Missouri
Department of
Natural Resources

QUALITY ASSURANCE PROJECT PLAN FOR NATURAL RESOURCES DAMAGES

REVISION 3
APRIL 13, 2011

Prepared by the
Missouri Department of Natural Resources
Division of Environmental Quality
Hazardous Waste Program
Superfund Section

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A. PROJECT MANAGEMENT

A1. Signature Page

PROGRAM APPROVALS

HWP NRD Project Officer Frances Klahr 5/4/11
Signature Date

HWP QA Project Officer Julieann Warren 5-4-2011
Signature Date

HWP Director [illegible] 5/4/2011
Signature Date

ESP Director [illegible] 5/12/11
Signature Date

DEQ Quality Assurance Manager [illegible] May 24, 2011
Signature Date

A2. Distribution List

Missouri Department of Natural Resources (MDNR)

Keith Bertels - Quality Assurance (QA) Manager, Division of Environmental Quality (DEQ)

Hazardous Waste Program (HWP)
David Lamb - Director
Dennis Stinson – Chief, Superfund Section
Frances Klahr - Natural Resources Damages Coordinator, Superfund Section
Julieann Warren – Chief, Site Assessment Unit

Environmental Services Program (ESP)
Alan Reinkemeyer – Director
Chris Boldt – Chief, Chemical Analysis Section (CAS)
Eric Sappington – Chief, ESP Field Services Unit
Karla Wiseman - Quality Assurance Project Plan (QAPP) Coordinator

A3. Project/Task Organization

The following list identifies key individuals and organizations participating in the project, and discusses their specific roles and responsibilities as they pertain to this QAPP.

Project Management Staff for NRD, Superfund Section, HWP, DEQ, MDNR

Role: NRD Coordinator, HWP, DEQ, MDNR

Responsibilities: Overall management of Natural Resource Damage Assessment (NRDA) projects. Coordinate all site-specific activities related to conducting the NRDA including correspondence, communication and scheduling. Conduct sample collection by appropriate methods to provide data of sufficient quality. Prepare NRD assessment reports ensuring that site-specific activities conducted pursuant to this QAPP meet project Data Quality Objectives (DQOs).

Julieann Warren, Chief, SAU, HWP, DEQ, MDNR

Role: QA Project Officer

Responsibilities: As QA Project Officer reviews the NRD QAPP and subsequent revisions, and ensures that the most current revision is available to all staff. Ensures that hardcopy and electronic versions of the QAPP are maintained and available to all Unit staff. Assists in the development of project DQOs and project sampling plans. Review data collected and resolve QA issues that arise. Evaluate analytical data to ensure that

DQO are met. Utilize the data collected to complete NRDA and/or to evaluate remediation objectives. Review and approve all project and Quality Assurance/Quality Control (QA/QC) data. Ensures that all QA requirements of the QAPP are met. Coordinate overall project activities.

Roles: HWP QA Coordinator

Responsibilities: As HWP QA Coordinator, serves as the program's point of contact on all QA issues. Coordinates all QA activities for the program. Provides QA/QC information and reviews all HWP QA/QC activities. Informs QA Manager of all program QA needs, problems, and status. Assists in the completion of the QA status reports to the EPA. As Supervisor of SAU, reviews the data and validates that the project DQOs are met. Assists as appropriate in the performance auditing of all activities performed by the HWP and contractual staff.

Environmental Specialist Staff of Field Services Unit, ESP, DEQ, MDNR

Role: Field Staff, FSU, ESP, DEQ

Responsibilities: Prepare and implement site specific sampling plans to collect environmental samples according to ESP Standard Operating Procedures (SOPs) at NRD sites. Conduct sample collection by appropriate methods to provide data of sufficient quality. Prepare and implement health and safety plans for investigations conducted by the Department at NRD sites. Prepare formal reports of sampling investigations for SAU staff to evaluate and include in NRDA reports.

Eric Sappington, Chief, Field Services Unit, ESP, DEQ, MDNR

Role: Chief, FSU, ESP, DEQ

Responsibilities: Supervises field staff conducting investigations and assists in scheduling their activities. Assures staff is qualified and trained to perform the work, familiar with the required SOPs, including those related to QA/QC, and have the equipment necessary to perform the work. Reviews reports of investigation for completeness, clarity, and accuracy.

Chris Boldt, Chief, CAS, ESP, DEQ, MDNR

Role: Supervisor, CAS, ESP

Responsibilities: Ensures that appropriate analytical methods, CAS SOPs, QC procedures, documentation, and training are implemented and routinely followed by all supervisory and technical staff of the CAS. Utilizes data, review checklists, and QC

charts for both precision and accuracy data in the data quality review process. Conducts reviews of data files following review and approval by staff at the unit chief level.

Alan Reinkemeyer, Director, ESP, DEQ, MDNR

Role: Director, ESP

Responsibilities: Ensures overall validation and final approval of data generated by the ESP. Assists as appropriate in the performance auditing of all activities performed by ESP personnel.

Keith Bertels, Quality Assurance Manager, DEQ, MDNR

Role: DEQ QA Manager

Responsibilities: Monitors the overall QA operations for the division. Develops and maintains the Quality Management Plan (QMP). Reviews and approves all QAPPs for the division. Prepares QA status reports for the EPA.

A4. Project Background/Definition

A4.1 Project Background

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and the Oil Pollution Act (OPA) provide for the restoration of natural resources lost or injured by hazardous substance releases (§107(f)) and discharges of oil (§1006) and require the designation of certain Federal and State officials to act on behalf of the public as Trustees for natural resources. Natural resources include land, fish, biota, water, groundwater, drinking water supplies, and other resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States, any State or local government, or Indian Tribe.

The designated federal Trustees include the Secretaries of the Departments of the Interior, Commerce, Defense, Energy and Agriculture. State natural resource Trustees are designated by the Governor of each state, and for Native American Tribes, the Tribal chairman or a person designated by Tribal officials act as the Trustee. The Director of the Department of Natural Resources is the designated Trustee for the State of Missouri. Trustees generally have overlapping management interests in the same resources or "co-extensive authority". The statutory prohibition against double recovery requires Trustees to coordinate their natural resource damage (NRD) actions as co-trustees.

Trustees conduct NRDAs. The purpose of conducting a NRDA is to identify and document the extent of injuries to natural resources; quantify the injuries and all associated losses to the public; and select restoration projects. Section 301(c) of CERCLA requires the promulgation of

regulations for the assessment process. The President, pursuant to Executive Order 12580 (January 23, 1987), vested the rulemaking authority with the Department of the Interior (DOI).

The DOI regulations (43 CRF 11) provide a framework and standards for the NRDA process in coastal and marine environments (Type A) and other environments (Type B). The Type A process involves the use of a computer model to assess damages, in a standard and simplified manner, that result from chemical or oil discharges into coastal and marine environments. Type B is used in situations that require an individual approach. Both types follow four sequential phases.

Pursuant to section 1006(e)(1) of OPA, the National Oceanic and Atmospheric Administration (NOAA), the agency designated by the Department of Commerce (DOC) to act as Trustee for the natural resources administered by DOC, was charged with developing NRDA regulations (Type A) resulting from a discharge of oil (except for any part of oil defined as a "hazardous substance" by CERCLA). The regulations provide a framework for conducting NRDAs that achieve restoration and include four distinct phases: prespill planning; preassessment, restoration planning and restoration implementation.

Under CERCLA, preassessment screens (Phase I) are conducted using readily available information to determine if certain criteria have been met to warrant further action. The assessment plan (Phase II) defines the procedures used to confirm the exposure of trust resources and identifies how the potential injuries will be evaluated. During assessment implementation (Phase III) necessary data is gathered to quantify the injuries and determine damages. During post-assessment (Phase IV) the Trustees prepare a report of assessment outlining the results of the implementation phase. A reasonable number of restoration alternatives, including natural recovery, are usually proposed. A preferred alternative is selected based on several factors. All proposed alternatives are subject to public review and comment prior to implementation of any project.

The goal of the NRD is restoration and Trustees who comply with the regulations have the advantage of creating a rebuttable presumption in litigation. This means the potentially responsible parties (PRPs) have the burden of proof. Trustees do not have to follow the established regulations, but can perform the assessment in cooperation with the PRPs to promote integration of NRD into the response and site cleanup process as well as advancing the speed of the restoration. Additionally, coordination among the Trustees and response agencies ensures integration of NRD into the remedial process, promoting timely and efficient cleanup and expedited restoration by reducing injury, investigative costs, and thus, overall NRD liability.

A4.2 Project Definition

This QAPP covers the field and analytical activities related to CERCLA and OPA NRDAs. In the absence of cooperative agreements with PRPs and/or federal or tribal Trustees, total funding will be provided from the Natural Resource Protection Fund (NRPF). If co-trustees are involved, only the state Trustee's portion will be paid from the NRPF. Once damages have been awarded

or settlement reached, the Trustees establish an account for the recovered damages that are to be used to restore, replace, rehabilitate or acquire the equivalent of the injured resources. Pursuant to the *Memorandum of Understanding Between the Missouri Department of Natural Resources and the United States Department of the Interior*, any funds recovered as a result of joint assessment and restoration activities will be deposited into the DOI Natural Resource Damage Assessment and Restoration Fund unless all Trustees agree otherwise.

A NRD checklist may be utilized by the NRD Coordinator or HWP personnel, at the request of the NRD Coordinator, during a site reconnaissance visit to collect cursory NRDA information for referral purposes to other Trustees (i.e., federal and/or tribal). No sampling will be conducted at this stage until the cursory information is evaluated and a need identified.

The PRPs will be invited to participate in a cooperative assessment (CA) process whereby both the PRPs and Trustees will jointly develop the sampling plan. Each sampling plan will include a site description and history, sampling strategies, sample collection order and quantity, sample containers and preservation requirements, chain-of-custody, analyses requested, data quality objectives developed using the 7-step systematic planning process, investigation-derived waste, site safety and reporting requirements. When PRPs are conducting the sampling for NRDAs, split sampling will be required for verification purposes. ESP may collect split samples as necessary.

If the PRPs do not participate in the CA process, the Trustees may conduct a formal NRDA in accordance with the DOI regulations (43 CFR 11). During the pre-assessment screen phase, where appropriate, existing sampling data will be used for injury determination and pathway exposure purposes. Additional sampling could be required to fill data gaps. Data needs will vary based on what stage (e.g., pre-remedial or remedial action) the site is in when the NRDA is initiated. ESP assistance may be required at this phase. When the NRD Coordinator requests assistance from ESP at the pre-assessment phase, a formal sampling plan may or may not be required. If a formal sampling plan is not required ESP personnel will collect samples according to MDNR's SOPs for sampling (Appendix 5) and will prepare an abbreviated trip report.

If the pre-assessment screen meets the five established criteria and there is a determination that an assessment should be conducted, the NRDA will move to the second phase – assessment planning. ESP will prepare sampling plans for the assessments that will focus on developing data to support a NRD claim and could potentially be used to support other actions within the Hazardous Waste program. Prior to preparing sampling plans, ESP personnel, in conjunction with HWP personnel, may conduct a site reconnaissance to select sampling points, or a map indicating potential sampling locations will be prepared by HWP and transmitted to ESP. ESP will develop the sampling plan based upon the information from the site reconnaissance or map prepared. The sampling plan will include a site description and history, sampling strategies, sample collection order and quantity, sample containers and preservation requirements, chain-of-custody, analyses requested data quality objectives developed in using the 7-step systematic planning process, investigation-derived waste, site safety and reporting requirements.

All NRD field activities and public contacts will be coordinated through the NRD Coordinator. Draft sampling plans will be sent to the NRD Coordinator and HWP QAC for approval on sampling points and parameters. Sampling plan approval will be documented on the signature page, which will include the signature of the ESP personnel who prepared the report and approval signature of the NRD Coordinator and HWP QAC. Since the NRD Coordinator and HWP QAC are independent of those responsible for generating the data (i.e., ESP), approval of the sampling plan in terms of QA requirements is sufficient to ensure that data is of known and usable quality.

Changes in site conditions between the time of the site reconnaissance and the on-site sampling visit may alter sampling points and parameters in the field. Such deviations or changes to the sampling plan while in the field will be made and approved by the NRD Coordinator or HWP QAC who originally approved the sampling plan. The deviations or changes will be documented in the final Sampling Report prepared by ESP and submitted to the NRD Coordinator. Safety considerations will be made prior to arriving on-site for sampling and more in-depth site investigation. Sampling Plans will include a Site Health and Safety Plan. Sampling will generally be limited to sediment, surface water, groundwater, containerized wastes, air, surface and subsurface soil, and background media, but could include plant and/or animal tissue and whole or fillet fish sampling. When sufficient information is known about a site, specific monitoring points and parameters will be recommended. The sampling plan will estimate the number of samples to be collected, but existing site conditions and the visual appearance at the time of sampling will determine the actual number of samples collected. On-site screening chemical analyses may be conducted by ESP when a variety of unknown materials or media are present on-site, or when field screening analyses could result in significant economies in laboratory analytical work.

It is estimated that ESP personnel will be requested to conduct sampling on one site for natural resources damages purposes. The ESP field personnel will be responsible, in conjunction with HWP personnel as appropriate, for field activities involving the collection of samples, including decontamination procedures and disposal of investigation derived wastes.

A5. Project/Task Description

A5.1 Task Description

The tasks included in projects addressed by this QAPP can be grouped into the following general categories: site reconnaissance, sampling plan preparation, sample collection, sample analysis, data verification and validation, documentation and reporting, and auditing. The various tasks in these categories are briefly described below.

A5.1.1 Site Reconnaissance

At the beginning of each project, ESP and HWP personnel may jointly conduct a site reconnaissance for the purposes of selecting sampling points. In the absence of a site reconnaissance, HWP personnel will prepare a map indicating potential sampling locations and provide to ESP.

A5.1.2 Sample Collection

Projects conducted under this QAPP will generally require the collection of site samples from environmental media. The media to be sampled will vary based on site-specific conditions, and may include, sediment, surface water, groundwater, containerized wastes, background media, air, surface and subsurface soil, plant and/or animal tissue, or whole or fillet fish samples. Other media may require sampling on a site-specific basis.

Based on available site information, the NRD Coordinator or HWP staff will prepare a sampling request memo to ESP. The memo will provide general site background information, describe the number, type, and location of samples to be collected, along with analytical parameters requested for each sample. The NRD Coordinator or HWP staff will use the DQO process described in Section A6 of the QAPP to develop the sampling request memo. Based on the sampling request memo, ESP and the NRD Coordinator or HWP staff will prepare and implement a sampling plan. Sample collection is typically conducted by ESP personnel, with on-site oversight by HWP personnel. However, for some projects with limited sampling needs, HWP personnel will assist with sampling or conduct sampling independently

A5.1.3 Sample Analysis

Samples collected for projects under this QAPP will be submitted to the ESP CAS for laboratory analysis. The CAS will conduct sample analysis using standard EPA testing methods, and provide analytical results to the NRD Coordinator. The analytical parameters requested will vary by project. Further information about sample analysis is provided in Section B.

On-site field screening analyses may be conducted by the ESP or HWP personnel when a variety of unknown materials or media are present on-site, or when field screening analyses could result in significant economies in laboratory analytical work.

A5.1.4 Data Verification and Validation

In general, data verification and validation are performed by the staff and supervisors of ESP FSU and CAS. Further data validation is conducted by the HWP QA Project Officer during review of the reports generated by ESP, and review of the final project report. Data verification and validation methods are as described in ESP FSU and CAS SOPs. Data quality assessment is conducted by the HWP QA Project Officer/HWP QA Coordinator. Details on validation, verification, and data quality assessment process are provided in Section D.

A5.1.5 Documentation and Reporting

Documentation and reporting tasks are completed at various steps along each project's duration. Notes from the site reconnaissance and sampling events are recorded in a field notebook, and formalized in a site reconnaissance memo (prepared by ESP) and a sampling report (prepared by ESP or HWP personnel). A sampling plan and health and safety plan are prepared by ESP working together with the NRD Coordinator and approved by the HWP QA Project Officer/HWP QA Coordinator. Following sample analysis, CAS provides analytical data reporting sheets to the NRD Coordinator containing sample results. The sample collection event is summarized in a sampling report prepared by ESP. Summary reports are prepared by ESP following audits of both laboratory and field sampling performance. Further information on documenting and reporting is provided in each of the following main sections of the QAPP.

A5.1.6 Auditing

Periodic auditing is done both of laboratory performance and field activities.

A5.2 Special Equipment and Services

Some of the projects initiated under this QAPP will require the use of special equipment and/or services. Where used, this equipment and services will be fully described in the project sampling plan. A brief description of this equipment and services along with information on how they will be implemented is provided below.

A5.2.1 Excavation and Well Installation

The NRD Coordinator and/or HWP personnel will identify the need to perform limited excavation at sites to obtain samples of buried material or to document other subsurface conditions. The NRD Coordinator or HWP personnel will also identify the need for installation of any permanent or temporary monitoring wells. The ESP will manage the procurement, selection, and oversight of contractual services for excavation or installation work using procedures acceptable for expenditure of federal funds. The ESP will involve the NRD Coordinator and/or HWP personnel in concurrence of scopes of work, Requests for Proposals (RFP), and other procurement documents and will involve the NRD Coordinator and/or HWP personnel in contractor selection.

A5.2.2 Global Positioning System

The NRD Coordinator and/or HWP personnel will either request the ESP to collect Global Positioning System (GPS) readings for all sites or collect such data themselves. The decision on which staff will collect GPS data will be made on a site-specific basis, and will be specified in

the sampling plan. The readings should include one locational point for the general site position and a reading for each sample collection point. All GPS points should be collected in accordance with Department data collection policy using a Trimble GPS, and the data post-processed. The GPS readings will be used to create Geographic Information System (GIS) site maps using ARCGIS®.

A5.2.3 X-Ray Fluorescence Detector (XRF)

For some projects, the NRD Coordinator and/or HWP personnel will identify the need to conduct screening of site samples for specific metals using the HWP's XRF analyzers. The NRD Coordinator and/or HWP personnel may conduct XRF screening independently or they may request that ESP screen soil samples from a site using one of the three following methods: in-situ screening, screening samples collected and homogenized in plastic bags, or screening fully prepared samples (dried, ground and sieved). Analysis of soil and sediment samples with the XRF will be conducted in accordance with the manufacturer's user's guide and applicable EPA SW-846 methods

A5.3 Project Scheduling

This QAPP covers the field and analytical activities related to CERCLA NRD assessments. These ongoing assessments will be funded through the Natural Resource Protection Fund. As these assessments are ongoing, the QAPP is designed to continue in effect indefinitely. The NRD Coordinator and QA Project Officer will review the QAPP at least once a year, and will provide any significant changes in the content of the QAPP. This annual QAPP review will be completed no later than August 15th of each year.

A description of the types of services anticipated to be requested from the ESP FSU, along with the estimated volume of these services, is provided in a workplan prepared between the HWP and ESP annually. A list of the estimated number and type of laboratory analyses anticipated to be requested from the ESP CAS are provided in a workplan between the HWP and ESP prepared annually.

A6. Systematic Planning Process (Data Quality Objectives)

DQOs are qualitative and quantitative statements derived from the Systematic Planning and DQO processes, developed by EPA and further described in *Guidance for the Data Quality Objectives Process* (U.S. EPA, 2006), *Data Quality Objectives Process for Hazardous Waste Investigations* (U.S. EPA, 2006a), and Guidance on Systematic Planning Using the Data Quality Objectives Process (U.S. EPA, 2006b). The DQO process is the Systematic Planning Process used to develop this QAPP. The DQO process is an iterative, strategic planning approach designed to ensure that the type, quality, and quantity of environmental data used in decision making are appropriate for the intended application. The following section describes general DQOs applicable to all projects conducted under this QAPP. Since this QAPP is generic, in that it does not pertain to a specific project, DQOs cannot be fully developed here. Instead, the

general steps will be described, and any portions of the DQOs that apply to all projects will be provided. The specific DQOs for each project will be developed and documented in the sampling plan prepared by the NRD Coordinator together with ESP.

A6.1 Problem Statement

A6.1.1 Background Information

Historical and background information relevant to the general process of NRD assessments is presented in section A3. When available, a summary of background information, specific to each site assessed under this QAPP, will be provided by the NRD Coordinator to ESP at the beginning of each project requiring ESP field and analytical services.

A6.1.2 Conceptual Site Model

A conceptual site model (CSM) will be prepared for each project and documented in the sampling plan. The CSM will be described in the narrative of the sampling plan, and a graphic diagram will be included as a figure in the plan. An example CSM diagram is included as Appendix 1.

A6.1.3 Available Resources and Constraints

Workplans will be negotiated annually between HWP and ESP identifying the amount of field and analytical services HWP will be requesting from ESP each State Fiscal Year for conducting site assessment activities.

A6.2 Decision Statements

The primary overall goal of NRD assessments is to identify and document the extent of injuries to natural resources; quantify the injuries and all associated losses to the public; and select restoration projects.

A6.3 Inputs into the Decision

The types of information inputs required to resolve the decision statements presented in Section A6.2 are listed below. The information is gathered from numerous sources including the site reconnaissance, interviews of site owners, operators, employees, and/or others related to the site, analytical data generated by MDNR's ESP or other laboratory, published reference books and resources, MDNR databases, U.S. Fish and Wildlife and other co-Trustees, internet resources, and evaluations of site conditions by MDNR geologists.

- Historical site data including: property use, surrounding land use, site operations, ownership history, regulatory history
- Previously collected environmental sampling data
- Site reconnaissance observations
- Waste sources and ecological receptors

- Census Data
- Meteorological and Climatic Data
- Geologic data provided by the DGLS geologists
- Groundwater resource and usage data
- Surface water resource and usage
- Sensitive Environments or Species data
- Physical, chemical and toxicological data on hazardous substances of concern
- Analytical results from waste and environmental media
- Background concentrations (measured or published) of hazardous substances of concern

Waste source and affected media sampling data will be compared to, but not limited to; established ecological benchmarks or criteria outlined in the DOI NRDA regulations.

A6.4 Study Boundaries

43 CFR Part 11.61 (Injury Determination Phase) establishes non-mandatory procedures for determining whether an injury to natural resources has occurred and if the injury resulted from the discharge of oil or release of a hazardous substance based upon the exposure pathway and the nature of the injury. The injury determination phase consists of general information; injury definition; pathway determination; and testing and sampling methods.

A6.5 Decision Rules

The primary goal of NRD assessments conducted under this QAPP is to identify and document the extent of injuries to natural resources; quantify the injuries and all associated losses; and select restoration projects. Separate decision rules for each NRD assessment will be based on site-specific project goals, and documented in the sampling plan.

A6.7 Design Optimization

For each NRD assessment, the NRD Coordinator, in consultation with the QA Project Officer and ESP FSU sampling staff, will review the DQO output from Sections A6.1 through A6.6 together with existing environmental data for the site, and develop a sample collection design based on this review. The sample collection design will specify the type, location, timing, number of analyses per sample, and, if different than specified in Section B, the sample size, field sampling or analytical methods, and QC samples. Rationale for the location of samples and types of analyses will be thoroughly developed and supported. This information will all be documented in the sampling plan prepared by ESP and approved by the NRD Coordinator and/or HWP personnel.

A7 Special Training Requirements/Certification

In accordance with 40 CFR Part 311, which references 29 CFR 1910.120, all staff are required to successfully complete a 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) site safety course, with 8-hour annual refreshers and medical monitoring prior to conducting any field work on a site where hazardous substances are present or suspected.

A8 Documentation and Records

Documentation procedures are outlined in the following MDNR SOPs: ESP-CAS-2020 "Data Review, reduction and Transfer to LIMS", ESP-CAS-2090 "Quality Control Procedures and Quality Control Charts" for the CAS and MDNR-ESP-004 "Field Documentation" for the ESP FSU.

The reports and documents generated throughout NRD assessments are listed below. An example of each type of report and document is included in Appendix 2: Example Sampling Plan and Report Outlines.

- Site Sampling Plan
  This plan is generated by the NRD Coordinator together with ESP FSU, reviewed by the HWP QA Project Officer and signed by the NRD Coordinator before sampling occurs. The Site Sampling Plan includes a Site Health and Safety Plan as an appendix.

- Results of Sample Analyses Report
  The laboratory will report sample results on the Results of Sample Analysis sheets. The laboratory result sheets will be generated by the ESP CAS and sent to the NRD Coordinator within 30 days of receipt of the samples. The sheets will include the information detailed in Table 2 on the following page.

- Site Sampling Report
  This report will be generated by the ESP FSU for all NRD assessment sampling events thatrequire a sampling plan. The Site Sampling report will be submitted to the NRD Coordinator as soon as possible after all analytical data has been reported.

The ESP will provide a minimum of Level II QC data reporting for each NRD assessment under this QAPP. This level of data quality is generally accepted by the USEPA as qualitative, quantitative and legally defensible. The minimum Level II QA/QC data to be included in each laboratory analysis report is defined below.

1. Sample Data. See Table 2 below.
2. Results of blanks (i.e., trip, equipment, and lab blanks).
3. Results of field duplicates identified as such.
4. Results of laboratory control data for replicates and spikes. Calculated as Percent Relative

5. Standard Deviations (%RSD) or replicates and Percent Recovery (%R) of spikes, and the control limits values utilized for each parameter/matrix.
6. Results of field spikes, if any, identified as such.

The above list, which applies to both inorganic and organic analysis, will ensure that the Project Managers are apprised of the quality level of the analytical data through each laboratory report.

Table 2. Data To Be Included in Laboratory Results of Sample Analysis Sheets

Report Sheet Element	Comment
Site name	From the COC form "Site/Study Name:" field
County	From the COC form "County" field
Program Contact	
LDPR and Job Code	
Sample number	From the COC form "Sample Number" field
Sample description	From the COC form "Description (permit/station number, sample type, etc.):" field.
Date and time of sample collection	From the COC form "sample Collected" field
Sample collector & affiliation	From the COC form "Collector's Name" and "Affiliation" fields
Date of Analysis	
Report Date	
Analytical method used	
QC Batch ID	
Sample Matrix	From the COC form "Matrix" field
Practical Quantitation Limit (PQL)	Included in the "Result" column when qualifier "ND" is used.
Units (e.g. ug/l, mg/kg, etc.)	
Qualifier	From the list in Appendix 8.

A Laboratory Information Management System (LIMS) at the ESP maintains all information and data on all environmental samples received. The system is utilized to log in samples collected, record results of analyses, and generate sample analyses and management reports. The LIMS is backed up daily through the off-site DNR tape backup system. System maintenance is performed weekly. This includes checking for operating system errors, LIMS system errors, and database integrity.

All original copies of site-specific reports and documents will be stored in site specific files in

the HWP Records Center. All non-site specific quality management reports and documents relating to this QAPP will be stored in the QA/QC Superfund in the HWP Records Center. The QA Manager for the department identifies all QA and QC documents listed in the DEQ Agency Records Disposition Schedule. The NRD Coordinator and ESP will follow the current Agency Records Disposition Schedule approved by the Secretary of State's Office for all QA and QC documents and records of environmental data.

B. MEASUREMENTS/DATA ACQUISITION

B1 Sampling Process Design

Sampling conducted during NRD assessments will be designed to meet the general DQOs developed for the specific project type as discussed in Section A6. Site-specific DQOs will be developed for individual projects, and these will be specified in the sampling plan prepared by the NRD Coordinator and ESP FSU. Depending on the scope of the NRD assessment, the results may be used to determine the appropriate next course of action (e.g. further assessment if conducted during the pre-assessment screen, no action, etc.). .

Based on available site information, and/or data gathered during the site reconnaissance, the NRD Coordinator together with ESP FSU will prepare a sampling plan. The sampling plan will provide general site background information, document the data quality objectives using the DQO process, describe the number, type, and location of samples to be collected, along with analytical parameters requested for each sample. The plan will be reviewed by the HWP QA Officer prior to submission to ESP. Because the QA Project Officer is independent of those responsible for generating the data, (i.e. ESP), their review of the sampling plan in terms of QA requirements is sufficient to ensure the project sampling design is adequate to meet the DQOs and will be of usable quality. The NRD Coordinator will also notify the CAS by e-mail in advance of sampling to indicate the anticipated number and type of samples to be collected, the date(s) of sampling, and the analyses required.

An example sampling plan outline is provided as Appendix 4. Sampling plan approval will be documented on the signature page, which will include the signature of the ESP personnel who prepared the report and the approval signature of the NRD Coordinator. Sample collection is generally conducted by ESP personnel, with on-site oversight by the NRD Coordinator and/or HWP personnel. However, for some projects with limited sampling needs, the HWP personnel may conduct the sampling.

The sampling plan will provide a best estimate of the number and types of samples to be collected, but site conditions at the time of sampling will determine the actual number and type of samples collected. Decisions on deviations from the sampling plan in terms of sampling points and parameters will be made and approved by the QA Project Officer or NRD Coordinator who approved the sampling plan. The deviations or changes will be documented in a field notebook, and in the final sampling report prepared by the ESP and submitted to the NRD Coordinator.

Background sample(s) will be collected for each type of environmental media sampled (e.g. soil, sediment, groundwater, surface water, air) for each project in accordance with the guidance provided in MDNR-ESP-210 "Quality Assurance/Quality Control for Environmental Data Collection".

B2 Sampling Methods and Procedures

The field investigations and sample collection activities for all projects will adhere to the methods described in established department SOPs. A list of Department SOPs is provided in Appendix5. Additional sample volume will be collected from one background sampling location of each matrix sampled for each project. The additional volume will provide enough sample for the laboratory to conduct matrix spike and matrix spike duplicate analyses on the background sample. Collection of twice the optimum volume specified in Appendix 3 will provide sufficient sample volume.

The NRD Coordinator and/or HWP personnel, in consultation with the ESP sampling staff will be responsible for corrective action regarding any failures in sampling encountered in the field. Unanticipated needs to deviate significantly from these sampling methods and procedures in the field will be approved by the NRD Coordinator in consultation with ESP sampling staff.

B3 Sample Handling and Custody Requirements

Chain-of-custody and field documentation of samples collected for this project will be in accordance with MDNR-ESP-002 "Field Sheet and Chain-of-Custody Record" and MDNR-ESP-004.

B4 Analytical Method Requirements

The specific analytical methods required for a specific project will be included in the sampling plan. All analyses will be conducted in accordance with applicable ESP CAS SOPs.

The HWP may occasionally request that ESP conduct a tentatively identified compound (TIC) search on a sample or group of samples. ESP will provide a list of compounds tentatively identified together with an estimated concentration for each compound. Estimated concentrations will be calculated using a relative response factor (RRF) of 1.0 unless data is available to indicate that a more specific RRF is warranted.

Any analytical work not performed by the ESP will be conducted at a laboratory under contract with the ESP. The contract will specify that EPA SW-846 methods or other methods as specified will be utilized and that the QC procedures specified in these methods will be followed. The contract will require that all QC documentation be provided with each analytical deliverable package. The ESP will be responsible for ensuring all analytical data provided under contract for the project meets the contract requirements and the requirements of this QAPP.

B4.1 List of Target Analytes

The specific target analytes required will vary on a project-specific basis, and will be specified in the sampling plan and in the chain of custody submitted to the CAS with the samples. Some analyses are requested by referencing commonly grouped analytes such as Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), pesticides and herbicides, and RCRA Metals. The specific analytes to be included in these groups when requested are listed in the tables of Appendix 4. For some projects analytes, other than those listed in Appendix 4 will be required. The NRD Coordinator and/or HWP personnel will consult with the CAS on special analytical needs for these projects well in advance of sampling.

B4.2 Sensitivity Requirements

Method Detection Limits (MDLs) for each analytical parameter will be established by the CAS as specified in 40 CFR 136 Appendix B and Section 5, Chapter 1, Quality Control, of SW-846. PQLs as defined in 40 CFR Part 300 Appendix A, Section 1.1 will be developed by the CAS. The CAS may use either the PQL or the MDL as reporting limits for analyses conducted under this QAPP, however the reporting limit used must be identified on the laboratory reporting form. Project-specific sensitivity requirements will be documented in the sampling plan.

Analytical results obtained for projects conducted under this QAPP will be compared to various action limits established for the project, or to screening benchmarks, the most common of which include ecological benchmarks and/or criteria established in the DOI NRD regulations (43 C.F.R. Part 11). Ideally, the laboratory reporting limits would be at or below each benchmark value in each environmental media.

It is important to note that interference caused by difficult sample matrices and highly contaminated samples may cause PQLs to be elevated above those specified in the project-specific sampling plan.

The NRD Coordinator will consult with ESP CAS well in advance of sampling regarding the appropriate analytical method, to verify that the laboratory PQL will meet the project DQOs, and to determine the appropriate course of action where applicable (e.g. the use of an alternative analytical method or subcontracting to another laboratory).

Data that do not meet the project DQOs for sensitivity will be qualified by the ESP CAS as described in the applicable verification/validation procedure (Section D), and documented in the project report.

B4.3 Laboratory Turnaround Time Requirements

All analyses will be conducted within the EPA-specified maximum sample holding time limits specified in the tables of Appendix 5. ESP will provide the analytical data report sheets to the NRD Coordinator within 30 calendar days of the delivery of samples to the ESP laboratory for

analysis. In the event that the 30-day turn around time cannot be met, the ESP will notify the NRD Coordinator. The NRD Coordinator authorizes the ESP to contract out analysis for those samples that will not meet the 30-day turnaround time due to workload at the ESP. The NRD Coordinator may request expedited turnaround time (10 days) for laboratory analysis of samples at certain sites. If the NRD Coordinator requests expedited turnaround ESP CAS will be notified by e-mail well in advance of sampling to specify the analytes, number of samples, and date by which results are needed.

Any data obtained from analyses conducted on samples after the holding time limits specified in Appendix 3 will be qualified by the CAS as described in the applicable validation procedure (Section D) and discussed in the project report.

B5 Field and Laboratory Quality Control Elements

A number of field and laboratory QC checks will be required to ensure data meet the project DQOs. The principal quality attributes important to NRD assessments are precision, accuracy, comparability, representativeness, and completeness. Criteria for these attributes are discussed below. All QC samples, including field blanks, trip blanks, equipment rinsate blanks, replicate splits and duplicate samples will be collected in accordance with MDNR-ESP-210 "Quality Assurance/Quality Control for Environmental Data Collection."

B5.1 Precision

Precision is a measure of mutual agreement among individual measurements of the same property, under prescribed similar conditions. It is typically expressed in terms of the standard deviation among a set of data or as the relative percent difference between two measurements. For the purposes of this QAPP the components of precision have been grouped into those associated only with the laboratory analysis and those associated with the overall sampling and analysis process.

B5.1.1 Laboratory Precision

Precision of laboratory analyses is assessed by the analysis of Matrix Spike/Spike Duplicates (MS/MSD), laboratory duplicate samples, and blind performance evaluation samples. The frequency with which laboratory precision is assessed, and the performance criteria vary by analyte, analytical method, and environmental media. The criteria and methods for assessment of laboratory precision are specified in the analytical methods and are developed in accordance with MDNR-CAS-2090, MDNR-CAS-2070, and CAS SOPs for the various analyses. Data that do not meet the laboratory precision criteria 3 will be qualified by the CAS as described in the applicable validation procedure (Section D), and discussed in the project report.

B5.1.2 Overall Sampling and Analysis Precision

Precision will be measured as data variability between replicate and duplicate field samples collected at various points in the sample collection process. The scale at which the dups/reps are

collected will determine how the estimate of precision will be interpreted. For example, the data variability between two or more separate soil samples collected very near each other and submitted for separate analysis provide a measure of short-scale heterogeneity present at the site. In other cases a soil sample may be collected and manually mixed in a pan prior to subsampling into two or more separate jars for analysis. In that case the data variability between the results provides a measure of within-sample heterogeneity and precision of the subsampling process. At the smallest scale, two or more analytical subsamples will be collected at the lab from the same sample jar. In that instance, data variability will measure micro-scale heterogeneity and precision of the lab subsampling process.

Specific QC measures to be taken for a given project will be detailed in the Sampling Plan. Overall precision of the entire sampling and analytical process will be assessed using analyses of blind field duplicate and replicate split samples. Aqueous and air precision QC samples will be collected as duplicates, while non-aqueous precision QC samples will be sampled as replicate splits. Definitions of the terms "duplicate" and "replicate split" are provided in MDNR-FSS-210. Non-aqueous samples to be analyzed for VOCs cannot be homogenized prior to collection due to the potential for loss of VOCs. Therefore, in place of replicate split samples, for projects involving the collection of non-aqueous samples for VOC analysis, duplicate non-aqueous samples will be collected. Duplicate air samples collected in accordance with EPA Method TO-15 will consist of two samples analyzed from the same Summa canister, while replicate split samples will be samples analyzed from two separate canisters collected from the same air mass.

Precision will generally be measured using the Relative Standard Deviation (RSD) when three or more measures are taken, and Relative Percent Difference (RPD) when two measures are taken.

$$RSD = 100\left[\frac{S\tan dardDeviation}{\bar{x}}\right]$$

$$RPD = 100\left[\frac{x_1 - x_2}{\bar{x}}\right]$$

The RSD/RPD criterion for aqueous samples is $\leq 30\%$ for each contaminant measured above the laboratory reporting level. For non-aqueous VOC samples the criterion will be $\leq 50\%$. The criterion for air samples will be 25%. If data fall within these limits, then the overall precision of the sampling and analytical process is adequate to meet the project DQOs. Data that do not meet these precision criteria will be qualified as described in the applicable validation procedure (Section D), and discussed in the project report.

Because this QAPP is generic, covering many different NRD assessments, these precision criteria will be applied to a large number of analytes in various complex sample matrices. It is not likely that the precision limits for the overall sampling and analytical process will be met for every contaminant in every sample for every project. This is especially true for projects involving the sampling of non-aqueous matrices. When released to the environment, many contaminants distribute themselves extremely unevenly in soils; even on the small scale at which sampling occurs. This problem is further confounded by the heterogeneous nature of the dense clayey and silty clay soils found in many areas of the state. The need to collect duplicate non-

aqueous samples for VOC analysis exacerbates the problem further still, since the primary and duplicate samples may not be homogenized prior to analysis. The variability measured at the different scales using these QC practices should be used to quantify uncertainty in estimates made of concentration. Great care will be taken when interpreting overall sampling and analysis precision data for non-aqueous duplicate and replicate split samples. The NRD Coordinator and/or HWP personnel, in consultation with appropriate ESP personnel, will evaluate all qualified data on a project-specific basis, and determine how/whether to use the data.

B5.1.3 Accuracy

The accuracy of laboratory analyses will be assessed by analysis of preparation/method blanks, laboratory control samples, surrogates, internal standards, matrix spikes, and blind performance samples. The frequency with which laboratory accuracy is assessed, and the performance criteria vary by analyte, analytical method, and environmental media. Criteria for laboratory accuracy are specified in the analytical methods and will be developed and maintained in accordance with the following CAS SOP: MDNR-CAS-2090.

Field accuracy will be assessed through the analysis of trip blanks, field blanks, and field equipment rinse blanks. For all projects involving the collection of aqueous samples, a trip blank will be included at a frequency of one per separate sampling event (mobilization) per sample cooler. If aqueous samples are collected from multiple projects during the same mobilization for the same analytical parameters, a single trip blank per cooler may be used to assess accuracy for all of the projects. A field blank may be requested by the NRD Coordinator and/or HWP personnel for some projects where the potential for contamination of samples by atmospheric pollutants is suspected. An equipment rinsate blank will be collected for projects where the sampling equipment is decontaminated in the field for reuse. The equipment rinsate blank will be collected at a frequency of one per separate sampling event (mobilization) for each different combination of sampling equipment, decontamination method, and analytical parameter.

Contaminants should not be detected above the laboratory reporting level in trip blanks, field blanks, and equipment rinse blanks. Any data that do not meet these accuracy criteria will be qualified as described in the applicable validation procedure (Section D). The NRD Coordinator and/or HWP personnel in consultation with appropriate ESP personnel will evaluate all qualified data on a project-specific basis, and determine how/whether to use the data.

B5.1.4 Data Comparability

Comparability is an expression of the confidence with which one data set can be compared to another. The objective of comparability for this QAPP is to ensure that sampling data developed during the project investigation may be readily compared to each other and to the appropriate screening benchmarks. All data will be reported as $^{\circ}$ Celsius (flash point) pH units, µg/l or mg/l for water, liquids or Toxicity Characteristic Leaching Procedure (TCLP), µg/kg or mg/kg for soil, sediment or other solids, and µg/m^3 for air. Comparability is further addressed by using appropriate field and laboratory methods that are consistent with current standards of practice as approved by EPA.

B5.1.5 Data Representativeness

Data representativeness addresses the degree to which measurements are made and physical samples are collected in a manner that the resulting data appropriately reflect the environment or condition being studied or measured.

Representativeness is ensured for projects under this QAPP in several specific ways that are further discussed in other sections of this QAPP:

- Use of correct sampling procedures and equipment (Section B2)
- Adherence to QA and QC requirements for ensuring sample integrity (Section B5)
- Collection of an adequate amount of sampled material (Section B2 and Appendix 3)
- Selection and implementation of appropriate analytical measurement method, including sample preparation (Section B4 and Appendices 3 and 4).

B5.1.6 Data Completeness

Completeness is expressed as a percentage of the amount of valid data obtained compared to the amount that was planned. One hundred percent of data completeness is desired for the collection of field samples for all project investigations. If less than 100 percent is received, the QA Project Officer will decide if the valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions is sufficient to meet the project DQOs. If not, additional sampling will be required.

B6 Instrument/Equipment Maintenance and Calibration Requirements

Field analytical instruments used during this project will be maintained and calibrated according to instructions provided by the instrument manufacturer, and applicable field analytical methods. All major laboratory instruments used for quantitative sample analysis in the CAS are covered by service/maintenance contracts with the instruments' vendors. In addition to the detailed maintenance procedures performed as part of these contracts, the analytical staff at the laboratory performs the routine daily maintenance and calibration procedures which are necessary to ensure that the analytical data produced is of definable quality and meets the DQOs of the projects. Maintenance and calibration procedures are conducted in accordance with manufacture's instrument manuals, MDNR-CAS-2040, and other CAS SOPs for specific instruments/analyses. A full list of applicable CAS SOPs is included as Appendix 5.

B7 Inspection/Acceptance Requirements for Supplies and Consumables

These requirements are specified in MDNR-CAS-2140 "Supplies Procurement, Inspection and Acceptance."

B8 Non-direct Measurements

Several types of data and information will be obtained from non-measurement sources for use in projects conducted under this QAPP. The primary types of non-measurement data are listed in

Section A6.3. These data will be used with the directly measured data collected during each project to evaluate potential uncontrolled hazardous substance sites as described in Section A3. Non-direct measurement data must meet the documentation and referencing provisions of the EPA Guidance Document, *Regional Quality Control Guidance for NPL Candidate Sites*, (U.S. EPA, 1991b).

B9 Data Management

Data management will be in accordance with the following SOPs: MDNR-CAS-2000, MDNR-CAS-2020, MDNR-CAS-2090, and MDNR-CAS-2130.

Documentation will be in accordance with MDNR-ESP-004, and will include the sampling reports, copy of the chain-of-custody, and field QA controls with the analytical results. Data reduction will occur in accordance with MDNR analytical SOPs for each parameter. If difficulties are encountered during sample collection or sample analyses, a brief description of the problem will be provided in the sampling report prepared by ESP. The laboratory qualifiers listed in Appendix 6 will be used where applicable on the results of analysis report sheets provided by the CAS. Data reporting will be in accordance with MDNR-CAS-2020.

Adequate precautions will be taken during the reduction, manipulation, and storage of data in order to prevent the introduction of errors or the loss or misinterpretation of data. The LIMS maintains all information and data on all environmental samples received. The system is utilized to log in samples collected, record results of analyses, and generate sample analyses and management reports. The LIMS is backed up daily through the off-site DNR tape backup system. System maintenance is performed weekly. This includes checking for operating system errors, LIMS system errors, and database integrity.

The current Agency Records Disposition Schedule approved by the Secretary of State's Office for all QA and QC documents and records of environmental data will be followed.

C. ASSESSMENT/OVERSIGHT

C1 Assessment and Response Action

This section describes the internal and external checks necessary to ensure that all elements of the QAPP are correctly implemented as prescribed, that the quality of the data generated by implementation of the QAPP is adequate, and that any necessary corrective actions are implemented in a timely manner.

C1.1 Laboratory Performance Assessment

EPA, Region VII conducts periodic Laboratory On-Site Evaluations to assess the laboratory procedures in order to maintain certification under the requirements of the Safe Drinking Water Act and for other state operated, federally-funded programs.

C1.2 Field Performance Assessment

The auditor in charge of ESP field QA will conduct audits of field activities according to MDNR-ESP-211 "Quality Assurance Field Auditing Procedures." The process of choosing when field audits are conducted is not based on a particular project or site-sampling event, but rather is based on assuring that each ESP staff member involved in sample collection is audited at least once every two years. The time of year, and thus the particular site-sampling event field personnel are working on, is randomly chosen.

For this project, the ESP field QA auditor is authorized to issue a stop work order upon finding a significant condition that would adversely affect the quality and usability of the data. The ESP field QA auditor will have the responsibility for initiating and implementing response actions associated with findings identified during the field audit. The procedures require that the field personnel properly address any response actions needed.

C1.3 Overall Project Performance Assessment

Overall performance auditing of projects conducted under this QAPP will be undertaken annually by the EPA Site Assessment Manager. These audits will evaluate the effectiveness of the projects in attaining the stated DQOs, documentation practices, and the overall quality of project reports.

EPA Region VII conducts periodic evaluations of the state's environmental programs. These evaluations normally include some type of review of the department's quality management system, and may include examination of DEQ QAPPs.

C1.4 Data Validation

All field and laboratory data will be subject to validation by review for accuracy, precision, completeness, representativeness and comparability. The acceptance criteria for measurement data are discussed in Section B5. Data validation procedures are presented in Section D2.

C2 Reports to Management

Field performance assessment audits will be documented by the ESP field QA auditor in a written report that shall be kept on file at the ESP. Copies of the written report shall be provided to the subject of the audit, his/her supervisor, and the DEQ QA Manager upon request.

Results from the laboratory's semi-annual participation in the round robin audit studies, and from EPA Region VII's periodic On-Site Laboratory Evaluations, will be kept on file at ESP. Copies of these results will be provided to the HWP QA Coordinator.

Findings from the EPA Site Assessment Manager annual overall project evaluation are documented in a letter to the HWP QA coordinator, who facilitates the implementations of any

recommendations and/or corrective actions needed.

Comments and recommendations from the EPA Region VII periodic evaluations of state environmental programs are provided to the DEQ QA manager and used by DEQ management and staff to take any corrective actions which may be needed.

D. DATA VALIDATION AND USABILITY

D1 Data Verification, Validation, and Data Quality Assessment

This section describes the process for documenting the degree to which the collected data meet the project objectives, individually and collectively, and to estimate the effect of any deviations on the ability to use the data for addressing the decision rules described in Section A6.5.

D1.1 Sampling Design

The HWP QA Project Officer will verify that the sampling design in the sampling plan prepared by the NRD Coordinator and ESP FSU is adequate to meet the project DQOs. During preparation of the sampling report, ESP FSS personnel will verify that the actual number, type, location, and requested lab analyses collected conforms to that specified in the sampling plan. Any deviations noted during sampling design verification will be documented by the ESP FSU personnel in the sampling report.

D1.2 Sample Collection and Handling Procedures

The ESP FSU personnel responsible for the project and the ESP Director will provide verification and validation that the field portions of all sample collection and handling procedures used conform with those specified in Sections B2, B3, and Appendix 5 of this QAPP. The CAS supervisor will provide verification and validation that the laboratory portions of all sample handling procedures used, conform to those specified in Section B3 and Appendix 5 of this QAPP. The data will be further validated by the NRD Coordinator and/or HWP personnel during review of the sampling report, and by the QA Project Officer during review of the project report.

D1.3 Analytical Procedures

The CAS supervisor will provide verification and validation of each sample to ensure that the procedures used to generate the data were implemented as specified in Section B4 of the QAPP. Any deviations will be documented in the sampling report. The data will be further validated by the NRD Coordinator and/or HWP personnel during review of the sampling report, and by the QA Project Officer during review of the project report.

D1.4 Quality Control

The ESP FSU personnel responsible for the project will provide verification and validation that the data generated conform to the field QC elements in Section B5 of this QAPP. The CAS supervisor will provide verification and validation that the data generated conform to the laboratory QC elements of Section B5. Any QC deviations noted during verification and validation will be documented in the sampling report. The QC data will be further validated by the NRD Coordinator and/or HWP personnel during review of the sampling report, and by the QA Project Officer during review of the project report.

D1.5 Calibration

The CAS supervisor will provide verification and validation that the data generated conform with the instrument/equipment maintenance and calibration requirements in Section B6 of this QAPP. Any deviations noted during verification and validation will be documented in the sampling report.

D2 Validation and Verification Methods

Data validation methods are described in the analytical CAS SOPs for specific analyses and in MDNR-CAS-2020, MDNR-CAS-2070, MDNR-CAS-2090, MDNR-CAS-2130, MDNR-ESP-002, MDNR-ESP-003, MDNR-ESP-004, MDNR-ESP-018, MDNR-ESP-210, and MDNR-ESP-211.

Results of data verification and validation performed by ESP will be documented in the sampling report provided to the NRD Coordinator for each project. Validation activities conducted by the QA Project Officer will be documented in the project report.

D3 Reconciliation with User Requirements (Data Quality Assessment)

Results of each project will be reconciled with data user requirements using the Data Quality Assessment (DQA) process described in *Guidance for Data Quality Assessment*, EPA QA/G-9, July 2000. The DQA guidance was developed primarily for projects whose DQOs are amenable to evaluation by statistical analyses. The limited number of samples collected for most NRD assessment projects conducted under this QAPP are not readily evaluated by statistical analyses.

At the completion of the project, the NRD Coordinator, together with the QA Project Officer will review the sampling design, and data collection and analysis documentation to evaluate their consistency with the project DQOs specified in the QAPP and sampling plan. If it is determined that the DQOs are not met, the NRD Coordinator, together with the QA Project Officer/HWP QA Coordinator, will identify the appropriate corrective measures necessary, and ensure they are implemented. These measures will most commonly include laboratory re-analysis, re-sampling, and/or the collection of additional samples.

E. REFERENCES

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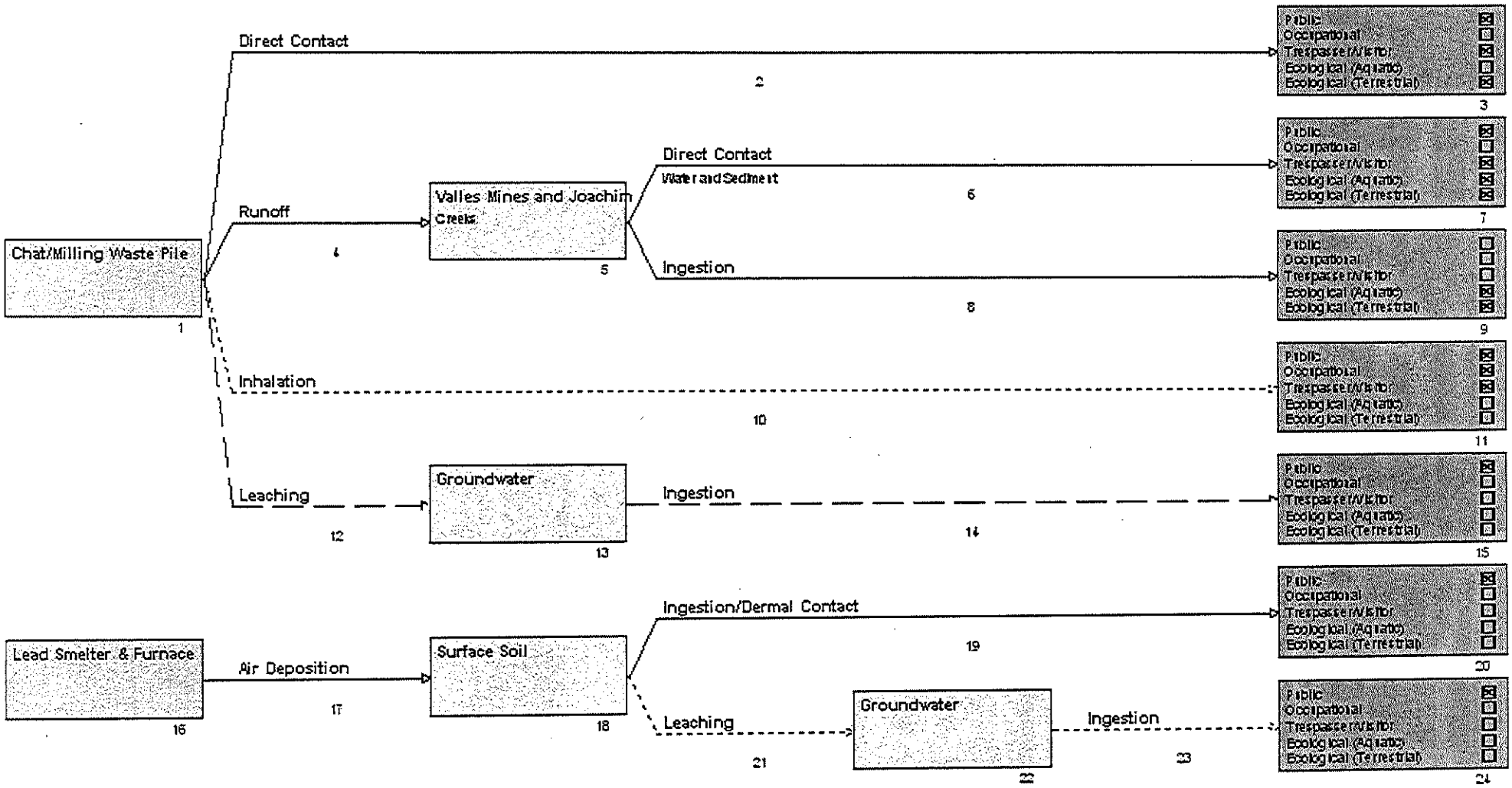
APPENDIX 1: EXAMPLE CONCEPTUAL SITE MODEL (CSM) DIAGRAM



APPENDIX 2: EXAMPLE SAMPLING PLAN AND REPORT OUTLINES

OUTLINE FOR SAMPLING PLAN

1.0 INTRODUCTION

2.0 SITE INFORMATION

2.1 LOCATION
2.2 DESCRIPTION
2.3 HISTORY/CONTAMINANTS OF CONCERN

3.0 SITE RECONNAISSANCE

4.0 DATA QUALITY OBJECTIVES

4.1 PROBLEM STATEMENT
4.1.1 Background Information
4.1.2 Conceptual Site Model
4.1.3 Available Resources and Constraints
4.2 DECISION STATEMENTS
4.3 INPUTS INTO THE DECISIONS
4.4 STUDY BOUNDARIES
4.5 DECISION RULES
4.6 LIMITS ON DECISION ERROR
4.7 SAMPLING DESIGN

5.0 FIELD ACTIVITIES

4.1 SAMPLING METHODS
4.1.1 Soil sampling
4.1.1.1 Surface soil sampling
4.1.1.2 Depth-discrete soil sampling
4.1.2 Water sampling
4.1.2.1 Surface water sampling
4.1.2.2 Groundwater sampling
4.1.3 Sediment sampling
4.1.4 Air sampling
4.1.5 Fish tissue sampling
4.1.6 Monitoring well installation
4.2 SAMPLING ORDER
4.3 SAMPLE QUANTITY
4.4 ANALYSES AND SENSITIVITY REQUESTED
4.5 SAMPLE CONTAINER AND PRESERVATION REQUIREMENTS
4.6 CHAIN-OF-CUSTODY

6.0 QUALITY CONTROL

5.1 FIELD METHODS
5.2 FIELD DECONTAMINATION
5.3 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SAMPLES
5.3.1 Trip blank
5.3.2 Duplicate (co-located) samples
5.3.3 Replicate (split) samples
5.3.4 Equipment Rinsate blank samples
5.3.5 Field blank samples

7.0 INVESTIGATION DERIVED WASTES (IDW) PLAN

8.0 SITE SAFETY

9.0 REPORTING

APPENDICES

APPENDIX A - Conceptual Site Model Diagram
APPENDIX B - Site Map
APPENDIX C - Site Health & Safety Plan

APPENDIX 2: EXAMPLE SAMPLING PLAN AND REPORT OUTLINES

OUTLINE FOR SITE HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

2.0 KEY PERSONNEL

3.0 SITE INFORMATION

3.1 OVERALL INCIDENT/RISK/HAZARD ANALYSIS
3.2 CONTAMINANT(S) OF CONCERN
3.2.1 Pysical State and Chemcial Characteristics
3.2.2 Physical Hazards
3.3 TASK SPECIFIC RISK ANALYSIS

4.0 MEDICAL SURVEILLANCE AND PERSONNEL TRAINING REQUIREMENTS

5.0 PERSONAL PROTECTIVE EQUIPMENT

6.0 FREQUENCY AND TYPE OF AIR MONITORING/SAMPLING

7.0 SITE CONTROL MEASURES

7.1 THE "BUDDY -SYSTEM"
7.2 SAFE WORK PRACTICES
7.3 SITE COMMUNICATIONS
7.4 WORK ZONES

8.0 DECONTAMINATION PROCEDURE/SOLUTIONS

9.0 EMERGENCY INFORMATION

10.0 ADDITIONAL EMERGENCY INFORMATION/NUMBERS

11.0 SIGNATURES

APPENDIX 2: EXAMPLE SAMPLING PLAN AND REPORT OUTLINES

OUTLINE FOR SAMPLING REPORT

1.0 INTRODUCTION

2.0 SITE INFORMATION

2.1 LOCATION
2.2 DESCRIPTION
2.3 HISTORY/CONTAMINANTS OF CONCERN

3.0 METHODS

3.1 FIELD PROCEDURES
3.1.1 Soil sampling
3.1.1.1 Surface soil sampling
3.1.1.2 Depth-discrete soil sampling
3.1.2 Water sampling
3.1.2.1 Surface water sampling
3.1.2.2 Groundwater sampling
3.1.2.2.1 Residential well sampling
3.1.2.2.1 Municipal well sampling
3.1.2.2.1 Monitoring well sampling
3.1.2.2.1 Temporary well sampling
3.1.3 Sediment sampling
3.1.4 Air sampling
3.1.5 Fish tissue sampling
3.1.6 Monitoring well installation
3.2 SAMPLING ORDER
3.3 SAMPLE QUANTITY
3.4 ANALYSES REQUESTED
3.5 CHAIN-OF-CUSTODY

4.0 DATA QUALITY

4.1 FIELD METHODS
4.2 FIELD DECONTAMINATION
4.3 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SAMPLES
4.3.1 Trip blank
4.3.2 Duplicate (co-located) samples
4.3.3 Replicate (split) samples
4.3.4 Equipment rinsate blank samples
4.3.5 Field blank
4.4 QA/QC DATA INTERPRETATION
4.4.1 Trip blanks
4.4.2 Equipment rinsate samples
4.4.3 Background samples

5.0 INVESTIGATION DERIVED WASTES (IDW)

6.0 OBSERVATIONS

7.0 REPORTING

APPENDIXS

APPENDIX 2: EXAMPLE SAMPLING PLAN AND REPORT OUTLINES

OUTLINE FOR SAMPLING REPORT (CONT.)

TABLE 1 - Sample Listing/Analytes
TABLE 2 - Sample Description
TABLE 3 - Geographic Coordinates of Sample Locations
APPENDIX A - Site Maps
APPENDIX B - Chain-of-Custody Copies/Analytical Results
APPENDIX C - Photographs
APPENDIX D - Copies of Field Notes

APPENDIX 3: HOLDING TIMES, PRESERVATION, AND SAMPLE VOLUMES

AQUEOUS MATRICES					
Parameter	**Minimum Volume (mls)**	**Optimum Volume (mls)**	**Container Type**	**Preservative**	**Holding Time**
INORGANIC NONMETALLIC CONSTITUENTS					
Cyanide (CN), Total	100	1000	P,G	Cool, NaOH to pH > 12	14 days
Cyanide (CN), Amenable to Chlorination	250	1000	P,G	Cool, NaOH to pH > 12	14 days
METALLIC CONSTITUENTS					
Total Metals (As, Ba, Cd, Co, Cr, Cu, Fe, Mn, Pb, Ni, Ag, Zn, Al, Sb, Be, Se, Mg, Ca, Hg)	250	1000	P,G	Cool, HNO_3 to pH < 2	6 mos. 28 days for Hg
Dissolved Metals (As, Ba, Cd, Co, Cr, Cu, Fe, Mn, Pb, Ni, Ag, Zn, Al, Sb, Be, Se, Mg, Ca, Hg)	150	1000	P,G	Filter on-site Cool HNO_3 to pH < 2	6 mos. 28 days for Hg
Dissolved Hexavalent Cr	100	500	P,G	Filter on-site; none	24 hrs.
TCLP Metals (Ag, As, Ba, Cd, Cr, Pb, Se, Hg)	750	1000	P,G	Cool	6 mos.

APPENDIX 3: HOLDING TIMES, PRESERVATION, AND SAMPLE VOLUMES

AQUEOUS MATRICES					
Parameter	Minimum Volume (mls)	Optimum Volume (mls)	Container Type	Preservative	Holding Time
ORGANIC CONSTITUENTS					
Semivolatile Organic Compounds (SVOCs)	1000	3000	G	Cool	7 days to extract
Chlorophenoxy Acid Herbicides	1000	3000	G	Cool	7 days to extract
Organochlorine Pesticides & PCBs	1000	3000	G	Cool	7 days to extract
Volatile Organic Compounds (VOCs)	40 (1 vial)	120 (3 vials)	G	Cool, HC1 to pH < 2	14 days
Total Petroleum Hydrocarbon (8015/OA2)	1000	3000	G	Cool	7 days to extract
2,3,7,8 – Tetrachloro-dibenzo-P-Dioxins (TCDD)	1000	3000	G	Cool	30 days to Extract

APPENDIX 3: HOLDING TIMES, PRESERVATION, AND SAMPLE VOLUMES

NON-AQUEOUS MATRICES					
Parameter	Minimum Volume (fl oz, gm, or oz)	Optimum Volume (fl oz or gm)	Container Type	Preservative	Holding Time
INORGANIC NONMETALLIC CONSTITUENTS					
Cyanide (CN), Total	8 fl.oz jar	8 fl oz jar	G	Cool	14 days
METALLIC CONSTITUENTS					
Total Metals (As, Ba, Cd, Co, Cr, Cu, Fe, Mn, Pb, Ni, Ag, Zn, Al, Sb, Be, Se, Mg, Ca, Hg)	100gm (~3oz)	8 fl oz jar	G	Cool	6 mos. 28 days for Hg
TCLP Metals (Ag, As, Ba, Cd, Cr, Pb, Se, Hg)	8 fl oz jar	(2) 8 fl oz jar	G	Cool	6 mos. 28 days for Hg
ORGANIC CONSTITUENTS					
Semi-volatile Organic Compounds (SVOCs)	50gm (~2oz)	8 fl oz jar	G	Cool	14 days to extract
TCLP SVOCs	8 fl oz jar	(2) 8 fl oz jar*	G	Cool	14 days to extract
Chlorophenoxy Acid Herbicides	50gm (~2oz)	(2) 8 fl oz jars	G	Cool	14 days to extract
TCLP Herbicides	8 fl oz jar	(2) 8 fl oz jar*	G	Cool	14 days to extract
Organochlorine Pesticides & PCBs	100gm (~4oz)	(2) 8 fl oz jars	G	Cool	14 days to

APPENDIX 3: HOLDING TIMES, PRESERVATION, AND SAMPLE VOLUMES

NON-AQUEOUS MATRICES					
Parameter	Minimum Volume (fl oz, gm, or oz)	Optimum Volume (fl oz or gm)	Container Type	Preservative	Holding Time
					extract
TCLP Pesticides	8 fl oz jar	(2) 8 fl oz jar*	G	Cool	14 days to extract
Volatile Organic Compounds (VOCs) (includes Total Petroleum Hydrocarbons 8015/OA1)	(1) 5gm Encore™ sample	(2) 5gm Encore™ samples**	E	Cool	14 days
TCLP VOCs	(1) 25gm Encore™ sample	(1) 25gm Encore™ samples**	E	Cool	14 days to extract
Total Petroleum Hydrocarbons (8015/OA2)	50gm (~2oz)	(1) 8 fl oz jar	G or E	Cool	7 days to extract
2,3,7,8 – Tetrachloro-dibenzo-P-Dioxins (TCDD)	50gm (~2oz)	8 fl oz jar	G	Cool	30 days to Extract

* If total and TCLP organics are needed, a total of (2) 8fl oz jars per analyte group will be adequate to conduct both analyses

** Optimal volume on sample(s) collected for precision QC analysis (replicates and duplicates) will be (4) 5gm Encore™ samples and (2) 25 gm Encore™ samples.

APPENDIX 4: PARAMETER LISTS AND SAMPLE QUANTITATION LIMITS

Organochlorine Pesticides, Chlorophenoxy Acid Herbicides, and Polychlorinated Biphenyls			
Methods[1]	Parameter	Water PQL ug/L	Soil PQL ug/Kg
3510C or 3545A/8081A	Aldrin	0.25	5
3510C or 3545A /8081A	alpha-BHC	0.25	5
3510C or 3545A /8081A	beta-BHC	0.25	5
3510C or 3545A /8081A	gama-BHC (Lindane)	0.25	5
3510C or 3545A /8081A	delta-BHC	0.25	5
3510C or 3545A /8081A	Chlordane	2.5	50
3510C or 3545A /8081A	4,4'-DDE	0.25	5
3510C or 3545A /8081A	4,4'-DDD	0.25	5
3510C or 3545A /8081A	4,4'-DDT	0.25	5
3510C or 3545A /8081A	Dieldrin	0.25	5
3510C or 3545A /8081A	Endosulfan I	0.25	5
3510C or 3545A /8081A	Endosulfan II	0.25	5
3510C or 3545A /8081A	Endosulfan sulfate	0.25	5
3510C or 3545A /8081A	Endrin	0.25	5
3510C or 3545A /8081A	Endrin aldehyde	0.25	5
3510C or 3545A /8081A	Heptachlor	0.25	5
3510C or 3545A /8081A	Heptachlor Epoxide	0.25	5
3510C or 3545A /8081A	Methoxychlor	0.25	5
3510C or 3545A /8081A	Toxaphene	2.5	50
3510C or 3545A /8151A	2,4-D	1	20
3510C or 3545A /8151A	2,4,5-T	0.1	2
3510C or 3545A /8151A	2,4,5-TP (Silvex)	0.1	102
3510C or 3545A /8151A	Pentachlorophenol	0.1	NA
3510C or 3545A /8082	Polychlorinated Biphenyls (PCBs)[2]	0.5	10
1311/3510C/8081A	TCLP Pesticides[3]	1	NA
1311/3510C/8151A	TCLP Herbicides[3]	1	NA

1. Most Recent revision of *EPA SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, or Methods for the Determination of Organic Compounds in Drinking Water (EPA/600/4-88-039)*.
2. Quantitated as total PCBs.
3. PQL is for each pesticide or herbicide listed in 40 CFR Part 261 Subpart C (261.24).

APPENDIX 4: PARAMETER LISTS AND SAMPLE QUANTITATION LIMITS

Volatile Organic Compounds (VOCs)			
Methods[1]	Parameter	Water PQL ug/L	Soil PQL ug/Kg
5030B or 5035/8260B	1,1,1,2-Tetrachloroethane	1	5
5030B or 5035/8260B	1,1,1-Trichloroethane	1	5
5030B or 5035/8260B	1,1,2,2-Tetrachloroethane	1	5
5030B or 5035/8260B	1,1,2-Trichloroethane	1	5
5030B or 5035/8260B	1,1-Dichloroethane	1	5
5030B or 5035/8260B	1,1-Dichloroethene	1	5
5030B or 5035/8260B	1,1-Dichloropropanone	2	10
5030B or 5035/8260B	1,1-Dichloropropene	1	5
5030B or 5035/8260B	1,2,3-Trichlorobenzene	5	25
5030B or 5035/8260B	1,2,3-Trichloropropane	1	5
5030B or 5035/8260B	1,2,4-Trichlorobenzene	5	25
5030B or 5035/8260B	1,2,4-Trimethylbenzene	1	5
5030B or 5035/8260B	1,2-Dibromoethane (EDB)	1	5
5030B or 5035/8260B	1,2-Dichlorobenzene	1	5
5030B or 5035/8260B	1,2-Dichloroethane	1	5
5030B or 5035/8260B	1,2-Dichloropropane	1	5
5030B or 5035/8260B	1,3,5-Trimethylbenzene	1	5
5030B or 5035/8260B	1,3-Dichlorobenzene	1	5
5030B or 5035/8260B	1,3-Dichloropropane	1	5
5030B or 5035/8260B	1,4-Dichlorobenzene	1	5
5030B or 5035/8260B	1,2-Dibromo-3-chloropropane	1	5
5030B or 5035/8260B	1-Chorobutane	1	5
5030B or 5035/8260B	2,2-Dichloropropane	1	5
5030B or 5035/8260B	2-Butanone (MEK)	5	25
5030B or 5035/8260B	2-Chlorotoluene	1	5
5030B or 5035/8260B	2-Hexanone	2	10
5030B or 5035/8260B	2-Nitropropane	1	5
5030B or 5035/8260B	4-Chlorotoluene	1	5
5030B or 5035/8260B	4-Methyl-2-pentanone(MIBK)	1	5
5030B or 5035/8260B	Acetone	20	100
5030B or 5035/8260B	Acrylonitrile	2	10
5030B or 5035/8260B	Allyl Chloride	1	5
5030B or 5035/8260B	Benzene	1	5
5030B or 5035/8260B	Bromobenzene	1	5
5030B or 5035/8260B	Bromochloromethane	1	5
5030B or 5035/8260B	Bromodichloromethane	1	5
5030B or 5035/8260B	Bromoform	1	5
5030B or 5035/8260B	Bromomethane	5	25
5030B or 5035/8260B	Carbon disulfide	1	5
5030B or 5035/8260B	Carbon Tetrachloride	1	5
5030B or 5035/8260B	Chloroacetonitrile	25	125
5030B or 5035/8260B	Chlorobenzene	1	5
5030B or 5035/8260B	Chloroethane[2]	5	25
5030B or 5035/8260B	Chloroform	1	5
5030B or 5035/8260B	Chloromethane[2]	25	125
5030B or 5035/8260B	cis-1,2-dichloroethene	1	5
5030B or 5035/8260B	cis-1,3-Dichloropropene	1	5
5030B or 5035/8260B	Dibromochloromethane	1	5
5030B or 5035/8260B	Dibromomethane	1	5
5030B or 5035/8260B	Dichlorodifluoromethane	1	5
5030B or 5035/8260B	Diethyl ether	20	100
5030B or 5035/8260B	Ethylbenzene	1	5

APPENDIX 4: PARAMETER LISTS AND SAMPLE QUANTITATION LIMITS

Volatile Organic Compounds (VOCs)			
Methods[1]	Parameter	Water PQL ug/L	Soil PQL ug/Kg
5030B or 5035/8260B	Ethylmethacrylate	1	5
5030B or 5035/8260B	Hexachlorobutadiene	2	10
5030B or 5035/8260B	Hexachloroethane	1	5
5030B or 5035/8260B	Iodomethane	5	25
5030B or 5035/8260B	Isopropylbenzene	1	5
5030B or 5035/8260B	m,p-xylene	1	5
5030B or 5035/8260B	Methacrylonitrile	1	5
5030B or 5035/8260B	Methyl Acrylate	10	50
5030B or 5035/8260B	Methylene chloride[2]	20	100
5030B or 5035/8260B	Methylmethacrylate	1	5
5030B or 5035/8260B	Methyl-t-butyl ether	1	5
5030B or 5035/8260B	Naphthalene	5	25
5030B or 5035/8260B	n-Butylbenzene	1	5
5030B or 5035/8260B	Nitrobenzene	10	50
5030B or 5035/8260B	n-Propylbenzene	1	5
5030B or 5035/8260B	o-Xylene	1	5
5030B or 5035/8260B	Pentachloroethane	1	5
5030B or 5035/8260B	p-isopropyltoluene	1	5
5030B or 5035/8260B	Propionitrile	20	100
5030B or 5035/8260B	sec-Butylbenzene	1	5
5030B or 5035/8260B	Styrene	1	5
5030B or 5035/8260B	Tert-Butylbenzene	2	10
5030B or 5035/8260B	Tetrachloroethene	1	5
5030B or 5035/8260B	Tetrahydrofuran	5	25
5030B or 5035/8260B	Toluene	1	5
5030B or 5035/8260B	Total Xylenes	2	10
5030B or 5035/8260B	Trans-1,2-Dichloroethene	1	5
5030B or 5035/8260B	Trans-1,3-Dichloropropene	1	5
5030B or 5035/8260B	Trans-1,4-Dichloro-2-butene	1	5
5030B or 5035/8260B	Trichloroethene	1	5
5030B or 5035/8260B	Trichloroflouromethane	5	25
5030B or 5035/8260B	Vinyl Chloride	1	5
1311/5030B/8260B	TCLP VOCs[3]	40	NA

1. Most Recent revision of *EPA SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.*
2. A lower PQL may be needed for this analyte on specific projects covered by this QAPP. Arrangements will be made with ESP CAS in advance of sampling to take special analytical precautions or to subcontract analysis.
3. PQL listed is for each volatile organic compound listed in 40 CFR Part 261 Subpart C (261.24).

APPENDIX 4: PARAMETER LISTS AND SAMPLE QUANTIATION LIMITS

Semivolatile Organic Compounds (SVOCs)			
Methods[1]	Parameter	Water PQL ug/L	Soil PQL ug/Kg
3510C or 3545A /8270C	1,2,4-Trichlorobenzene	5	100
3510C or 3545A /8270C	1,2-Dichlorobenzene	5	100
3510C or 3545A /8270C	1,3-Dichlorobenzene	5	100
3510C or 3545A /8270C	1,4-Dichlorobenzene	5	100
3510C or 3545A /8270C	2,4,5-Trichlorophenol	10	100
3510C or 3545A /8270C	2,4,6-Trichlorophenol	510	200
3510C or 3545A /8270C	2,4-Dichlorophenol	5	100
3510C or 3545A /8270C	2,4-Dimethylphenol	5	100
3510C or 3545A /8270C	2,4-Dinitrophenol	50	1000
3510C or 3545A /8270C	2,4-Dinitrotoluene	520	400
3510C or 3545A /8270C	2,6-Dinitrotoluene	5	100
3510C or 3545A /8270C	2-Chloronaphthalene	10	200
3510C or 3545A /8270C	2-Chlorophenol	5	400
3510C or 3545A /8270C	2-Methyl-4,6-dinitrophenol	10	400
3510C or 3545A /8270C	2-Methylnaphthalene	5	100
3510C or 3545A /8270C	2-Methylphenol	5	100
3510C or 3545A /8270C	2-Nitroaniline	5	100
3510C or 3545A /8270C	2-Nitrophenol	5	100
3510C or 3545A /8270C	3,3'-Dichlorobenzidine	5	100
3510C or 3545A /8270C	3-Nitroaniline	5	100
3510C or 3545A /8270C	4-Bromophenyl phenyl ether	5	100
3510C or 3545A /8270C	4-Chloro-3-methylphenol	5	100
3510C or 3545A /8270C	4-Chloroaniline	5	400
3510C or 3545A /8270C	4-Chlorophenyl phenyl ether	10	200
3510C or 3545A /8270C	4-Methylphenol	10	200
3510C or 3545A /8270C	4-Nitroaniline	5	100
3510C or 3545A /8270C	4-Nitrophenol	50	1000
3510C or 3545A /8270C	Acenaphthene	5	100
3510C or 3545A /8270C	Acenaphthylene	5	100
3510C or 3545A /8270C	Anthracene	5	100
3510C or 3545A /8270C	Azobenzene	5	100
3510C or 3545A /8270C	Benzo(a)anthracene	5	100
3510C or 3545A /8270C	Benzo(a)pyrene	5	100
3510C or 3545A /8270C	Benzo(b)fluoranthene	5	100
3510C or 3545A /8270C	Benzo(ghi)perylene	5	100
3510C or 3545A /8270C	Benzo(k)fluoranthene	5	100
3510C or 3545A /8270C	Benzoic Acid	10	200
3510C or 3545A /8270C	bis(2-Chloroethoxy)methane	20	400
3510C or 3545A /8270C	bis(2-Chloroethyl)ether	5	100
3510C or 3545A /8270C	bis(2-chloroisopropyl)ether	5	100
3510C or 3545A /8270C	bis(2-Ethylhexyl) phthalate	10	200
3510C or 3545A /8270C	Butyl benzyl phthalate	10	200
3510C or 3545A /8270C	Chrysene	5	100
3510C or 3545A /8270C	Dibenzo(a,h)anthracene	5	100
3510C or 3545A /8270C	Dibenzofuran	5	100
3510C or 3545A /8270C	Diethyl phthalate	20	400
3510C or 3545A /8270C	Dimethyl phthalate	5	100
3510C or 3545A /8270C	Di-n-butyl phthalate	5	100
3510C or 3545A /8270C	Di-n-octyl phthalate	5	100
3510C or 3545A /8270C	Fluoranthene	5	100
3510C or 3545A /8270C	Fluorene	5	100
3510C or 3545A /8270C	Hexachlorobenzene	5	100

ESP-CAS-2520	Total Nitrogen – Autoclave Method
ESP-CAS-2600	Analysis of Base Neutral and Acid Extractable Semi-Volatile Organics by GC/MS
ESP-CAS-2605	Petroleum Fractions –OA2
ESP-CAS-2610	Analysis of Drinking Water for Carbamate Pesticides
ESP-CAS-2620	Analysis of Drinking Water for Haloacteic Acids
ESP-CAS-2625	Analysis of PCBs on Swabs
ESP-CAS-2630	Analysis of PCBs in Water
ESP-CAS-2632	Analysis of PCBs in Soil by Heated Pressurized Soxhlet Extraction
ESP-CAS-2650	Analysis of Pesticides in Water/Wastewater
ESP-CAS-2655	Analysis of Drinking Water by Method 525.2
ESP-CAS-2657	Analysis of Drinking Water by Methods 507/508
ESP-CAS-2660	Analysis of Samples for Total Petroleum by Fingerprint Analysis
ESP-CAS-2665	Analysis of Petroleum Tank Samples by MRBCA Method
ESP-CAS-2670	Analysis of Volatile Organics by GC/MS
ESP-CAS-2680	Analysis of Volatile Organics in Drinking Water by GC/MS
ESP-CAS-2690	Analysis of Chlorinated Acid Herbicides in Drinking Water
ESP-CAS-2695	Analysis of Chlorinated Acid Herbicides in Soil/Sludge
ESP-CAS-2696	Analysis of Chlorinated Acid Herbicides in Non-Potable Water
ESP-CAS-2700	Flashpoint
ESP-CAS-2710	Oil and Grease (O&G)
ESP-CAS-2720	TCLP Extraction for Volatile Organics
ESP-CAS-2750	TO-15
ESP-CAS-2755	Analysis of Organochlorine Pesticides in Non-Drinking Water, Soil and Organic Samples
ESP-CAS-2760	Analysis of Organophosphorus Pesticides in Non-Drinking Water, Soil and Organic Samples

Hazardous Waste Program

Superfund Section, Site Assessment Unit

MDNR-SAU-100	Writing Pre-CERCLIS Site Screening Reports
MDNR-SAU-101*	Writing Site Assessment Reports
MDNR-SAU-102*	Formatting Site Assessment Reports
MDNR-SAU-103*	Creating Site Maps
MDNR-SAU-104	Creating an Analytical Data Table
MDNR-SAU-107*	Obtaining Information for Site Assessment Investigations
MDNR-SAU-200*	Completing the Desk Top Review Form
MDNR-SAU-201*	Completing the Pre-CERCLIS Site Initiation Form
MDNR-SAU-202	Completing the Pre-CERCLIS Site Screening Form

MDNR-SAU-203*	Completing Preliminary Assessment Scoresheets
MDNR-SAU-204*	Completing Site Investigation Scoresheets
MDNR-SAU-205*	Completing the Removal Site Evaluation Form
MDNR-SAU-300*	Operation of Trimble GPS Receiver
MDNR-SAU-301*	Operation of Portable X-Ray Fluorescence (XRF) Analyzers
MDNR-SAU-302	Operating Digital Cameras
MDNR-SAU-303*	Operating 35mm Cameras
MDNR-SAU-400*	Documenting Field Notes
MDNR-SAU-401	Naming Sites
MDNR-SAU-402*	Entry of Site Data into the Site Management and Reporting System Database (SMARS)
MDNR-SAU-403*	Filing Procedures
MDNR-SAU-404*	Electronic File Management
MDNR-SAU-405*	Requesting an Missouri Department of Conservation (MDC) Ecological Review

* SOP is planned, but has not been written as of the date of this QAPP revision.

APPENDIX 6: LABORATORY ANALYTICAL DATA QUALIFIERS

Data Qualifier	Explanation
1	Improper collection method
2	Improper preservation
3	Exceeded holding time
4	Estimated value; detected below the PQL
5	Estimated value; quality control data outside limits
6	Estimated value; analyte outside calibration range
7	Analyte present in blank at > ½ reported value
8	Sample was diluted during analysis
9	Laboratory error
10	Estimated value; matrix interference
12	Insufficient sample quantity
13	Estimated value; true result is > reported value
14	Estimated value; non-homogenous sample
15	No result; failed quality control requirements
16	Not analyzed – related analyte not detected
17	Results in dry weight
18	Sample pH is outside the acceptable range
19	Estimated Value
20	Not analyzed – Instrument failure
21	No result – spectral interference
22	pH was performed at the Laboratory
23	Contract Lab specific qualifier – see sample comments
24	No result – matrix interference
25	No Result: Excessive Chlorination
26	No Result: Excessive Dechlorination
ND	Not detected at reported value

APPENDIX 7: ACRONYM LISTING

DEQ	Division of Environmental Quality
CAS	Chemical Analysis Section
CERCLA	Comprehensive Environmental Response Compensation & Liability Act
COC	Chain of Custody
DGLS	Division of Geology and Land Survey
DQA	Data Quality Assessment
DQO	Data Quality Objective
EPA	Environmental Protection Agency
ES	Environmental Specialist
ESP	Environmental Services Program
FSU	Field Services Unit
FTE	Full Time Employee
GC/MS	Gas Chromatrography/Mass Spectrometry
GIS	Geographic Information System
GPS	Global Positioning System
DGLS	Division of Geology and Land Survey
HAZWOPER	Hazardous Waste Operations and Emergency Response
HWP	Hazardous Waste Program
LIMS	Laboratory Information Management System"
LMAD	Locational Data Method Accuracy Description
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDL	Method Detection Limit
MDNR	Missouri Department of Natural Resources
MIP	Membrane Interface Probe
MRBCA	Missouri Risk Based Corrective Action
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NIST	National Institute of Standards and Technology
NPL	National Priorities List
NRD	Natural Resources Damages
NRDA	Natural Resources Damages Assessment
PAH	Polynuclear Aromatic Hydrocarbons
PQL	Practical Quantitation Limit
PQL	Sample Quantitation Limit
PRG	Preliminary Remediation Goals
PRP	Potentially Responsible Party
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
RCRA	Resource Conservation Recovery Act
RFP	Request for Proposal
RPD	Relative Percent Difference
RRF	Relative Response Factor
SARA	Superfund Reauthorization Act
SCDM	Superfund Chemical Data Matrix
SOP	Standard Operating Procedure
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure

APPENDIX 7: ACRONYM LISTING

VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
WQS	Water Quality Standards
XRF	X-Ray Fluorescence