigation activities at any time. Measures will be taken in the field and laboratory to ensure that problems that may develop will be handled efficiently, effectively and accurately to ensure the continuity of the sampling activity.

The essential steps in the corrective action system are:

1. Identifying and defining the problem.
2. Notifying EPA of the problem, if required by work plan or procedure.
3. Assigning responsibility for investigating the problem.
4. Investigating and determining the cause of the problem.
5. Determining a corrective action to eliminate the problem.
6. Assigning and accepting responsibility for implementing the corrective action.
7. Implementing the corrective action and evaluating its effectiveness.
8. Verifying that the corrective action has eliminated the problem.
9. Documenting the corrective action on the appropriate form.

C.1.3.1 Sample Collection/Field Measurements

Technical staff and project personnel will be responsible for reporting suspected technical and QA non-conformances or suspected deficiencies of any activity or issued document by reporting the situation to the QA Manager or designee. The QA Manager will be responsible for assessing the suspected problems in consultation with the Field Manager to make a decision based on the potential for the situation to impact the quality of the data. When it is determined that the situation warrants a reportable nonconformance and corrective action, then an NCR will be initiated by the QA Manager.

The QA Manager will be responsible for ensuring that corrective actions for nonconformances are initiated by:

- Evaluating reported nonconformances;
- Controlling additional work on nonconforming items;
- Determining disposition or action to be taken;

- Maintaining a log of nonconformances;
- Reviewing NCRs and corrective actions taken; and
- Ensuring that NCRs are included in the final site documentation project files.

If appropriate, the QA Manager will ensure that no additional work dependent on the nonconforming activity is performed until the corrective actions are completed.

Corrective action for field measurements may include:

- Repeating the measurement to check the error;
- Checking for proper adjustments for ambient conditions such as temperature;
- Checking the batteries;
- Recalibrating equipment;
- Checking the calibration;
- Modifying the analytical method including documentation and notification (i.e., standard additions);
- Replacing the instrument or measurement devices; and
- Stopping work (if necessary).

The Field Manager or his designee is responsible for site activities. In this role, he may at times be required to adjust the site activities to accommodate site-specific needs. When it becomes necessary to modify a program, the responsible person notifies the Project Manager of the anticipated change and implements the necessary changes after obtaining the approval of the GSC Project Manager. Changes in the program will be documented on the Field Change Order (FCO) that will be signed by the initiators and the GSC Project Manager. The FCO for each document will be numbered serially as required. The FCO shall be attached to the file copy of the affected document. The GSC Project Manager must approve the change in writing or verbally before field

implementation. If unacceptable, the action taken during the period of deviation will be evaluated to determine the significance of the departure from established program practices and action taken.

The Field Manager is responsible for the controlling, tracking, and implementation of the identified changes. Reports on changes will be distributed to affected parties. Harley-Davidson will be notified whenever program changes in the field are made.

C.1.3.2 Laboratory Analyses

The project investigation laboratory QA plan provides systematic procedures to identify out-of-control situations and corrective actions. Corrective actions shall be implemented to resolve problems and restore malfunctioning analytical systems. Laboratory personnel have received QA training and are aware that corrective actions are necessary when:

- QC data are outside warning or control windows for precision and accuracy;
- Blanks contain target analytes above acceptable levels and must be investigated;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected by internal audits, external audits, or from performance evaluation samples results; and
- Inquiries concerning data quality are received.

Corrective action procedures are often handled at the bench level by the analyst who reviews the preparation or extraction procedure for possible errors and checks the instrument calibration, spike and calibration mixes, instrument sensitivity, etc. If the problem persists or cannot be identified, the matter is referred to the Laboratory Supervisor, Laboratory Manager, and/or Laboratory QA Department for further investigation. Once resolved, full documentation of the corrective action procedure is filed with project records and the Laboratory QA Department, and the information is summarized within case narratives.

Corrective actions may include:

- Reanalyzing the samples, if holding time criteria permit;
- Evaluating blank contaminant sources, elimination of these sources, and reanalysis;
- Modifying the analytical method (i.e., standard additions) with appropriate notification and documentation;
- Resampling and analyzing;
- Evaluating and amending sampling procedures; or
- Accepting data and acknowledging the level of uncertainty.

If resampling is deemed necessary due to laboratory problems, the Project Manager or Director will identify the necessary cost recovery approach to implement the additional sampling effort.

The following corrective action procedures will be required:

- Problems noted during sample receipt will be documented in the appropriate laboratory letter of receipt (LOR). The GSC Project Manager will be contacted immediately to determine problem resolution. Corrective actions will be thoroughly documented.
- When sample extraction/digestion or analytical holding times are not within method required specifications, the GSC Project Manager will be notified immediately to determine problem resolution. Corrective actions will be thoroughly documented.
- Initial and continuing calibration sequences that do not meet method requirements will result in a review of the calibration. When appropriate, reanalysis of the standards or reanalysis of the affected samples back to the previous acceptable calibration check is warranted.
- Appropriate measures will be taken to prepare and clean up samples in an attempt to achieve the practical quantitation limits as stated. When difficulties arise in achieving these limits,

the laboratory will notify the GSC Project Manager and the GSC Laboratory Coordinator to determine problem resolution. Corrective actions will be thoroughly documented.

- Dilutions impacting the practical quantitation limits will be documented in case narratives along with revised quantitation limits for those analytes affected. Analytes detected above the method detection limits, but below the practical quantitation limits, will be reported as estimated values.

- Failure of method-required QC to meet the requirements specified in this project QAPP shall result in review of affected data. Resulting corrective actions may encompass those identified earlier. The GSC Project Manager and Laboratory Manager will be notified as soon as possible to discuss possible corrective actions, particularly when unusual or difficult sample matrices are encountered.

When calculation and reporting errors are noted within a data package, reports will be reissued with applicable corrections. Case narratives will clearly state the reasons for reissuance of reports.

C.2 Reports to Management

Internal reports shall be provided to inform management of the results of field and laboratory audits, and to communicate the need for corrective actions, if corrective actions are necessary.

C.2.1 Quality Control Reports

During large environmental inspection activities or large construction/remediation projects performed at this facility, Quality Control Reports (QCRs) may be prepared. These reports will be signed and dated by the Field Manager. An example of the QCR format to be used is shown on **Figure C-1**. The contents of each QCR will include a summary of activities performed at the project site, weather information, activities performed including field instrument calibrations, departures from the approved Work Plan, problems encountered during field activities, and instructions received from government personnel. Deviations that may affect the project data quality objectives will be immediately conveyed to the GSC Laboratory Manager.

C.2.2 Laboratory Quality Assurance Reports

The laboratory will provide LORs and analytical QC summary statements (case narratives) with each data package. Chain-of-custody forms will be compared with samples received by the laboratory, and an LOR will be prepared and sent to the project describing differences in the chain-of-custody forms and the sample labels or tags. Deviations will be identified on the receiving report such as broken or otherwise damaged containers. This report will be forwarded to the Project Laboratory Coordinator within 24 hours of sample receipt and will include the following: a signed copy of the chain-of-custody form; itemized project sample numbers; laboratory sample numbers; cooler temperature upon receipt; and itemization of analyses to be performed.

Summary QC statements will accompany analytical results as they are reported by the laboratory in the form of case narratives for each sample delivery group.

Departures from approved plans will receive prior approval from the Laboratory Coordinator and will be documented with field change orders. These field change orders will be incorporated into the project evidence file.

The Project Manager will maintain custody of the project evidence file and will maintain the contents of files for this project, including relevant records, reports, logs, field logbooks, pictures, subcontractor reports, correspondence, and chain-of-custody forms until this information is requested or transferred to the Harley-Davidson Facility Project Coordinator. These files will be stored under the custody of the GSC Project Manager. The analytical laboratory will retain original analytical raw data information (both hard copy and electronic) in a secure, limited-access area and under custody of the laboratory Project Manager.

D DATA VALIDATION AND USABILITY

The elements in this section address the QA activities that occur after the data collection phase of a project task has been completed. Implementation of these elements determines whether the data conform to the specified criteria, thus satisfying the project objectives.

D.1 Data Review, Verification, and Validation

Data will be reviewed to ensure that it has been recorded, transmitted, and processed correctly. Data review will include the following activities:

1. Checking for data entry, transcription/transposition, calculation, reduction, and transformation errors.

2. Ensuring that a complete list of sample information is available, including sample matrices, blanks, duplicates, shipping dates, preservatives, and holding times.

3. Performing completeness checks to determine whether there are deficiencies, such as missing data or loss of data integrity resulting from electronic file corruption or loss of electronic files during storage or processing.

Data verification is the process for evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual specifications. It essentially evaluates performance against pre-determined specifications, for example, in an analytical method, or a software or hardware operations system.

Data validation is an analyte-specific and sample-specific process that extends the evaluation of data beyond method, procedure, or contractual compliance (i.e., data verification) to determine the quality of a specific data set relative to its end use. It focuses on the project's specifications or needs, designed to meet the needs of the decision makers/data users and should note potentially unacceptable departures from the QAPP.

Data usability will be determined by a data quality assessment of the validated data, and may involve statistical evaluation (such as tests for outliers or trends) or scientific evaluation. A

statistical analysis will result in quantitative statements about the quality of the data, while a scientific analysis will result in qualitative statements. Severe data quality problems may require that the data not be used, whereas some data may still be used even if some validations failed.

D.1.1 Field Measurements

Raw data from field measurements and sample collection activities will be appropriately recorded in field logbooks. Data to be used in project reports will be reduced and summarized. The methods of data reduction will be documented.

The Field Manager or his/her designee is responsible for data review of field-generated data. This includes verifying that field descriptive data are recorded properly, that field instrument calibration requirements have been met, that field QC data have met frequency and criteria goals, and that field data are entered accurately in logbooks and worksheets.

D.1.2 Laboratory Services

Samples collected for these investigations will be sent to qualified laboratories. Data review and verification for samples analyzed by the laboratory will be performed according to specifications outlined in the laboratory's QA plan (see **Appendix C**). Laboratory reports will include documentation verifying analytical holding time compliance.

Laboratories will perform in-house analytical data review and verification under the direction of the Laboratory QA Officer. The Laboratory QA Officer is responsible for assessing data quality and informing the GSC Laboratory Coordinator and Project Manager of data which are considered "unacceptable" or require caution on the part of the data user in terms of data reliability. Data will be reviewed and verified as described in the laboratory QA plan. Data review, and reporting by the laboratory will be conducted as follows:

- Raw data are produced by the analyst who has primary responsibility for the correctness and completeness of the data. Data will be generated following the QAPP defined methods and implementing laboratory SOP protocols.

- Level 1 technical data review is completed relative to an established set of guidelines by a peer analyst. The review shall ensure the completeness and correctness of the data while assuring that method QC measures have been implemented and were within appropriate criteria.

- Level 2 technical review is completed by the Area Supervisor or Data Review Specialist. This review includes the data for attainment of QC criteria as outlined in the established methods and for overall reasonableness. The Level 2 review ensures that calibration and QC data are in compliance by checking at least 10 percent of the data calculations. This review shall document that the data package is complete and ready for reporting and archival.

- Upon acceptance of the raw data by the Area Supervisor, the report is generated and sent to the Laboratory Project Manager for Level 3 administrative data review. This review will ensure consistency and compliance with laboratory instructions, the laboratory QA plan, the project laboratory scope of work (SOW), and the project QAPP.

- The Laboratory Project Manager will complete a thorough review of all reports.

- Final reports will be generated and signed by the Laboratory Project Manager.

- Data will then be delivered to the project for data assessment or validation.

The data review process will include identification of out-of-control data points and data omissions, as well as interactions with the laboratory to correct data deficiencies. Decisions to repeat sample collection and analyses may be made by the GSC Project Director or his designee based on the extent of the deficiencies and their importance in the overall context of the project. The laboratory will provide flagged data to include items such as: 1) concentration below required detection limit; 2) estimated concentration due to poor spike recovery; and 3) concentration of chemical also found in laboratory blank.

The laboratory will prepare and retain full analytical and QC documentation for the project. Such retained documentation may be in hard (paper) copy or electronic storage media (i.e., CD or hard

drive) as dictated by the analytical methodologies employed. As needed, laboratory will supply hard copies and/or electronic copies of the retained information.

The laboratory will provide the following information to the project in each analytical data package submitted:

- Cover sheets listing the samples included in the report and narrative comments describing problems encountered in analysis;
- Tabulated results of inorganic, organic, and miscellaneous parameters identified and quantified;
- Analytical results for QC sample spikes, sample duplicates, initial and continuous calibration verifications of standards and blanks, standard procedural blanks, LCSs, and other deliverables as identified in Section D.3;
- Tabulation of instrument detection limits determined in pure water.

D.2 Verification and Validation Methods

A systematic process for data verification and validation will be performed to ensure that the precision and accuracy of the analytical data are adequate for their intended use. The greatest uncertainty in a measurement is often a result of the sampling process and inherent variability in the environmental media rather than the analytical measurement. Therefore, analytical data validation will be performed only to the level necessary to minimize the potential of using false-positive or false-negative results in the decision-making process (i.e., to ensure accurate identification of detected versus non-detected compounds). This approach is consistent with the DQOs for the project, with the analytical methods, and for determining chains-of-custody and calculating risk.

Samples will be analyzed through implementation of "definitive" analytical methods. "Definitive data" will be reported consistent with the deliverables identified in Section D.3, Tables B-5 and B-6. This report content is consistent with what is understood as a comprehensive data deliverable (data forms including laboratory QC, calibration information, and raw data). This "definitive data" will then be evaluated through the review process presented in Subsections D.2.1 through D.2.10.

DQOs identified in Section A.7 and method-specified criteria will be reviewed. Complete analytical documentation will be retained by the subcontract laboratory.

Data validation will be accomplished by comparing the contents of the data packages and QA/QC results to requirements contained in the requested analytical methods. The validation support staff will be responsible for these activities. It will be the practice of GSC to conduct data validation on 10 percent of the data packages received from the laboratory using knowledgeable validation support staff. In addition, the GSC validation support staff will review the laboratory data for holding times and for field blank contamination.

Validation support staff will conduct a systematic review of 10 percent of the data for compliance with the established QC criteria in accordance with 300-7 (in Appendix D) and based on the following categories:

- Holding times,
- Blanks,
- LCSs,
- Surrogate recovery (organic methods),
- Internal standards (primarily organic methods),
- Inductively coupled plasma (ICP) or atomic absorption QC,
- Calibration,
- Sample reanalysis,
- Secondary dilutions, and
- Laboratory case narrative.

Laboratory analytical results will also be assessed by the data validator for compliance with the applicable DQIs listed in Section A.7.2. Upon completion of validation, a data validation report

will be prepared for the data deliverables packages reviewed. Limitations on the use of laboratory data will be reported by means of qualification codes as summarized in the data validation reports. The most common qualification code is a "J" which indicates that the reported concentration is estimated.

Consistent with the data quality requirements as defined in the DQOs, project data and associated QC will be evaluated on these categories and qualified as per the outcome of the review.

D.2.1 Holding Times

Evaluation of holding times ascertains the validity of results based on the length of time from sample collection to sample preparation or sample analysis. Verification of sample preservation must be confirmed and accounted for in the evaluation of sample holding times. The evaluation of holding times is essential to establishing sample integrity and representativeness. Concerns regarding physical, chemical, or biochemical alteration of analyte concentrations can be eliminated or qualified through this evaluation.

D.2.2 Blanks

The assessment of blank analyses is performed to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks applies to any blank associated with the samples, including field, trip, equipment, and method blanks. Contamination during sampling or analysis, if not discovered, results in false-positive data.

Blanks will be evaluated against reporting levels as specified in **Table A-6**. Analytical method blanks should be below 2X these levels. Field, trip, and equipment rinse blanks will be evaluated against 5X these levels for most analytes and 10X these levels for common laboratory solvent analytes.

D.2.3 Laboratory Control Samples

The LCS serves as a monitor of the overall performance of the analytical process, including sample preparation, for a given set of samples. Evaluation of this standard provides confidence in or allows qualification of results based on a measurement of process control during each sample analysis.

D.2.4 Surrogate Recovery

System compounds are added to every sample, blank, MS, MSD, and standard. They are used to evaluate extraction, cleanup, and analytical efficiency by measuring recovery on a sample-specific basis. Poor system performance as indicated by low surrogate recoveries is one of the most common reasons for data qualification. Evaluation of surrogate recovery is critical to the provision of reliable sample-specific analytical results.

D.2.5 Internal Standards

Internal standards are utilized to evaluate and compensate for sample-specific influences on the analyte quantification. They are evaluated to determine if data require qualification due to excessive variation in acceptable internal standard quantitative or qualitative performance measures. For example, a decrease or increase in internal standard area counts for organics may reflect a change in sensitivity that can be attributed to the sample matrix. Because quantitative determination of analytes is based on the use of internal standards, evaluation is critical to the provision of reliable analytical results.

D.2.6 Furnace Atomic Absorption QC

Duplicate and furnace post-digestion spikes are evaluated to establish precision and accuracy of individual analytical determinations. Because of the nature of the furnace atomic absorption technique and because of the detailed decision tree and analysis scheme required for quantitation of the elements, evaluation of the QC is critical to ensuring reliable analytical results.

D.2.7 Initial and Continuing Calibration

The purpose of initial and continuing calibration verification analyses is to verify the linear dynamic range and stability of instrument response. Relative instrument response is used to quantify the analyte results. If the relative response factor is outside acceptable limits, the data quantification is uncertain and requires appropriate qualification.

D.2.8 Sample Reanalysis

When instrument performance-monitoring standards indicate an analysis is out of control, the laboratory is required to reanalyze the sample. If the reanalysis does not solve the problem (i.e., surrogate compound recoveries are outside the limits for both analyses), the laboratory is required to submit data from both analyses. An independent review is required to determine which one is the appropriate sample result.

D.2.9 Secondary Dilutions

When the concentration of an analyte in a sample exceeds the initial calibration range, a new aliquot of that sample must be diluted and reanalyzed. The laboratory is required to report data from both analyses. When this occurs, an independent review of the data is required to determine the appropriate results to be used for that sample. An evaluation of each analyte exceeding the calibration range must be made, including a review of the dilution analysis performed. Results chosen in this situation may be a combination of both the original results (i.e., analytes within initial calibration range) and the secondary dilution results.

D.2.10 Laboratory Case Narratives

Analytical case narratives are reviewed for specific information concerning the analytical process. This information is used to direct the data validator to potential problems with the data.

D.3 Reconciliation with User Requirements

Analytical data for this project will be screened electronically and reviewed by qualified chemists. Flags signifying the usability of data will be noted and entered into an analytical database. Deficiencies in data deliverables will be corrected through direct communication with the field or laboratory, generating immediate response and resolution. Significant data discrepancies noted during the validation process will be documented through NCRs, which are sent to the laboratory for clarification and correction. Decisions to repeat sample collection and analyses may be made by the GSC Project Manager based on the extent of the deficiencies and their importance in the overall context of the project.

Data generated for investigations will be computerized in a format organized to facilitate data review and evaluation. The computerized data set will include data flags in accordance with the above-referenced protocols, as well as additional comments of the Data Review Team. The associated data flags will include such items as: U-not detected at the associated level, J-associated value estimated, UJ-not detected and associated value estimated, R-associated value unusable or analyte identity unfounded, =-compound properly identified and value positive.

Data validation will be accomplished by the joint efforts of the data validator and the QA Manager. Data validation by data management will be based on the criteria that the sample was properly collected and handled according to the Field Sampling Plan and addendums. An evaluation of data accuracy, precision, sensitivity, and completeness, based on criteria in Section A.7 of this QAPP, will be performed by a data validator. This data validation will indicate that data are: 1) usable as a quantitative concentration; 2) usable with caution as an estimated concentration; or 3) unusable due to out-of-control QC results. Project investigation data sets will be available for controlled access by the GSC Project Manager and authorized personnel. Each data set will be incorporated into investigation reports as required.

Following validation, the analytical chemistry data will be reviewed for possible anomalies or departures from assumptions made in work plans or sampling plans during the planning phases of data collection. This inspection of the data will consist of the following steps:

1. Have any parameters been detected for the first time at this sampling location?

2. Are any parameters now absent that previously have been consistently detected at this sampling location?

3. Have any parameters been reported at concentrations significantly outside the previously reported ranges?

If the data do not meet the inspection criteria listed above, then the following actions will be taken:

1. The database value will be checked against the value reported on the laboratory hard copy.

2. Laboratory validation, field conditions, and field data will be reviewed to determine whether a cause can be identified.

3. Professional judgment will ultimately determine whether data is acceptable and reasons for discarding unacceptable data will be documented.

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TABLE A-2
SUMMARY OF QUALITY ASSURANCE OBJECTIVES

Data Use	Sample Type	Analytical Method	Precision (RPD)[a]		Accuracy	Accuracy	Completeness
			Field Dups	Lab Dups	Lab LCS	Lab MS	
Screening for H&S plus sample site selection, dust monitoring	Discrete	FID/PID Volatile organics MiniRam	± comparison	NA	NA	NA	95%
Confirmation of contamination removal	Discrete	SW-8260B Volatile organics	<50 RPD	<40 RPD	75-125% recovery	60-140% recovery	90%
Contaminant Measurement	Discrete or composite	SW8260B Volatile Organics	<50 RPD	<40 RPD	75-125%	60-140%	90%
		SW-8270C Semivolatile organics	<50 RPD	<40 RPD	50-130% recovery	30-140% recovery	90%
		SW-8082A PCBs	<50 RPD	<40 RPD	50-130% recovery	40-140% recovery	90%
		SW-6010A/7471A Metals	<50 RPD	<35 RPD	90-110% recovery	75-125% recovery	90%
		Hexavalent Chromium SW-846 7196a	<50 RPD	<35 RPD	90-110% recovery	75-125% recovery	90%
		SW-846 9012a Total Cyanide	<50 RPD	<35 RPD	90-110% recovery	75-125% recovery	90%
Waste characterization	Discrete (VOCs) or composite	SW-1311 TCLP analytes and waste characteristics	NA	<40 RPD	80-120%	75-125% recovery	80%

[a] Relative percent differences at values within five times the reporting level comparison are acceptable if values are plus or minus three times the reporting level.

NA = Not applicable.

TABLE A-3
SOLID INVESTIGATIVE DQO SUMMARY

Data Use	Sample Type	Analytical Method	Precision (RPD)[a]		Accuracy	Accuracy	Completeness
			Field Dups	Lab Dups	Lab LC	Lab MS	
Screening for H&S plus sample site selection	Discrete	FID/PID Volatile organics (headspace)	NA	NA	± 0.1 ppm	NA	95%
Contaminant Measurement	Discrete	SW-8260B Volatile organics	<30 RPD	<20 RPD	80-120% recovery	70-130% recovery	90%
	Discrete or composite	SW-8270C Semivolatile organics	<30 RPD	<20 RPD	60-120% recovery	30-140% recovery	90%
		SW-8082A PCBs	<30 RPD	<20 RPD	60-120% recovery	40-140% recovery	90%
		SW-6010A/7470 TAL metals	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		Hexavalent Chromium SW-846 7196a	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		EPA 335.5 Total Cyanide	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		SM 4500 CN E Free Cyanide	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		Miscellaneous Anions	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
IDW characterization	Composite	TCLP analytes and Miscellaneous	NA	<40 RPD	80-120% recovery	70-130% recovery	90%

[a] Relative percent differences at values within five times the reporting level comparison are acceptable if values are plus or minus three times the reporting level.

NA = Not applicable

TABLE A-4
LIQUID INVESTIGATIVE DQO SUMMARY

Data Use	Sample Type	Analytical Method	Precision (RPD)[a]		Accuracy	Accuracy	Completeness
			Field Dups	Lab Dups	Lab LCS	Lab MS	
Screening for H&S plus sample site selection	Discrete	FID/PID Volatile organics (headspace)	NA	NA	± 0.1 ppm	NA	95%
Determination of basic water characteristics	Discrete	Conductivity - Horiba U22, field multi-meter OR EPA-120.1	<10 RPD	NA	± 0.1 µmhos/cm	NA	95%
		pH - Horiba U22, field multi-meter OR EPA-150.1	<10 RPD	NA	± 0.1 s.u.	NA	95%
		Temperature – Horiba U22, field multi-meter OR EPA-170.1	<10 RPD	NA	± 0.1 □C	NA	95%
		Turbidity – Horiba U22, field multi-meter OR Turbidity meter	<10 RPD	NA	± 2 NTU	NA	95%
		Ox-red potential - Horiba U22, field multi-meter	<10 RPD	NA	± 30 eV	NA	95%
		Dissolved oxygen –Horiba U22, field multi-meter OR EPA-360.1	<10 RPD	NA	± 0.1 ppm	NA	95%
Contaminant Measurement	Discrete	SW-846 8260B Volatile organics	<30 RPD	<20 RPD	80-120% recovery	70-130% recovery	90%
	Discrete or composite	SW-846 8270C Semi-volatile organics	<30 RPD	<20 RPD	60-120% recovery	30-140% recovery	90%
		SW-846 8082A PCBs	<30 RPD	<20 RPD	60-120% recovery	40-140% recovery	90%
		SW-846 6020A/7470 TAL metals	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		Hexavalent Chromium SW-846 7196a	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		EPA 335.4 Total Cyanide	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		SM 4500 CN E Free Cyanide	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
		Miscellaneous Anions	<30 RPD	<20 RPD	90-110% recovery	75-125% recovery	90%
IDW characterization	Composite	TCLP analytes and Miscellaneous	NA	<40 RPD	80-120% recovery	70-130% recovery	90%

[a] Relative percent differences at values within five times the reporting level comparison are acceptable if values are plus or minus three times the reporting level.

NA Not applicable.

TABLE A-5
SUMMARY OF QUALITY CONTROL MEASURES

1.	Field sampling documentation will be in the form of field logbooks, sampling field data sheets and chain of custody records.
2.	Monitoring and/or field-portable analytical equipment will be calibrated prior to collection and analyses of samples with results and/or performance check procedures/methods summarized and documented in a field, personal, and/or instrument log notebook.
3.	Both the analytical sample results and the laboratory-determined method detection limits (MDLs) will be presented in the final laboratory data deliverable reports.
4.	Analytical holding times will be determined from date and time of sample collection to date and time of sample analysis. Date and time of sample collection will be documented on the sampling field data sheet as well as the Chain of Custody Record. The date and time of sample analysis will be provided by the laboratory in the final data deliverables packages.
5.	Initial and continuous instrument calibration data will be presented.
6.	QC blank results (non-dedicated equipment rinse, trip, method, preparation, instrument, etc.), will be provided as applicable.
7.	For gas chromatography (GC) methods, matrix spike / matrix spike duplicate (MS/MSD) QC samples will be collected and analyzed to provide a quantitative measure of analytical precision and accuracy. For gas chromatography / mass spectrometer (GC/MS) methods, laboratory control samples (LCSs) will be analyzed to provide a quantitative measure of the analytical precision and accuracy. Duplicate samples will not be collected for soils and sediments due to the difficulty in obtaining representative aliquots for these media.
8.	Laboratory analysis will use EPA-approved methods. In addition, appropriate documentation such as gas chromatograms, mass spectra, etc. will be included in the final deliverable reports such that compound identification may be confirmed. All sample analysis runs (e.g. undiluted, diluted, re-runs) will be included in the final data deliverables packages.
9.	Sampling locations (wells and borings) will be surveyed to the nearest 0.1 feet for planar coordinates and ground surface elevation, and to the nearest 0.01 feet for top-of-casing (measurement point) elevation. Groundwater elevations will be measured to the nearest 0.01 feet.

TABLE A-6
PROJECT ANALYTE LIST AND REPORTING LEVELS FOR VOLATILE ORGANIC COMPOUNDS

		Water	Solid
		8260B	8260B
Analyte Description	CAS Number	ug/L	ug/Kg
1,1,1,2-Tetrachloroethane	630-20-6	1	5
1,1,1-Trichloroethane	71-55-6	1	5
1,1,2,2-Tetrachloroethane	79-34-5	1	5
1,1,2-Trichloroethane	79-00-5	1	5
1,1-Dichloroethane	75-34-3	1	5
1,1-Dichloroethene	75-35-4	1	5
1,2-Dibromoethane (EDB)	106-93-4	1	5
1,2-Dichloroethane	107-06-2	1	5
1,2-Dichloropropane	78-87-5	1	5
1,4-Dioxane	123-91-1	200	1000
2-Butanone (MEK)	78-93-3	5	5
2-Hexanone	591-78-6	5	5
4-Methyl-2-pentanone (MIBK)	108-10-1	5	5
Acetone	67-64-1	5	20
Acrylonitrile	107-13-1	20	100
Benzene	71-43-2	1	5
Bromochloromethane	74-97-5	1	5
Bromodichloromethane	75-27-4	1	5
Bromoform	75-25-2	1	5
Bromomethane	74-83-9	1	5
Carbon disulfide	75-15-0	1	5
Carbon tetrachloride	56-23-5	1	5
Chlorobenzene	108-90-7	1	5
Chloroethane	75-00-3	1	5
Chloroform	67-66-3	1	5
Chloromethane	74-87-3	1	5
cis-1,2-Dichloroethene	156-59-2	1	5
cis-1,3-Dichloropropene	10061-01-5	1	5
Dibromochloromethane	124-48-1	1	5
Ethylbenzene	100-41-4	1	5
Methyl tert-butyl ether	1634-04-4	1	5
Methylene Chloride	75-09-2	1	5
Styrene	100-42-5	1	5
Tetrachloroethene	127-18-4	1	5
Toluene	108-88-3	1	5
trans-1,2-Dichloroethene	156-60-5	1	5
trans-1,3-Dichloropropene	10061-02-6	1	5
Trichloroethene	79-01-6	1	5
Vinyl chloride	75-01-4	1	5
Xylenes, Total	1330-20-7	3	15

TABLE A-7
PROJECT ANALYTE LIST AND REPORTING LEVELS
FOR SEMI-VOLATILE ORGANIC COMPOUNDS

		Water	Solid
		8270C	8270C
Analyte Description	CAS Number	ug/L	ug/Kg
1,2,4-Trichlorobenzene	120-82-1	10	330
1,2-Dichlorobenzene	95-50-1	10	330
1,3-Dichlorobenzene	541-73-1	10	330
1,4-Dichlorobenzene	106-46-7	10	330
2,4,5-Trichlorophenol	95-95-4	10	330
2,4,6-Trichlorophenol	88-06-2	10	330
2,4-Dichlorophenol	120-83-2	2	67
2,4-Dimethylphenol	105-67-9	10	330
2,4-Dinitrophenol	51-28-5	50	1700
2,4-Dinitrotoluene	121-14-2	10	330
2,6-Dinitrotoluene	606-20-2	10	330
2-Chloronaphthalene	91-58-7	2	67
2-Chlorophenol	95-57-8	10	330
2-Methylnaphthalene	91-57-6	2	67
2-Methylphenol	95-48-7	10	330
2-Nitroaniline	88-74-4	50	1700
2-Nitrophenol	88-75-5	10	330
3,3'-Dichlorobenzidine	91-94-1	10	330
3-Nitroaniline	99-09-2	50	1700
4,6-Dinitro-2-methylphenol	534-52-1	50	1700
4-Bromophenyl phenyl ether	101-55-3	10	330
4-Chloro-3-methylphenol	59-50-7	10	330
4-Chloroaniline	106-47-8	10	330
4-Chlorophenyl phenyl ether	7005-72-3	10	330
4-Nitroaniline	100-01-6	50	1700
4-Nitrophenol	100-02-7	50	1700
Acenaphthene	83-32-9	2	67
Acenaphthylene	208-96-8	2	67
Anthracene	120-12-7	2	67
Benzo[a]anthracene	56-55-3	2	67
Benzo[a]pyrene	50-32-8	2	67
Benzo[b]fluoranthene	205-99-2	2	67
Benzo[g,h,i]perylene	191-24-2	2	67
Benzo[k]fluoranthene	207-08-9	2	67
bis (2-chloroisopropyl) ether	108-60-1	2	67
Bis(2-chloroethoxy)methane	111-91-1	10	330
Bis(2-chloroethyl)ether	111-44-4	2	67
Bis(2-ethylhexyl) phthalate	117-81-7	20	670
Butyl benzyl phthalate	85-68-7	10	330
Carbazole	86-74-8	2	67
Chrysene	218-01-9	2	67
Dibenz(a,h)anthracene	53-70-3	2	67

TABLE A-7
PROJECT ANALYTE LIST AND REPORTING LEVELS
FOR SEMI-VOLATILE ORGANIC COMPOUNDS

		Water	Solid
		8270C	8270C
Analyte Description	CAS Number	ug/L	ug/Kg
Dibenzofuran	132-64-9	10	330
Diethyl phthalate	84-66-2	10	330
Dimethyl phthalate	131-11-3	10	330
Di-n-butyl phthalate	84-74-2	10	330
Di-n-octyl phthalate	117-84-0	10	330
Fluoranthene	206-44-0	2	67
Fluorene	86-73-7	2	67
Hexachlorobenzene	118-74-1	2	67
Hexachlorobutadiene	87-68-3	2	67
Hexachlorocyclopentadiene	77-47-4	10	330
Hexachloroethane	67-72-1	10	330
Indeno[1,2,3-cd]pyrene	193-39-5	2	67
Isophorone	78-59-1	10	330
Methylphenol, 3 & 4	106-44-5	10	330
Naphthalene	91-20-3	2	67
Nitrobenzene	98-95-3	20	670
N-Nitrosodi-n-propylamine	621-64-7	2	67
N-Nitrosodiphenylamine	86-30-6	10	330
Pentachlorophenol	87-86-5	10	330
Phenanthrene	85-01-8	2	67
Phenol	108-95-2	2	67
Pyrene	129-00-0	2	67

TABLE A-8
PROJECT ANALYTE LIST AND REPORTING LEVELS FOR PCB COMPOUNDS

		Water	Solid
		8082	8082
Analyte Description	CAS Number	ug/L	ug/Kg
PCB-1016	12674-11-2	0.4	16.667
PCB-1221	11104-28-2	0.4	16.667
PCB-1232	11141-16-5	0.4	16.667
PCB-1242	53469-21-9	0.4	16.667
PCB-1248	12672-29-6	0.4	16.667
PCB-1254	11097-69-1	0.4	16.667
PCB-1260	11096-82-5	0.4	16.667

TABLE A-9
PROJECT ANALYTE LIST AND PROJECT REPORTING LEVELS FOR METALS

		Water	Solid	Water	Solid
		6020	6020	6010B	6010B
Analyte Description	CAS Number	ug/L	mg/Kg	ug/L	mg/Kg
Antimony	7440-36-0	2	0.2	10	1
Arsenic	7440-38-2	1	0.1	10	1
Barium	7440-39-3	10	1		
Beryllium	7440-41-7	1	0.1	4	0.4
Cadmium	7440-43-9	1	0.1	5	0.5
Chromium, Total	7440-47-3	2	0.2	5	0.5
Copper	7440-50-8	2	0.2	25	2.5
Lead	7439-92-1	1	0.1	3	0.3
Nickel	7440-02-0	1	0.1	40	4
Selenium	7782-49-2	5	0.5	5	0.5
Silver	7440-22-4	1	0.1	5	0.5
Thallium	7440-28-0	1	0.1	10	1
Vanadium	7440-62-2	1	0.1		
Zinc	7440-66-6	5	0.5	20	2

		Water	Solid	Water	Solid
		7470A	7471A	7196A	7196A
Analyte Description	CAS Number	ug/L	mg/Kg	mg/L	mg/Kg
Chromium, Hexavalent	18540-29-9	NA	NA	0.01	0.4
Mercury	7439-97-6	0.2	0.033	NA	NA

TABLE A-10
PROJECT ANALYTE LIST AND PROJECT REPORTING LEVELS FOR MISCELLANEOUS PARAMETERS

Matrix	Analyte Description	Method	CAS Number	RL	Units
Water	Cyanide, Total	335.4	57-12-5	0.01	mg/L
Solid	Cyanide, Total	9012A	57-12-5	0.5	mg/Kg
Water	Available cyanide	1677	STL00015	0.002	mg/L
Solid	Available cyanide	1677	STL00015	0.04	mg/Kg
Water	Total Suspended Solids	2540D	STL00161	4	mg/L
Water	pH	9040B	STL00204	0.1	SU
Water	HEM (Oil and Grease)	1664A	STL00181	5	mg/L
Water	Sulfide	9034	18496-25-8	3	mg/L
Solid	Percent Moisture	Moisture	STL00234	0.1	%
Water	1,4-Dioxane	8270C LL	123-91-1	2	ug/L

TABLE A-11
PROJECT REPORTING LEVELS FOR WASTE CHARACTERISTICS AND MISCELLANEOUS PARAMETERS

Parameters	Analytical Methods	Project Reporting Levels[a]
Volatile Organic Compounds (VOCs) (TCLP Analyte List)	**SW 846-1311 (zero headspace ext.) SW 846-5030/8260B[b]**	**Leachate (µg/L)[c]**
Vinyl chloride		200
1,1-Dichloroethene		100
Chloroform		100
1,2-Dichloroethane		100
2-Butanone (methyl ethyl ketone)		200
Carbon tetrachloride		100
Trichloroethene		100
Benzene		100
Tetrachloroethene		100
Chlorobenzene		100
Semivolatile Organic Compounds (SVOCs) (TCLP Analyte List)	**SW 846-1311 (extraction) SW 846-3510C/8270C[b]**	**Leachate (µg/L)[c]**
1,4-Dichlorobenzene		200
2-Methylphenol (o-cresol)		200
3-Methylphenol (m-cresol)		200
4-Methylphenol (p-cresol)		200
Hexachloroethane		200
Nitrobenzene		200
Hexachlorobutadiene		200
2,4,6-Trichlorophenol		200
2,4,5-Trichlorophenol		200
2,4-Dinitrotoluene		200
Hexachlorobenzene		200
Pentachlorophenol		1000
Pyridine		200

NOTE: Project reporting levels for waste characteristics have not been updated and will be updated once available from Test America.

TABLE A-11
PROJECT REPORTING LEVELS FOR WASTE CHARACTERISTICS AND MISCELLANEOUS PARAMETERS

Parameters	Analytical Methods	Project Reporting Levels[a]
Pesticides **(TCLP Analyte List)**	**SW 846-1311 (extraction) SW 846-3520/8081[b]**	**Leachate (µg/L)**
gamma-BHC (Lindane)		1.0
Heptachlor		1.0
Heptachlor epoxide		1.0
Endrin		1.0
Methoxychlor		2.0
Chlordane (technical)		10
Toxaphene		40
Herbicide Compounds (TCLP Analyte List)	**SW 846-1311 (extraction) SW 846-8151A[b]**	**Leachate (µg/L)**
2,4-D		80
2,4,5-TP (silvex)		20
Metals (TCLP Analyte List)	**SW 846-1311 (extraction) 3010A/6020, 3020A, or 7000 series[b]**	**Leachate (µg/L)**
Arsenic		20
Barium		200
Cadmium		20
Chromium		40
Lead		20
Mercury (CVAA)	SW 846-7470[b]	4
Selenium		100
Silver		20
Miscellaneous		
Total Suspended Solids	EPA 160.2	4 mg/L
Total Petroleum Hydrocarbons	EPA 418.1	1 mg/kg
Total Organic Carbon	EPA 415.1	1 mg/L
Waste Characteristics		
pH	SW 846-9045[b]	NA
Ignitability	SW 846-1010[b]	NA

a These are expected quantitation limits based on reagent grade water or a purified solid matrix. Actual quantitation limits may be higher depending upon the nature of the sample matrix. The limit reported on final laboratory reports will take into account the actual sample volume or weight, percent solids (where applicable), and the dilution factor, if any. The quantitation limits for additional analytes to this list may vary, depending upon the results of laboratory studies.

b Test Methods for Evaluating Solid Waste, U.S. EPA, SW-846 Third Edition.

c Reporting Levels are set below regulatory levels at those normally provided by the assigned project laboratory.

d American Society for Testing and Materials, ASTM Standards, Vol. 04.08, Soil and Rock, 1995 and Vol. 11.04, Water and Environmental Technology, 1993.

NOTE: Project reporting levels for waste characteristics have not been updated and will be updated once available from Test America.

TABLE B-1
CONTAINER REQUIREMENTS FOR WATER SAMPLES

Analyte Group	Container	Minimum Sample Size	Preservative	Holding Time
Volatile Organic Compounds	3 - 40 mL glass vials with Teflon®-lined septum (no headspace)	40 mL	1:1 HCL to pH <2 Cool, 4°C	14 d
Semivolatile Organic Compounds	1 – L amber glass bottle with Teflon®-lined lid[a]	1000 mL	Cool, 4°C	7 d (extraction) 40 d (analysis)
Polychlorinated biphenyls (PCBs)	2 – 1 L amber glass bottles	1 L	Cool, 4°C	7 d (extraction) 40 d (analysis)
Metals	1 - L glass or polybottle	100 mL, metals	HNO_3 to pH <2 Cool, 4°C	180 d
Mercury – SW-846 7470A	1 - L glass or polybottle	100 mL, metals	HNO_3 to pH <2 Cool, 4°C	28 d
Cyanide (total or free)	1 – L plastic or glass	500 mL	NaOH to pH >12, 0.6 gram ascorbic acid, Cool, 4°C	14 d
Hexavalent Chromium -SW-846 7196A	1- 200 mL high density polypropylene bottle or glass	125 mL[a]	Cool, 4°C	24 hr
TOC	100 mL glass bottle or 40 ml glass vials	100 mL	H_2SO_4 or HCl to pH <2 Cool, 4°C	28 d
pH	100 mL glass or polybottle	50 mL	None	Immediately in the field
TSS	250 mL – plastic or glass	100 mL ea.	Cool, 4°C	7 d

[a] One investigative water sample in twenty will require an additional volume for the laboratory to perform appropriate laboratory QC analysis. [i.e., matrix spike/matrix spike duplicate (MS/MSD)].

TABLE B-2
CONTAINER REQUIREMENTS FOR SOIL/SOLID SAMPLES

Analyte Group	Container	Minimum Sample Size	Preservative	Holding Time
Volatile Organic Compounds (VOC) for soil samples	3 – TerraCore™ sample containers with approx. 5 g of sample, and 1- 125 ml (4 oz) glass jar [for moisture determination]	5 g (TerraCore sampler)	Cool, 4°C	48 h for TerraCore™ samples to be frozen, then 14 d (analysis)
Semivolatile Organic Compounds	1 – 250 ml (8 oz) glass jar with Teflon®-lined cap	50 g	Cool, 4°C	14 d (extraction) 40 d (analysis)
Polychlorinated biphenyls (PCBs)	Use same container as SVOCs	50 g	Cool, 4°C	14 d (extraction) 40 d (analysis)
Metals and CN	1 – 250 ml (8 oz) wide mouth plastic or glass jar	200 g	Cool, 4°C	180 d
Mercury – SW-846 7471A	Use same container as Metals	25 g	Cool, 4°C	28 d
Hexavalent Chromium -SW-846 7196A	Use same container as Metals	20 g	Cool, 4°C	7 d
Full TCLP Analysis	1 – 32 oz glass jar with Teflon®-lined cap	500 g	Cool, 4°C	14 d (extraction)
Reactivity	Use same container as full TCLP	500 g	Cool, 4°C	14 d (extraction)
Ignitability	Use same container as full TCLP	500 g	Cool, 4°C	14 d (extraction)
Corrosivity (pH)	Use same container as full TCLP	500 g	Cool, 4°C	14 d (extraction)
TCLP – VOC	1 – 8 oz.glass jar, with a screw cap and a silicone rubber coated with Teflon® septa	6 oz.	Cool, 4°C	14 d (extraction)

TABLE B-3
SAMPLE NUMBERING SCHEME

Sample Identification: XX-AAAA-mm-NNN-nn-z

XX = Site Designator	Site designators used for the project will be as follows: Harley-Davidson Site =HD
AAAA= Area/Project Designator	An Area Designator will be used for a specific area investigation. Example project or area designators are as follows: Cyanide Spill (MW-2) Area = CSA Reforested Area = RA Site Perimeter Area = SPA Northeast Property Boundary Area = NPBA Former Lagoon Area = FLA Bunkers and Shell Ranges = B&SR North End Test Track = NETT Magnesium Burn Area = MGBA North Plant Area = NPA Old Waste Containment Area = OWCA Metal Chip Bin Area = MCBA South Property Boundary Area = SPBA West Parking Lot = WPL Burn Pile Area = BPA Eastern Landfill area = ELF Drum Storage Area = DSA Building 66 Chrome/Nickel/Zinc Plater = B66P North End of Building 4 – Former Northern Degreaser = B4ND North End of Building 4 – Former Southern Degreaser = B4SD North End of Building 4 – Former Methylene Chloride Area = B4MC North End of Building 4 – Wastewater Tanks = NB4W North End of Building 4 – Zinc Plater area = B4ZP Fire Water Pond area = FWP Building 2 Wastewater Sump Area = B2WW Building 2 Former Cutting Oil Tank Area = B2CO Building 2 Former Bomb Line Area Settling Tanks = B2BL Building 2 TCA Area = TCA Building 41 North Access Road = B41N Former Coal Storage Area (NW Bldg 10) = FCSA Building 67 Container Storage Area = B67C Building 41, IWTP = IWTP Building 40, Hazardous Waste Storage Area (Tank Farm) = B40T Building 16, Former Degreaser Area = B16D Building 57, Former Metals Fabrication = B57C Building 51, Former <90 day hazardous waste storage area = B51H

TABLE B-3
SAMPLE NUMBERING SCHEME

mm = Sample Station/Media Type

Examples
Soil Boring = SB
Surface Soil Sample = SS
Sediment Sample = SD
Test Pit = TP
Monitoring Well = MW (or CW)
Residential Well = RW
Surface Water Sample = SW
Spring = SP
Soil Gas = SG
Roll-off = RO
Waste Characterization = WC
Quality Control sample = QC

NNN = Sample Number

The Field Manager will maintain a listing of three digit station identifiers and correlate them to specific sampling/station locations.

nn/nn = Sample Interval in Feet Below Ground Surface (for soils), or Feet below measuring point (for water)

Examples
Soil Sampling:
12/15= Top of interval is 12 feet and bottom of interval is 15 feet below ground surface.

Water Sampling:
12/12= Pump depth/intake depth set at 12 feet below measuring point.
0/0= indicates that intake depth is unknown.
Roll Off or Soil Pile Sampling:
0/0.5 = surface soil sample taken from top 6 inches.
X/X = depth for composite sampling.

z = Sample Type

Examples
0 = Primary Investigative Sample
1 = Field Duplicate Sample
2 = Trip Blank
3 = Equipment Rinsate
4 = Site Source Water Blank
5 = Investigation Derived Waste (IDW) (total analysis)
5T = Investigation Derived Waste (IDW) (TCLP analysis)

TABLE B-4
FIELD INSTRUMENT USES, DETECTION LIMITS, AND CALIBRATION

Instrument	Uses	Detection Limits	Calibration	Comments
Total Organic Vapor Meters	Sample screening for VOCs	PID - 0.2 ppm isobutylene	1 point – PID isobutylene daily	Action level must be stated in Health and Safety Plan
	Health and safety screening	FID - 1.0 ppm methane	1 point – FID methane daily	Instrument cannot differentiate naturally occurring compounds from contaminants
			Verification check every 20 samples	PID cannot detect compounds with ionization potentials > 11 eV
MiniRae 2000/3000	Aerosol and airborne particulate monitoring	2000 – 0.05-99 mg/m3 3000 – 0-15,000 ppm	Set by manufacturer	None.
Horiba U22 or Specific pH Meters	Field screening of waters	N/A	2 point with standards at pH 7.0 and 4.0 or pH 7.0 and 10.0 daily	Accuracy is to +/- 0.5 pH units
Combustible Gas Meter (CGM)	Monitoring combustible compounds level in air	Varies by instrument	To manufacturer instructions	None.
Horiba U22 or Temperature Meter	Determining water temperature	N/A	To manufacturer instructions	None.
Horiba U22 or Conductivity Meter	Determining conductivity of water	N/A	1 point in KCL solution	Calculations and acceptance criteria must be available in the field

PID = photoionization detector
FID = flame ionization detector
N/A = not applicable

Note: Additional field instruments including geophysical equipment, downhole logging tools, transducers and water quality monitors will be added as the equipment is selected.

TABLE B-5
LABORATORY STANDARD DATA DELIVERABLES FORMS LIST

Method Requirements	Deliverables
Requirements for all methods:	
- Holding time information and methods requested	Signed chain-of-custody forms
- Discussion of laboratory analysis, including any laboratory problems	Case narratives
- LCS (run with each batch of samples processed)	Results (control charts when available)
Organics: GC/MS analysis	
- Sample results, including TICs	EPA Form 1 or equivalent
- Surrogate recoveries	EPA Form 2 or equivalent
- Matrix spike/spike duplicate data	EPA Form 3 or equivalent
- Method blank data	EPA Form 4 or equivalent
- GC/MS tune	EPA Form 5 or equivalent
- GC/MS initial calibration data	EPA Form 6 or equivalent
- GC/MS continuing calibration data	EPA Form 7 or equivalent
- GC/MS internal standard area data	EPA Form 8 or equivalent
Organics: GC analysis	
- Sample results	EPA Form 1 or equivalent
- Surrogate recoveries	EPA Form 2 or equivalent
- Matrix spike/spike duplicate data	EPA Form 3 or equivalent
- Method blank data	EPA Form 4 or equivalent
- Initial calibration data	EPA Form 6 or equivalent
If calibration factors are used	A form listing each analyte, the concentration of each standard, the relative calibration factor, the mean calibration factor, and the %RSD
- Calibration curve if used	Calibration curve and correlation coefficient
- Continuing calibration data	EPA Form 9 or equivalent
- Positive identification (second column confirmation)	EPA Form 10 or equivalent
Metals	
- Sample results	EPA Form 1 or equivalent
- Initial and continuing calibration	EPA Form 2 or equivalent, dates of analyses and calibration curve, and the correlation coefficient factor
- Method blank	EPA Form 3 or equivalent and dates of analyses
- ICP interference check sample	EPA Form 4 or equivalent and dates of analyses
- Spike sample recovery	EPA Form 5A or equivalent
- Postdigestion spike sample recovery for ICP metals	EPA Form 5B or equivalent
- Postdigestion spike for GFAA	EPA Form 5B or equivalent
- Duplicates	EPA Form 6 or equivalent
- LCS	EPA Form 7 or equivalent
- Standard additions (when implemented)	EPA Form 8 or equivalent
- Holding times	EPA Form 13 or equivalent
- Run log	EPA Form 14 or equivalent
Wet Chemistry	
- Sample results	Report result
- Matrix spike recovery	% Recovery
- Matrix spike duplicate or duplicate	% Recovery and % RPD
- Method blank	Report results
- Initial calibration	Calibration curve and correlation coefficient
- Continuing calibration check	Recovery and % difference
- LCS	LCS result and control criteria

GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
RPD = relative percent difference
TIC = tentatively identified compound
GFAA = graphite furnace atomic absorption
LCS = laboratory control standard
PCB = polychlorinated biphenyl
RSD = relative standard deviation

TABLE B-6
LABORATORY STANDARD ELECTRONIC DATA DELIVERABLES (EDD)

EDD Fields (Max Length)	Description
SMP_ID (15)	The original client sample identification number. For Lab QC samples this field may be left empty or filled with a place holder like 'QC' or 'NA' for LCS and blanks. The original client sample ID should be used for MS, MSD, and SUR samples.
LAB_ID (15)	The laboratory's sample identification number.
DATE_SMP (10)	The date the sample was collected in the field (MM/DD/YYYY).
TIME_SMP (10)	The time the sample was collected in the field (MM/DD/YYYY).
DATE_REC (10)	The date the sample was received by the laboratory (MM/DD/YYYY).
DATE_EXT (10)	The date the sample was extracted (MM/DD/YYYY). The extraction refers to any preparatory techniques such as extraction, digestion, and separation.
DATE_ANA(10)	The date the sample was analyzed (MM/DD/YYYY).
TIME_ANA(5)	The time the sample was analyzed (HH:MM).
MATRIX (10)	The sample matrix. Valid values are Water, Solid, or Air.
METHOD (21)	The method requested by the client (i.e., SW846 8080). This should not be the lab method number.
RES_TYPE (4)	The laboratory result type. Currently the loading routine only handles the following values:
	REG-results of a primary analysis of a client sample
	REA- results of a reanalysis of a client sample
	DIL- results of an analysis of a diluted client sample
	LCS-results of a laboratory control sample as %recovery
	LCST-expected (true) result of a laboratory control sample as a concentration
	LCSF-actual (final) result of a laboratory control sample as a concentration
	SUR-surrogate recovery as % recovery
	MS-matrix spike recovery as a % recovery
	MST- expected (true) result of a matrix spike sample as a concentration
	MSF- actual (final) result of a matrix spike sample as a concentration
	MSD-matrix spike duplicate recovery as relative percent difference
	MSDT- expected (true) result of a matrix spike duplicate sample as a concentration
	MSDF- actual (final) result of a matrix spike duplicate sample as a concentration
	BLK-result of a laboratory blank sample.
CAS_NUM (15)	The CAS number or blank if no CAS number is available.
PARAMTR (50)	Chemical name for the analytic parameter.
RESULTS (N)	The analytic result
UNITS (15)	The units for the result.
LABQUAL (6)	The qualifiers assigned by the laboratory.
DET_LIMIT (N)	The Contract-Required Detection Limit for the analyte being measured. It should be reported in the same units as the result.
REP_LIMIT (N)	The Contract-Required Reporting Limit for the analyte being measured. It should be reported in the same units as the result.
UNC (N)	The 2 sigma error in the net count rate for radiological analyses. Should be expressed in the same units as the analytic result.
DILUTION (N)	The overall dilution of the sample aliquot. A value of one should correspond to nominal conditions for the method. Values less than one correspond to concentrations.
SMP_WT (N)	The weight or volume of the sample used for the analysis.
WT_UNITS (2)	The units for the sample weight or volume.
FILTERED (1)	Must have 'F' if the sample was filtered either by the lab or in the field.
PCT_SOL (N)	Percent solids
TIC (10)	Enter 'TIC' or retention time for tentatively identified compound. Blank if not a TIC.

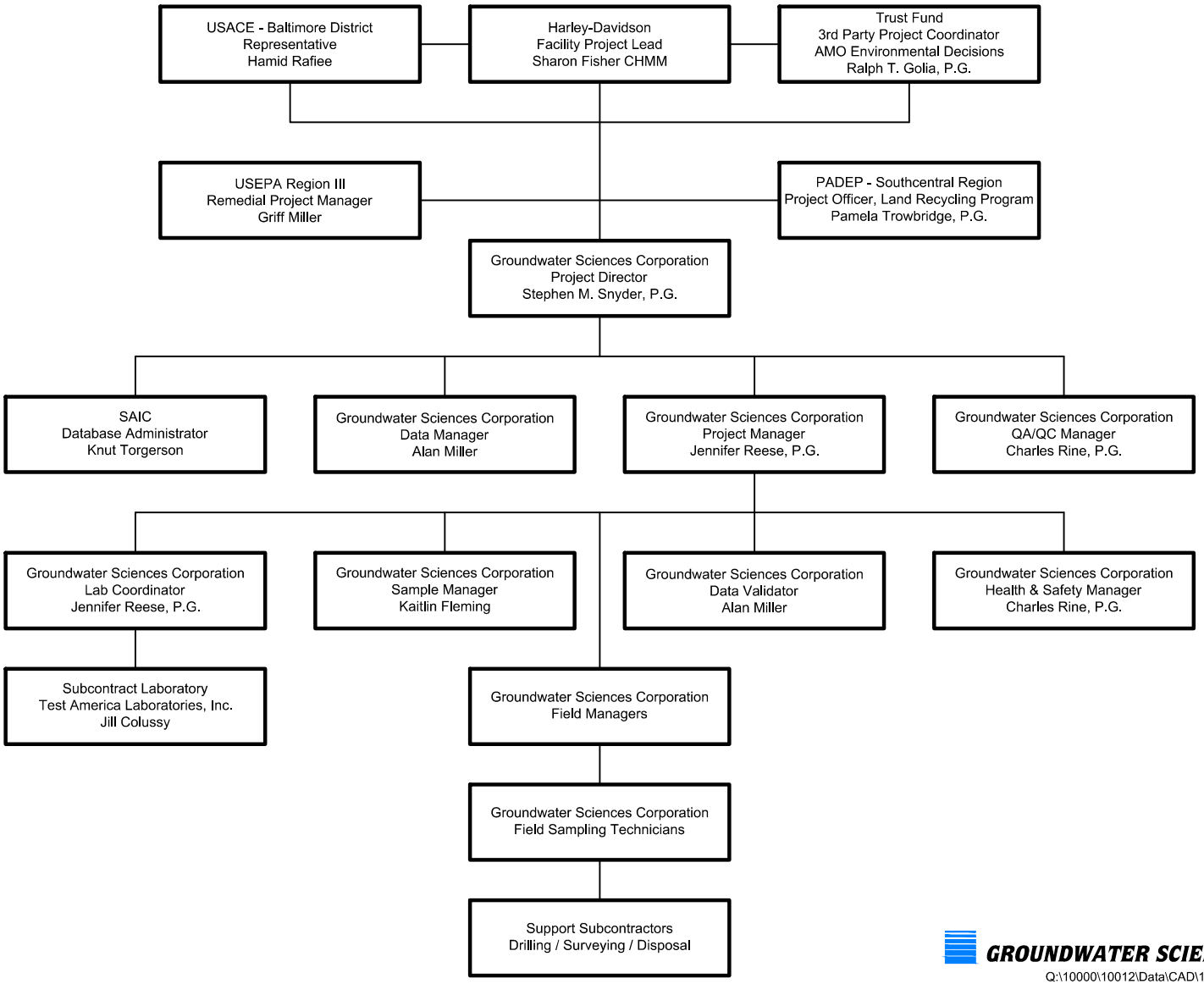
The laboratory EDD may be delivered either as an Excel spreadsheet or as a comma or tab delimited file readable by Excel. The file name must include the SDG number or equivalent. For example, if multiple files were submitted for the same SDG, the filename could be the SDG number followed by a sequential number for each file in the SDG. A file cannot contain more than one SDG. Multiple analytic fractions may be present in the file. The first row of the file should contain the field names. The expected field names and comments about them are listed below. Fields do not have to be present in the order specified and additional fields may be included; however, columns must be present for all fields identified below. N-Indicates that the field requires a numeric entry.

Figure A-1

Project Organization Chart

Quality Assurance Project Plan

Former York Naval Ordnance Plant



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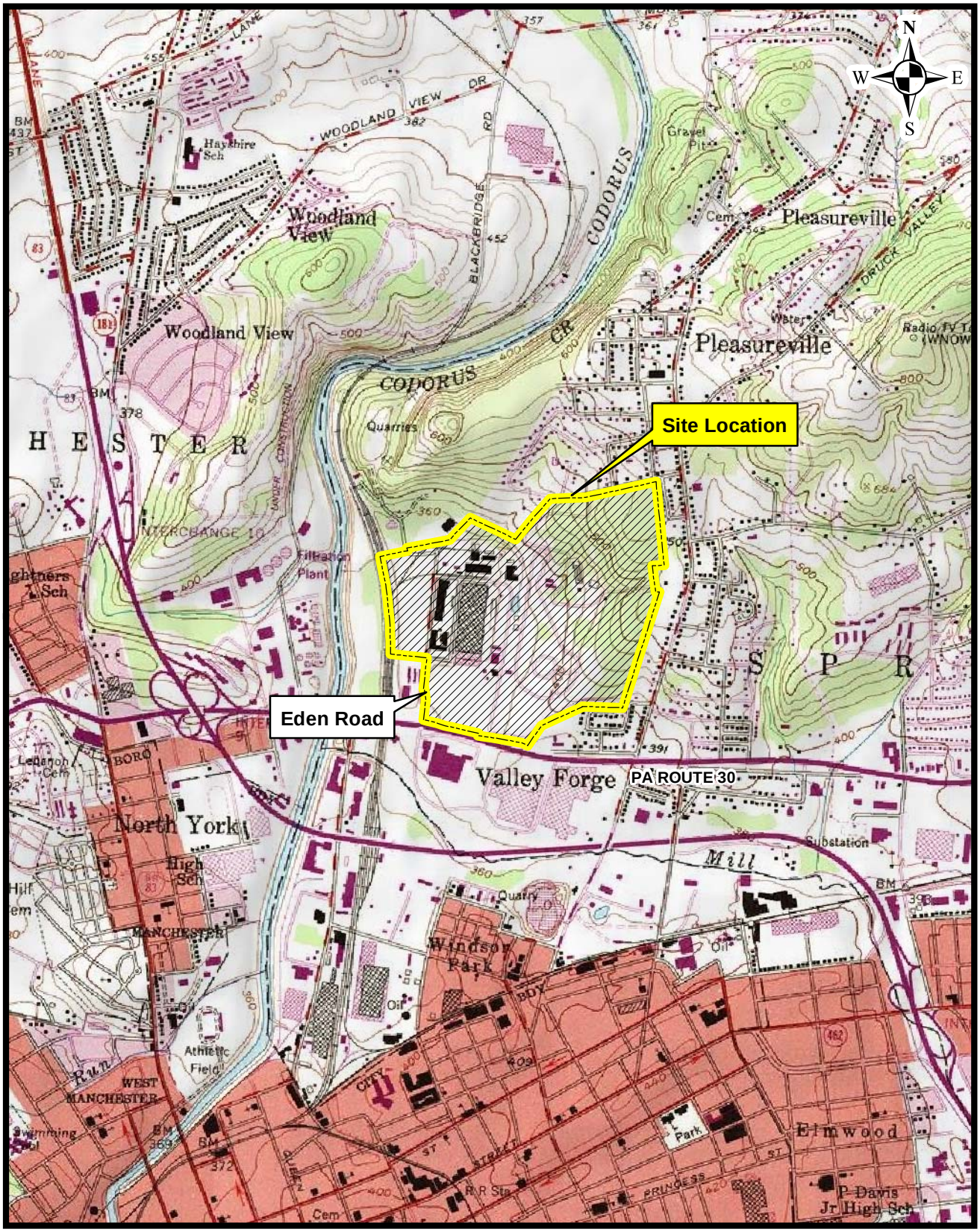
Q:\10000\10012\Data\CAD\10012-025orgcht-A1.dwg / 6-25-2012



Portion of the York, PA
7.5-minute USGS Quadrangle
(2001)

Figure A-2

Former York Naval Ordnance Plant

1425 Eden Road, York, PA 17402

Site Location Map

GROUNDWATER SCIENCES CORPORATION

K:\10000\10012\Projects\2012 Field Sampling Plan\QAPP\FigA-2_SiteLoc.mxd • 5/7/2012

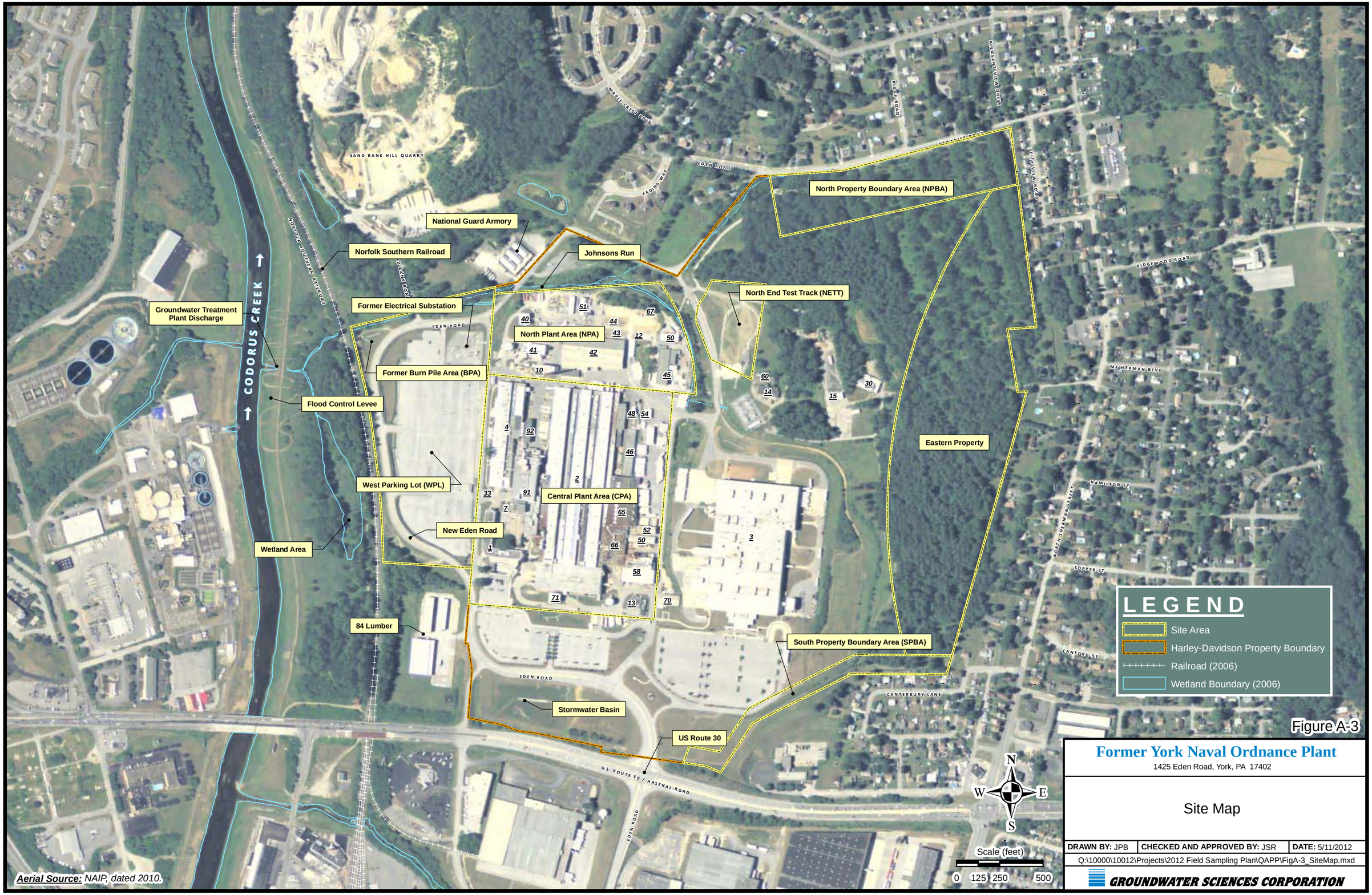


Figure A-3

Former York Naval Ordnance Plant

1425 Eden Road, York, PA 17402

Site Map

DRAWN BY: JPB	**CHECKED AND APPROVED BY:** JSR	**DATE:** 5/11/2012

Q:\10000\10012\Projects\2012 Field Sampling Plan\QAPP\FigA-3_SiteMap.mxd

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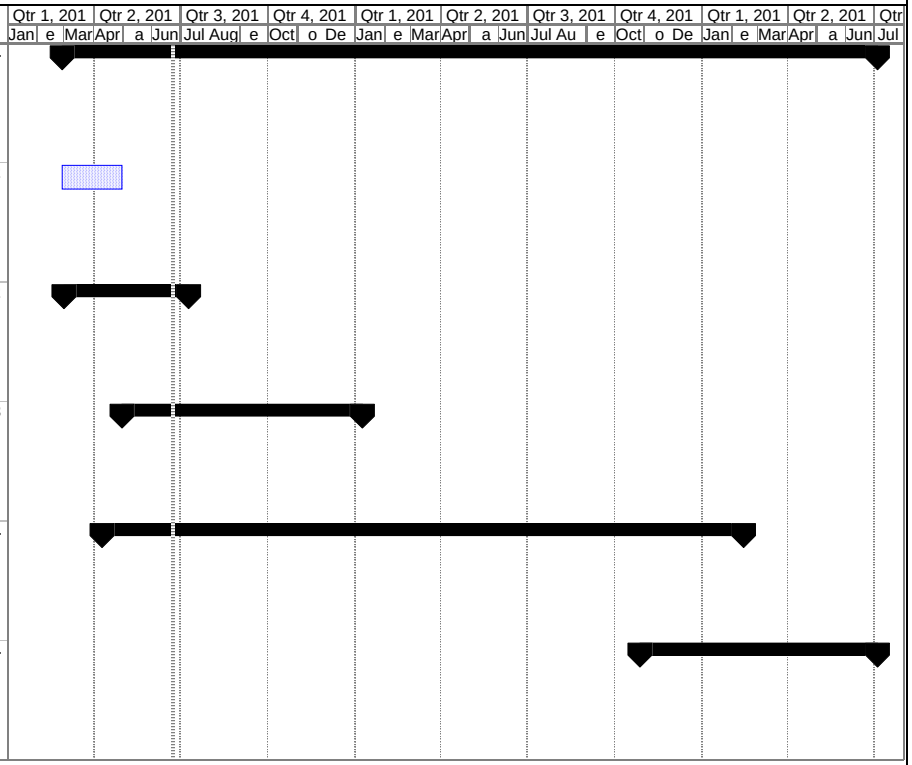
Aerial Source: *NAIP, dated 2010.*

Figure A.4
fYNOP Supplemental R (Part 2)
Schedule

ID	WBS	Task Name	Start	Finish
1	1	**fYNOP Groundwater SRI (Part 2)**	**Tue 2/28/12**	**Fri 7/4/14**
2	1.1	**Field Sampling Plan**	**Tue 2/28/12**	**Mon 4/30/12**
3	1.2	**Phase 1-Pre-Drilling Tasks**	**Thu 3/1/12**	**Mon 7/9/12**
19	1.3	**Phase 2 Drilling Tasks**	**Tue 5/1/12**	**Tue 1/8/13**
72	1.4	**Phase 3-Surface Water and Karst Studies**	**Tue 4/10/12**	**Thu 2/13/14**
99	1.5	**Phase 4-Data Analysis and Report**	**Mon 10/28/13**	**Fri 7/4/14**



Project: GWRI Part2 Schedule12_29_1
Date: Fri 6/22/12

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress
Split
External Tasks
Project Summary
Group By Summary
Deadline

Figure C-1
QUALITY CONTROL/INSPECTION REPORT
Environmental Inspection Activities
Harley-Davidson Motor Company
York, Pennsylvania
Page 1 of ___

Project No. _____ Day: _____ Date: _____

	Weather	**Temperature**	**Precipitation**	**Wind**
AM				
Noon				
PM				

1. Key Personnel On-Site
   Harley-Davidson: _____
   _____
   GSC: _____
   _____
   Contractor(s): _____
   _____
   Visitor(s) (include time and purpose of visit): _____
   _____

2. Work Performed Today by Contractors:
   _____
   _____
   _____
   _____
   _____
   _____
   Primary Equipment On-Site: _____
   _____
   _____

3. Health and Safety Meetings, Levels and Activities: _____
   _____
   _____
   _____
   _____
   _____
   _____

Figure C-1
QUALITY CONTROL/INSPECTION REPORT
Environmental Inspection Activities
Harley-Davidson Motor Company
York, Pennsylvania
Page 2 of ___

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4. Environmental Observations (attach and reference additional information/maps as needed):
   _____
   _____

   List Inspection Type (indicate whether: I-Initial, F-Follow-up or S-Sampling), Location, Observation and Action(s) to be Taken:

Type	Location	Observation	Action

   List Sample Reference (Chain-of-Custody [COC] No.), Sample ID, Type (S-Soil, GW-Groundwater, SW-Surface Water, W-Waste), Location/Depth Where Collected, Analyses Requested or General Results of Previous Tests:

COC No.	Sample ID	Type	Location/Depth	Analyses/Results

5. Problem(s) Encountered/Corrective Action(s) Taken: _____
   _____
   _____
6. Special Notes/Remarks: _____
   _____
   _____
7. Tomorrow's Expectations: _____
   _____
   _____

GSC On-Site Inspector: _____ Checked By: _____

Appendix A

GSC FIELD DOCUMENTATION FORMS

Field Operations Report

Well Development Field Data Sheet

Soil Geologic Well Log

Rock Classification Sheet

Daily Drilling and Monitoring Well Construction Report

Concurrent Indoor Air, Substructure Soil Vapor and Ambient Air Sampling Photoionization Detector Calibration Record

Concurrent Indoor Air, Substructure Soil Vapor and Ambient Air Sampling Flame Ionization Detector Calibration Record

Field Data Table

Calibration Record

Soil Sampling Field Data Sheet

Groundwater Field Data Sheet

Sampling Field Data Sheet

Aquifer Test Data

FIELD OPERATIONS REPORT

Project No. _____

Total Depth _____
Depth to S.S. Refusal _____
Depth to Competent Bedrock _____
Hole Diameter _____
Elev., Ground Surface _____

Boring No. _____
Location

Driller _____
Logged By _____
Drilling Began _____
Drilling Completed _____

Depth	Blow Count	RQD ft/ft	Recv ft/ft	Sample No./ Run No.	SAMPLE DESCRIPTION (USCS), GRn. Size, Color, Shape, Texture, Moistness, etc.	%Grain Size C	S	Sd	Gr	Other Notes	Graphic	Depth
2												
4												
6												
8												
0												
2												
4												
6												
8												
0												

Well Development Field Data Sheet

Well _____ Site _____

Development Personnel _____ Pump Type _____

Casing Diameter _____ DTW _____ DTB _____

Well Volume = _____ gal/ft* x (DTB - DTW) _____ = _____ gal

x3 = _____ gal

x10 = _____ gal

Date	Time	WL (ft)	Flow Rate	Temp	pH	ΔpH (units)	Cond.	ΔCond. (%)	Total Volume	Remarks & Clarity

*gal/ft: 1" = 0.041; 1.5" = 0.092; 2" = 0.163; 3" = 0.367; 4" = 0.65; 6" = 1.47; 8" = 2.61

or

gal/ft calculation: $(1/4d^2\pi h) \times 7.4805 =$ _____ gal/ft (h = 1; d = diameter in feet)

Revised 8/25/95

SOIL GEOLOGIC WELL LOG

Project No. _____

Total Depth _____

Depth to S.S. Refusal _____

Depth to Competent Bedrock _____

Hole Diameter _____

Notes _____

Boring No. _____

Location _____

_____

_____

Driller _____

Logged By _____

Drilling Began _____

Drilling Completed _____

Well Construction Completed _____

Depth	Blow Counts	RQD ft/ft	Recv	Sample # / Run #	SAMPLE DESCRIPTION Name: GRADE, DENSITY, MOISTURE, COLOR, STRUCTURE (USCS), ETC.	Volatile Scan	Graphic: Lith.	Graphic: Well Construction	Depth

Groundwater Sciences Corporation

Rock Classification Sheet

Project _____ Job. No. _____ Sheet _____ of _____

Site Area _____ Drill Hole No. _____

Contractor _____ Driller _____ Classified By _____ Date _____ Coordinates N/S_____

E/W_____

	Drilling History					Geologic Characteristics	Engineering Characteristics		Groundwater
Depth	Run No.	Core Rec.	Remarks	Well Constr.	Graphic Log	Description	Description	Discont.	Static Water Level Time & Date

USE PRINTED 2-PART FORM

Groundwater Sciences Corporation

Daily Drilling and Monitoring Well Construction Report

Date _____ **Page** _____ **of** _____

Project Number _____

Project Name _____

Supervising Geologist(s) _____

Drilling Company _____

Rig Type/Number _____

Driller _____

Driller's Helper(s) _____

Daily Drilling Log

Well/Boring Number	Location	Type (HSA/Air)	Drilling (Ft/Dia.)	Core (Ft/Dia.)	Samples (No./Dia.)	Comments

Daily Activities Log

Time	Description	Hours	Time	Description	Hours
0630			1345		
0645			1400		
0700			1415		
0715			1430		
0730			1445		
0745			1500		
0800			1515		
0815			1530		
0830			1545		
0845			1600		
0900			1615		
0915			1630		
0930			1645		
0945			1700		
1000			1715		
1015			1730		
1030			1745		
1045			1800		
1100			1815		
1115			1830		
1130			1845		
1145			1900		
1200			1915		
1215			1930		
1230			1945		
1245			2000		
1300					
1315					
1330					

Materials Used

Well/Boring	Screen (ft./dia.)	Riser (ft./dia.)	Sand	Bentonite	Steel Casing	Other Materials

_____ _____

Signature - GSC **Signature - Contractor**

Concurrent Indoor Air, Substructure Soil Vapor and Ambient Air Sampling
Photoionization Detector Calibration Record

Meter ID	Date and Time	Personnel	Calibration Span Gas	Comments

Concurrent Indoor Air, Substructure Soil Vapor and Ambient Air Sampling
Flame Ionization Detector Calibration Record

Meter ID	Date and Time	Personnel	Calibration Span Gas	Internal Hydrogen Gas Cylinder Pressure	Comments

Groundwater Sciences Corporation
Field Data Table

Site: _____ Project: _____ Method: _____ Sampler: _____

Well	Sampling Date	Sampling Time	pH	Specific Conductivity	Temperature	Interval

Calibration Record

Instrument: _____

Serial #: _____

			pH		Conductivity		Calibrated By
Date	Time	Temp.	Initial	Corrected	Initial	Corrected	

Groundwater Sciences Corporation
2601 Market Place Street, Suite 310
Harrisburg, Pennsylvania 17110-9307

GROUNDWATER SCIENCES CORPORATION

Soil Sampling Field Data Sheet

GENERAL INFORMATION

Sample Location / ID: _____ Site: _____

Boring/Test Pit/Other (circle one) If Other Explain: _____

SAMPLING

Sample ID: | | | | | | | | | | | | |

Sample Method: (circle one) Geoprobe / Split Spoon / Backhoe/Excavator / Other _____

Date: _____ Personnel: _____ Air Temp: _____ Skies: _____ Wnd Spd/Drctn: _____

Sampled Depth Interval: _____ to _____ feet (bgs) START TIME: _____ STOP TIME: _____

PID Scan: _____ ppm Headspace YES / NO (circle one) Sample Type: GRAB / COMPOSITE (circle one)

LABORATORY INFORMATION

Laboratory: _____ Turnaround Time (TAT): _____ Number of Containers: _____

Date Shipped or Delivered: _____ Method of Delivery to Laboratory: _____

Analyses Requested: _____

_____

GENERAL INFORMATION

Sample Location / ID: _____ Site: _____

Boring/Test Pit/Other (circle one) If Other Explain: _____

SAMPLING

Sample ID: | | | | | | | | | | | | |

Sample Method: (circle one) Geoprobe / Split Spoon / Backhoe/Excavator / Other _____

Date: _____ Personnel: _____ Air Temp: _____ Skies: _____ Wnd Spd/Drctn: _____

Sampled Depth Interval: _____ to _____ feet (bgs) START TIME: _____ STOP TIME: _____

PID Scan: _____ ppm Headspace YES / NO (circle one) Sample Type: GRAB / COMPOSITE (circle one)

LABORATORY INFORMATION

Laboratory: _____ Turnaround Time (TAT): _____ Number of Containers: _____

Date Shipped or Delivered: _____ Method of Delivery to Laboratory: _____

Analyses Requested: _____

_____

ADDITIONAL NOTES

GROUNDWATER SCIENCES CORPORATION

Groundwater Field Data Sheet

Low-Flow Groundwater Purging and Sampling

General Information

Site/Location: _____
Project Number: _____
Sample Location/Well ID: _____
Surface Completion: _____
Physical Condition: _____

Purging Information

Date: _____
Personnel: _____
Total Depth: _____
SWL: _____
Well Diameter: _____
Well Volume: _____
Pump Type: _____
Pump Depth: _____
Start Time: _____
Stop Time: _____
Purge Rate: _____

Sampling Information

Date: _____
Personnel: _____
Sample Time: _____
Sample Rate: _____
Laboratory: _____
Analyses: _____

Time	pH (S.U.)	SC (mS/cm)	Turb (NTU)	Salinity	DO (mg/L)	Temp (deg C)	ORP (mV)	Depth to H_2O (ft)	NOTES
NA	+/- 0.1 Unit	+/- 3%	+/- 10% or <10 NTU		+/- 10%	+/- 1 deg C	+/- 10 mV	< 0.3 ft -- Adj Purge Rate As Necessary	NA

GROUNDWATER SCIENCES CORPORATION *Sampling Field Data Sheet*

GENERAL INFORMATION

Sample Location/Well ID: _____ Site: _____

Manhole/Standpipe/Other (circle one) If Other Explain: _____

Physical Well/Location Condition: _____

PURGING

Date: _____ Personnel: _____ Air Temp: _____ Skies: _____ Wnd Spd/Drctn: _____

TD: _____ SWL: _____ TD – SWL _____ Required Purge Vol: (TD – SWL x C F (below)) _____ (gal)

Method: _____ Start Time: _____ Stop Time: _____ Volume Purged: _____ (gal)

Water Level at End of Purge (WLEP): _____ Total Purge Time: _____ (minutes)

Conversion Factors (well diameter – gallons per foot of water): *(¼ d^2 π) x 7.4805 = gal/ft (d = well diameter in feet)*

1 Vol: ½" – 0.01; ¾" – 0.023; 1" – 0.041; 1 ¼" – 0.063; 1 ½" – 0.092; 2" – 0.163; 3" – 0.367; 4" – 0.653; 6" – 1.47; 8" – 2.61; 10" – 4.08; 12" – 5.88

3 Vol: ½" – 0.03; ¾" – 0.069; 1" – 0.123; 1 ¼" – 0.189; 1 ½" – 0.276; 2" – 0.489; 3" – 1.101; 4" – 1.959; 6" – 4.41; 8" – 7.83; 10" – 12.24; 12" – 17.64

SAMPLING

Sample ID: | | | | | | | | | | | | |

Sample Type: (circle one) Groundwater Surface water Other _____

Date: _____ Personnel: _____ Air Temp: _____ Skies: _____ Wnd Spd/Drctn: _____

WL Recovery (WL/time): _____/_____; _____/_____; _____/_____; _____/_____; _____/_____

Sampled Depth Interval: _____ to _____ feet (gs or toc) Sampling Method: _____

Field Data (in well or in line): SAMPLE TIME: _____

Depth	*pH*	*Sp. Cond.*	*Temp*	*DO*	*Eh*	*Clarity*

Sampler's Signature: _____ Was Sample collected w/in 2 hrs of End of Purge? YES NO

LABORATORY INFORMATION

Laboratory: _____ Turnaround Time (TAT): _____ Number of Containers: _____

Date Shipped or Delivered: _____ Method of Delivery to Laboratory: _____

Analyses Requested:

- ☐ PA DEP Unleaded Gasoline
- ☐ PA DEP Leaded Gasoline
- ☐ PA DEP Diesel/Heating Oil
- ☐ PA DEP Used Motor Oil
- ☐ AACM Pesticides
- ☐ Nitrate
- ☐ Nitrite
- ☐ Ammonia
- ☐ PP VOCs
- ☐ PP SVOCs
- ☐ PP Metals
- ☐ PP Pest/PCBs
- ☐ TCL VOCs
- ☐ RCRA Metals
- ☐ TCLP Metals
- ☐ TCLP VOCs
- ☐ Attached Sheet
- ☐ 124&135 TMB
- ☐ N&Sec Butbz
- ☐

OTHER: _____

ADDITIONAL NOTES

AQUIFER TEST DATA

Owner ______________________ Address ______________________ County ____________ State ________

Date ______________ Company performing test ______________________ Measured by ________________

Well No. ______________ Distance from pumping well ________ Type of test ______________________ Test No. ________

Measuring equipment ____

Time Data	Water Level Data	Discharge Data	Comments on factors affecting test data
Pump on: Date ______ Time ______ (t) Pump off: Date ______ Time ______ (t') Duration of aquifer test: Pumping ________ Recovery ________	Static water level ____________ Measuring point ____________ Elevation of measuring point ________	How Q measured ____________ Depth of pump/air line ____________ Previous pumping? Yes ____ No ____ Duration ________ End ________	

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		Comments on factors affecting test data

Appendix B

FIELD CHANGE REQUEST

NONCONFORMANCE REPORT

FIELD CHANGE REQUEST (FCR)

FCR NO. _____ DATE INITITATED _____

PROJECT _____

CONTRACT NO. _____

REQUESTOR IDENTIFICATION

NAME _____ ORGANIZATION _____ PHONE _____

TITLE _____ SIGNATURE _____

BASELINE IDENTIFICATION

BASELINE(S) AFFECTED ☐COST ☐SCOPE ☐MILESTONE ☐METHOD OF ACCOMPLISHMENT

AFFECTED DOCUMENT (TITLE, NUMBER AND SECTION) _____

DESCRIPTION OF CHANGE:

JUSTIFICATION:

IMPACT OF NOT IMPLEMENTING REQUEST:

PARTICIPANTS AFFECTED BY IMPLEMENTING PLAN:

COST ESTIMATE $_____ ESTIMATOR SIGNATURE _____

DATE _____ PHONE _____

PREVIOUS FCR AFFECTED ☐YES ☐NO IF YES, FCR NO. _____

PROJECT MANAGER _____ DATE _____

QA SPECIALIST _____ DATE _____

H&S MANAGER SIGNATURE (IF APPLICABLE) _____ DATE _____

NONCONFORMANCE REPORT (NCR)

Page ___ of ___

DATE OF NCR	NCR NUMBER
LOCATION OF NONCONFORMANCE	
INITIATOR (NAME/ORGANIZATION/PHONE)	FOUND BY
	DATE FOUND
RESPONSIBLE ORGANIZATION/INDIVIDUAL	PROGRAM
	PROJECT

DESCRIPTION OF NONCONFORMANCE: CATEGORY _____

_____ _____ ☐ ☐

INITIATOR SIGNATURE DATE QA/QC OFFICER DATE CAR REQ'D YES NO

DISPOSITION:

PROBABLE CAUSE:

ACTIONS TAKEN TO PREVENT RECURRENCE:

PROPOSED BY: _____

NAME DATE

JUSTIFICATION FOR ACCEPTANCE:

INITIATOR: _____

NAME DATE

Appendix C

TESTAMERICA QUALITY ASSURANCE MANUAL (February 2010)

*Appendix C is in portable document format (PDF) on
the compact disc (CD) in the front pocket of this binder.

Appendix D

SAIC TECHNICAL PROCEDURE TP-300-7 DATA VALIDATION

*Appendix D is in portable document format (PDF) on
the compact disc (CD) in the front pocket of this binder.