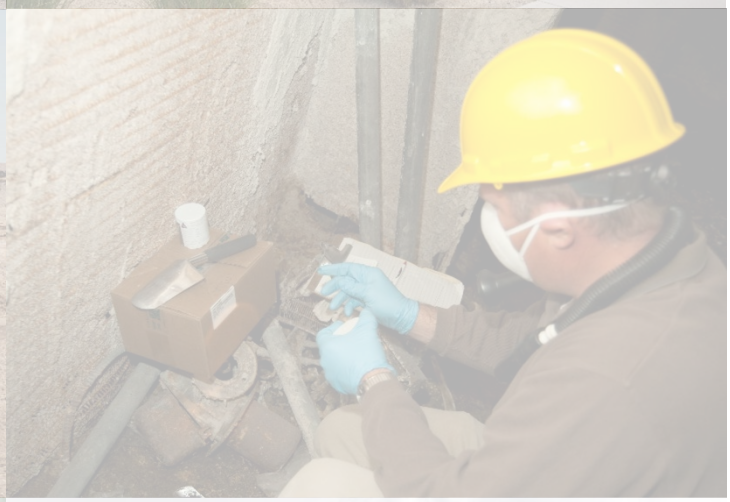

QUALITY ASSURANCE PLAN

for the NEVADA BROWNFIELDS PROGRAM

FINAL NEVADA BROWNFIELDS PROGRAM QUALITY ASSURANCE PLAN

This document has been prepared by the Nevada Brownfields Program operating as part of the Bureau of Corrective Actions, Nevada Division of Environmental Protection, Nevada Department of Conservation and Natural Resources.

This document establishes the data quality requirements for environmental site assessments and site cleanups completed by the Nevada Brownfields Program and the Nevada Brownfields Program Contractor.

This Quality Assurance Plan was developed in accordance with *EPA Requirements for Quality Assurance Project Plans* (EPA/QA/R-5, March 2001).

The effective date of this document is 01/03/2022.

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TABLES AND FIGURES

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ACRONYMS AND ABBREVIATIONS

ADQ	Audit of data quality
ASTM	American Society for Testing and Materials
CAP	Corrective action plan
CCAL	Continuing calibration
CEM	Certified environmental manager
CERCLA	Comprehensive Environmental Response, Cleanup and Liability Act
CFR	Code of Federal Regulations
CLP	Contract laboratory program
CSM	Conceptual site model
CWA	Clean Water Act
DQA	Data quality assessment
DQI	Data quality indicator
DQO	Data quality objective
EDD	Electronic data deliverable
EDSC	Environmental Data Standards Council
ELCP	Environmental Laboratory Certification Program
EPA	U.S. Environmental Protection Agency
ELS	Environmental laboratory services
ESA	Environmental site assessment
FSP	Field sampling plan
GC/MS	Gas chromatography and mass spectrometry
HASP	Health and Safety Plan
HRGC/HRMS	High resolution gas chromatography/high resolution mass spectrometry
ICAL	Initial calibration
ICP/MS	Inductively coupled plasma (atomic emission spectrometry) and mass spectrometry
IDW	Investigation-derived waste
IRIS	Integrated risk information system
LCS	Laboratory control sample
LRL	Lowest reporting limit
MCL	Maximum contaminant level
MDL	Method detection limit
MQO	Measurement quality objective
MS/MSD	Matrix spike and matrix spike duplicate
MSR	Management system review
MTBE	Methyl-tert-butyl-ether
mg/L	Milligrams per liter
µg/L	Micrograms per liter
NAC	Nevada Administrative Code
NBP	Nevada Brownfields Program
NDEP	Nevada Division of Environmental Protection
NELAC	National Environmental Laboratory Accreditation Conference
NIST	National Institute of Standards and Testing
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List

NRS	Nevada Revised Statues
PARCCS	Precision, accuracy, representativeness, completeness, comparability, and sensitivity
PE	Performance evaluation
PID	Photo-ionization detector
PRG	Preliminary remediation goal
PRQL	Project-required quantitation limit
QA	Quality assurance
QA/QC	Quality assurance/quality control
QC	Quality control
QCSR	Quality control summary report
QL	Quantitation limit
RBCA	Risk-based corrective action
RCRA	Resource Conservation and Recovery Act
RDA	Records disposition authorization
RFP	Request for proposal
RPD	Relative percent difference
RSL	Regional screening level
%R	Percent recovery
SAP	Sampling and analysis plan (an integrated field sampling plan and QA project plan)
SDWA	Safe Drinking Water Act
SOP	Standard operating procedure
SOW	Statement of work
SQL	Sample quantitation limit
SVOC	Semivolatile organic compound
TCLP	Toxicity characteristic leaching procedure
TSA	Technical system audit
TDS	Total dissolved solids
VOC	Volatile organic compound
VSP	Visual sample plan
YSA	Yearly systems audit

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GROUP A: PROGRAM MANAGEMENT

Introduction

This Quality Assurance (QA) Plan describes the quality process for the Nevada Brownfields Program (NBP), under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 128a. This program has the primary goal of protecting human health and the environment, while assisting in the assessment, cleanup, and redevelopment of Brownfields properties. The NBP provides a process for streamlining government oversight of cleanups and redevelopment of environmentally-challenged properties.

Program Organization and Planning Documentation

The NBP operates within the Bureau of Corrective Actions (Bureau) of the Nevada Division of Environmental Protection (NDEP). This Bureau functions as the consolidated source of environmental site cleanup in the State of Nevada, with authorities and responsibilities arising from delegated authorities through the Resource Conservation and Recovery Act (RCRA), the Clean Water Act (CWA), and from cooperative work agreements through CERCLA. The NBP, as defined, is a small component of the Bureau and consists of a single full-time employee with a line supervisor, whose authorities are divided over all Superfund- and CERCLA-related activities for which the NDEP has involvement.

The NDEP does not have an office or position specifically devoted to quality assurance (QA) management. As such, data quality responsibilities reside primarily within each separate program. The NBP has designated an NDEP staff member as the NBP Quality Coordinator, who will be the QA manager for all projects receiving Brownfields funding. The NBP Quality Coordinator may rely on several division-wide, internal resources, as well as outside independent services to minimize any potential conflict involving the role that staff members may play in the direct generation of data. The NBP Coordinator and Quality Coordinator are independent of direct data generation activities over which they have oversight. These structures, resources, and processes will be outlined in the following two subsections governing program organization and planning documentation.

The NBP provides the following:

- Site assessment and characterization to determine existence and extent of potential contamination;
- Cleanup and remediation services for sites with confirmed contamination;
- Potential to increase property values, create jobs, stimulate tax revenue, and revitalize communities;
- The ability to take blighted property and prepare them for resale, thereby generating income to stakeholders;
- Empowerment for local governments and communities to develop partnerships for restoring abandoned, idled, or underutilized sites to new users; and
- A process for streamlining government oversight of cleanups and redevelopment.

Program/Task Organization

The NBP, as described in the next chapter (Problem Definition and Background), performs site assessments and cleanups on behalf of applying eligible entities statewide. The operation of this program involves several individuals with specific responsibilities related to data quality representing four different organizational entities with specific functions related to the operation of Brownfields. The following paragraphs discuss these organizations and their general responsibilities, followed by discussions of specific responsibilities held by individuals within those organizations.

An organizational chart showing all the parties involved in the data quality system has been included as **Figure A1: Quality System Components of the Nevada Brownfields Program**. Entities are identified based on their roles in data quality management as data generators or data users. The defined NBP includes the Superfund Branch Supervisor, the Technical Lead, the NBP Coordinator, the Quality Coordinator, and the Nevada Brownfields Program Contractor (NBP Contractor). Representatives of the National Brownfields Program, operated by the U. S. Environmental Protection Agency (EPA), are also shown in Figure A1. The prospective data users include the program applicant, local government representatives, and the property owner; depending on the project, these three identified units may be synonymous, or they may represent distinct stakeholders, each with specific and different data needs. Program applicants may include local governments or property owners.

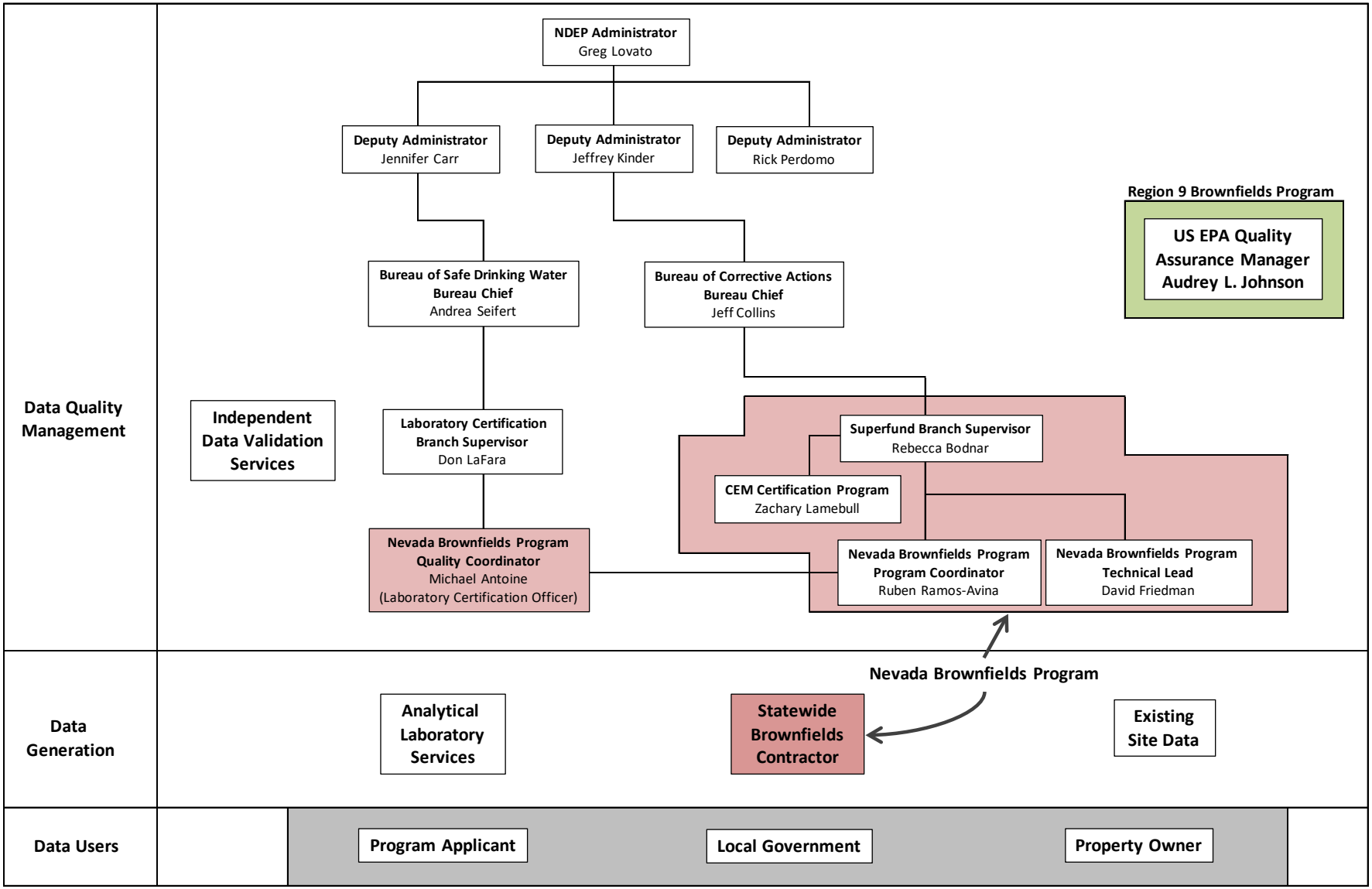
Under the NBP, grant applications are submitted for review by the NBP Coordinator. The NBP Coordinator generally co-reviews and approves applications in concurrence with the EPA Project Officer. Following approval of an application, the contractor recommends a scope of work to perform the project. NBP may accept the contractor's scope of work as presented or meet with the contractor to modify their proposal as necessary. Either a site assessment or site cleanup will be performed by the contractor. Site redevelopment is the goal after remediation is completed.

Organizational Roles and Responsibilities

Environmental Protection Agency

The federal government, through the EPA, operates the National Brownfields Program, which serves as the guiding model for the NBP. The EPA is the source of funding for the NBP through the Section 128—State Response Program Enhancement mechanism (42 USC Sec. 9628), as established by the National Brownfields Act. Because the EPA maintains the program model and provides the program funding, its roles and responsibilities are to ensure that the NDEP is conforming to appropriate program guidelines and meeting various terms and conditions attached to the grant funding. The Terms and Conditions statement attached to the funding dictates various aspects of the NBP including the eligibility of projects for funding and the generation of data in accordance with federally-established quality assurance/quality control (QA/QC) guidelines. As laid out in other sections of this QA Plan, the EPA has a role in both program-level (establishment and documentation of appropriate data quality structures) and project-level (determination of project eligibility and involvement in data collection planning) QA procedures.

Figure A1: Components of the Quality System for the Nevada Brownfields Program



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Nevada Division of Environmental Protection

The NDEP is responsible for the operation of the NBP. All programmatic activities reside in the Bureau of Corrective Actions, Superfund Branch. The NBP consists of a Bureau Chief, Supervisor, Technical Lead, NBP Coordinator, and NBP Quality Coordinator. Also, within the Superfund Branch is an environmental manager certification program that establishes standards and documents compliance for operation as a Certified Environmental Manager (CEM) in the State of Nevada. CEMs are certified to act as consultants to manage hazardous waste; sample air, soil, surface water, and groundwater for hazardous substances; respond to a release of a hazardous substance; and oversee cleanups.

Environmental laboratories that analyze water samples for compliance purposes must be certified by the State or the EPA. The NDEP Bureau of Safe Drinking Water certifies environmental laboratories for drinking water and wastewater analysis through the Laboratory Certification Program (LCP). The primary mission of the LCP is to provide guidance, expertise, and regulatory oversight to certified environmental laboratories for the purpose of ensuring public access to competent and reliable laboratory services. The data produced from the analysis of environmental samples are used to make informed decisions relating to the health and welfare of Nevada's citizens. These data must be of known quality, technically sound, and legally defensible. The LCP is used to maintain oversight on analytical labs for quality control (QC) on all environmental samples submitted for analysis under a regulatory program—either the CWA, Safe Drinking Water Act (SDWA) or RCRA. The NBP will rely on the laboratory certification program for the satisfaction of many of the QC elements associated with laboratory operation and reporting (see Appendix A of this QA Plan). Managers for the NDEP and the Bureau also have responsibilities for the successful functioning of all component programs.

Nevada Brownfields Program, Contractor

Data generation is accomplished by the NBP through the services of a contracted environmental consulting firm. The NBP Contractor is selected through a formal request for proposal (RFP) bidding process established by the State. The NBP Contractor is responsible for data generation activities in support of the NBP through field measurements and the subcontracting of analytical laboratory services. The direct contractual relationship between the selected company and the NDEP make it an integral component of the NBP. The selected firm is required to meet all data quality requirements established in this QA Plan to ensure the efficacy of submitted information. The selected firm also operates under their own corporate- or office-level QA plans that may be considered as a component in the overall structure of QA for the NBP; however, the QA plans of firms are generally for liability issues and best business practices and the NBP requires the firms to adhere to the NBP QA Plan.

Nevada Brownfields Program, Program Applicants

The NBP operates on behalf of program applicants; therefore, these entities often define the project scopes and project goals. Eligible entities apply to the NBP for services at a site to meet an established goal, such as the satisfaction of all-appropriate inquiry regulations or the

completion of a cleanup and the issuance of a "No Further Action" letter by the NDEP. The defined goals and the needs of the applicants as the primary data user drives the types and levels of data generation undertaken at a Brownfields project. For this reason, the program applicants play a critical role in the scoping and planning of projects prior to data generation. They have an additional interest in ensuring that the final product delivered by the NBP satisfies their expectations of project goals. The NBP Coordinator reviews applications and determines if the applicant and the site are eligible, not eligible, or of uncertain eligibility. The NBP Coordinator consults with the EPA Project Officer to ask for concurrence on most projects with few exceptions. Most eligible applicants are accepted into the Program, but the NBP prioritizes projects based on likelihood to succeed, community need, and the ability of a project to utilize other funding sources.

Individual Roles and Responsibilities

In addition to those general responsibilities maintained by the above organizations, specific responsibilities for QA have been assigned to individuals involved in the NBP. Most of these individuals will be referred to only as a given project title or position, since these assigned duties will be unaffected by staff changes within these positions. However, the designated Quality Coordinator for the NBP will be identified by name, and a revision to the QA Plan will be required at any point that a staff change occurs in this position. Individuals are listed below corresponding to the four previously listed organizational structures and according to the level of direct oversight within those organizations the individuals will provide in the NBP's QA system from least to most direct involvement.

<u>EPA Region 9, Nevada Project Officer</u>

The EPA Nevada Project Officer is the lead federal agent in the administration of cooperative agreements between the EPA and NDEP related to the State Response Program. The EPA Nevada Project Officer is the individual with the ultimate responsibility in determining whether the NBP, at both a program and project level, is complying with all federal program guidelines as dictated by funding Terms and Conditions. To facilitate the EPA Nevada Project Officer's responsibilities for program oversight under the Cooperative Agreements, copies of all correspondence and data reports are transmitted to their attention for inclusion in project files they maintain.

To ensure alignment of the state program with the mandates of the federal program, the EPA Nevada Project Officer is consulted prior to acceptance of a site into the NBP. Initial discussions of applicant eligibility, site eligibility, and project goals are typically discussed in an informal consultation between the NBP Coordinator and the EPA Nevada Project Officer prior to the formal application process. Applications are submitted to the NBP Coordinator for determination of eligibility and the ability of the NBP to support the project. If the NBP Coordinator determines the project eligible and resources are available, the NBP Coordinator forwards the application with a **NBP Project Screening Tool** document to the EPA Nevada Project Officer. The **NBP Project Screening Tool** document summarizes key aspects of site status that would statutorily disqualify a site from receiving support from the NBP under Federal

law. If a site clearly meets the definition and eligibility requirements of a Brownfield, the NBP Coordinator and EPA Nevada Project Officer may make the eligibility determination and additional documentation beyond the site application and screening tool document will not be necessary. If eligibility is not clear, the EPA Nevada Project Officer may require additional documentation to demonstrate the eligibility of a project. Additionally, if questions regarding eligibility arise, a detailed rationale for inclusion is submitted by the NBP Coordinator to the EPA Nevada Project Officer for review prior to acceptance of an application and expenditure of grant funds.

EPA Region 9, Quality Assurance Office

Staff in the QA Branch of EPA Region 9 will have direct oversight in the development and review of the NBP QA Plan and indirect involvement in the development and review of site-specific sampling and analysis plans (SAPs).

Prior to the implementation of QA elements as outlined in this QA Plan, this document will be reviewed and approved by the EPA QA Branch. Revisions will be made in accordance with EPA-provided comments until the QA Plan is finalized. Once the document is finalized, any proposed revisions to the QA Plan will need to be considered by the EPA QA Branch prior to inclusion in a revised document. Any substantial deviations from the prescribed performance of QA elements as outlined in the approved QA Plan will need to be documented and submitted as part of a Yearly Systems Audit (YSA) prepared by the NBP Quality Coordinator (the YSA is described in Section C of this document) or through another acceptable method if the deviation requires attention prior to the scheduled date of the YSA. The QA Branch will be responsible for reviewing YSAs submitted by the NDEP and making recommendations for corrective actions where elements are found not in compliance with the QA Plan.

Less direct involvement by the EPA QA Branch is planned for the development and review of project-specific SAPs. The primary responsibility for the review and approval of project-specific plans will reside with the NDEP; however, the EPA QA Branch may be invited to attend a project-scoping session, as requested by the NDEP. As much as once a year, as an element of the YSA, a project-specific SAP will be submitted for review to both the NDEP and EPA QA staff. This dual review will help the NDEP align, through the comparison of plan review comments, its QA requirements with the practices used by the EPA. Conclusions reached through the dual review will be documented in the YSA, along with plans for the implementation of proposed corrective actions. EPA may choose to review one SAP as an audit function; this SAP will have been reviewed and approved by the NDEP prior to EPA's audit review. The EPA QA Manager will select a representative SAP, based on their professional judgment, or the EPA QA Manager may request that the NBP Quality Coordinator select a representative SAP based on his or her professional judgment.

NDEP Administrator and Deputy Administrators

Management functions for the NDEP are handled through the office of the NDEP Administrator, who has responsibilities for the successful operation of all divisional programs. Division-wide

policies are established and implemented through the authorities of the Administrator and Deputy Administrators, who operate as the representative of the NDEP in state statutes and regulations. Division-wide policies established by the Administrator cover all aspects of the operation of the Division's personnel management, accounting, quality management, information security, and budgeting systems.

NDEP Environmental Laboratory Services

The NDEP operates an environmental laboratory certification program for the purpose of ensuring the citizens of Nevada access to quality analytical services. Certification for environmental laboratories is required for the analysis of samples associated with the CWA, the SDWA, and RCRA, which serve as the three primary regulatory authorities for site cleanup under State law. Projects under the NBP are required to use analytical laboratories certified by the State of Nevada. The responsibility of laboratory certification resides in the NDEP Bureau of Safe Drinking Water, Laboratory Certification Branch. To accomplish their objective of ensuring the availability of competent, reliable laboratory services, the Laboratory Certification Branch undertakes the following activities:

- Technical assistance—staff members of the Laboratory Certification Branch have been hired based on their years of experience with analytical procedures, instrumentation, methodologies, and QA measures. The staff serves as a technical resource for laboratories, the general public, and other NDEP programs in these areas of expertise.

- Dissemination of pertinent information—when the EPA promulgates new methodologies, regulatory levels, detection limits or when industry standards change or laboratory technology is updated, these changes are incorporated into the Laboratory Certification Program and disseminated to laboratories and the regulated community.

- Certification process—the certification program follows the guidelines presented in Chapter 4 of the National Environmental Laboratory Accreditation Conference (NELAC); Constitution, Bylaws and Standards which is referenced in the Nevada Administrative Code (NAC). Those relevant NACs are included as Appendix A to this QA Plan.

The application for laboratory certification in Nevada requires general information about the laboratory (including the primary accrediting authority), submittal of the laboratory's QA plan, a copy of the most-recent site inspection, demonstration of capability and submittal of method detection limit data, results of performance evaluation (PE) samples and NELAC certifications. Additionally, the names and contact information for laboratory managers and staff must be provided, along with worksheets indicating the types of analyses and analytes for which the laboratory wishes to be certified. Requirements for certification by the State of Nevada are provided in Appendix A of this QA Plan.

Bureau of Corrective Actions, Chief

The Bureau of Corrective Actions of the NDEP is responsible for a consolidated set of site cleanup regulations and authorities. All site cleanups conducted in the State of Nevada are

overseen by the Bureau of Corrective Actions through its combined authorities from state-delegated environmental programs including the CWA and RCRA. As the head of the Bureau of Corrective Actions, the Chief is responsible for the administration of all these cleanup authorities. In addition, because site cleanup regulations play an integral part in the development of data quality guidelines, the Chief also plays an important function in determining data quality and sufficiency for all programs under the Bureau of Corrective Actions and specifically for the NBP.

The regulations governing "corrective actions" (the collective term for state-lead cleanups in Nevada) determine on a general level the type and amount of data necessary to make cleanup decisions, including the issuance of "No Further Action" letters. The Chief is responsible for ensuring a consistent application of these regulations across all state cleanup sites. All site information is available to the Chief for review and consideration of site decisions. The Chief also holds regular, usually weekly, supervisor-level meetings to discuss Bureau issues and program operations.

In addition to overseeing compliance with existing regulations, the Chief is the primary driver for the initiation of new regulations or the revision of those existing ones found to be insufficient to handle current case operations. If a regulatory deficiency is identified, the Chief initiates the process to draft and adopt a revised or new regulation. Statutory authority for corrective actions is given by the Nevada Revised Statutes (NRS), Title 40: NRS 459.500-459.535; NRS 459.800-459.856; NRS 445C.010-445C.410: see http://www.leg.state.nv.us/NRS/. The Nevada Administrative Code (NAC) is the State of Nevada's code of state regulations and carries the same force of law as the NRSs.

The Chief will also receive QA information specific to the NBP, including the results of YSAs and any other audits initiated by the Program Supervisor. The Supervisor will consult with the Chief when implementing any Program corrective actions, as recommended through these audits.

Nevada Brownfields Program, Coordinator

All environmental cleanups undertaken in the State of Nevada are overseen through the designation of a remediation Case Officer in the Bureau of Corrective Actions. The Case Officer is responsible for reviewing and approving cleanup plans and closure reports to ensure that cleanups are conducted in accordance with the environmental authorities contained in state statutes and regulations. All Brownfields cleanups will be required to satisfy cleanup authorities in the NAC 445A.226 to 445A.22755.

For cleanups funded by the NBP, the NBP Coordinator is typically the Case Officer responsible for review and state oversight of the NBP site. The NBP Coordinator will be the primary data user and decision maker with authorities to determine whether the cleanup actions taken by the NBP Contractor at the direction of the NBP satisfies environmental regulations. The NBP Coordinator will dictate the appropriateness of selected action levels for contaminants in soil and groundwater and will make risk-based determinations regarding any contaminants left in place above these levels.

Specifically, the NBP Coordinator will review the Corrective Action Plan (CAP) submitted by the NBP Contractor. Prior to initiation of cleanup activities, the NBP Coordinator, functioning as the Case Officer for Brownfields projects, will first need to provide approval. The NBP Coordinator may indicate deficiencies in the CAP that will need to be addressed prior to approval. Additionally, he/she will review the final report produced after completion of the cleanup in determining whether to issue a "No Further Action" letter for case closure.

Nevada Brownfields Program, Technical Lead

The role of the NBP Technical Lead is to advise and consult as requested by the NBP Coordinator on any matters related to site assessment and cleanup. Consultation may include areas such as sample design; field methods; analytical methods, especially analyses performed in the field; and report review and conclusions, particularly Phase II Environmental Site Assessment and final cleanup reports. The role of the Technical Lead may overlap the role of NBP Quality Coordinator in certain circumstances; the primary distinction is that the Technical Lead is available to assist on issues pertaining to field work while the NBP Quality Coordinator's focus is to assure the PARCCS criteria of the analytical data obtained by the NBP.

Superfund Branch, Supervisor

The Supervisor of the Superfund Branch of the Bureau of Corrective Actions is responsible for administrative functions associated with the operation of cooperative agreements with the EPA. In addition to the NBP, these cooperative agreements cover activities associated with emergency response, the performance of preliminary assessments and site investigations under CERCLA, the Carson River Mercury Superfund site, and release reporting.

The responsibilities of the Superfund Branch Supervisor are primarily associated with program operation and fiscal management. At the program level, the Supervisor is responsible for shaping the NBP by negotiating budgets and work plans with the EPA Region 9 each year and by organizing quarterly discussions with the EPA Nevada Project Officer for the purposes of program review.

This position is also responsible for reviewing and participating in a YSA review for the NBP and integrating any conclusions or corrective actions into future program work plans. The Supervisor has the authority to implement any QC element or corrective action at the program-level at any time to satisfy concerns or comments made by any participating party in the NBP. This may include such situations as the program-wide enforcement of a revised regulatory action level, a requirement for increased documentation to satisfy public interest in particular projects, and identification of mandatory training opportunities for staff and consultants. The Supervisor also has the authority to initiate any additional audits, beyond the YSA, in response to adverse or unusual operating conditions.

The Superfund Branch Supervisor is also responsible for all contract management issues, including the selection of the NBP Contractor through the RFP process, the negotiation of contracts with the selected firms, the establishment of project budgets, and the review of submitted invoices.

Nevada Brownfields Program, Quality Coordinator

The daily administration of the NBP is handled by the NBP Coordinator. However, some program oversight activities involved with data quality for site cleanup are handled as part of the Quality Coordinator's responsibility to ensure data submitted to the program by its NBP Contractor meet appropriate levels of quality. The Quality Coordinator has the primary responsibility for the maintenance of the QA Plan and for ensuring that all data submitted to the NBP meets the requirements in this document. This is done through four major activities:

1. Review and Revisions of the QA Plan — the QA Plan will need to be updated to accommodate new developments in QA/QC or to respond to changes in NBP functions. Revisions to the QA Plan may become necessary through several different routes, and the Quality Coordinator will be responsible for responding and making these revisions when appropriate. During regular contact with the EPA, most usually during scheduled quarterly program review meetings, either the EPA Nevada Project Officer or QA Manager may make suggestions for improving quality performance that could be incorporated into the QA Plan. During the YSA, the NBP Quality Coordinator will examine the QA Plan and the performance of the NBP and may make suggestions for improved performance that result in revisions to the QA Plan. Likewise, the NBP Contractor may request revisions to the QA Plan in response to changes in industry-wide field methodology or for the addition of new or innovative technologies. Development and acceptance of new analytical methods may provide lower detection limits or other improvements that can be described in revisions to the QA Plan.

2. Review and Approval of SAPs/FSPs—the Quality Coordinator will have the ultimate responsibility to review site-specific SAPs or Field Sampling Plans (FSPs) submitted by the NBP Contractors to ensure compliance with provisions of the approved QA Plan. The Quality Coordinator will review the submitted SAPs and FSPs to determine whether the sampling event will satisfy project goals and includes sufficient QC elements to ensure appropriate data quality.

3. Development of Data Quality Objectives (DQOs)—prior to the preparation of SAPs by the Brownfields contractors, an initial scoping session may be held with all available stakeholders to outline project goals and DQOs. These initial meetings will roughly follow guidance for the standard DQO process developed by the EPA (EPA 2006a). The results of these initial meetings will be used to guide the development of the site-specific SAP and will be documented as part of the SAP preparation. The developments of DQOs will be a collaborative process, overseen by the NBP Quality Coordinator, and may include the EPA Region 9, site applicant, appropriate local authorities, and NBP Contractor.

4. Review of Data Reports—upon submittal of a report containing environmental data, generated under an approved SAP, it will be the responsibility of the NBP Quality Coordinator to review the report to determine conformance with the SAP and QA Plan.

The NBP Quality Coordinator will prepare comments for revision of the data reports prior to finalization and delivery to the program applicant for their use.

Nevada Brownfields Program Contractor, Project Leads

The NBP retains an environmental consultant (NBP Contractor) under contract to provide services to the program prior to selecting and approving projects, rather than hiring a consultant on a project-by-project basis. The NBP contract scope of work is written so that the selected contractor can perform several tasks for the NBP, as they are deemed necessary, in addition to performing the primary service of performing site assessments, investigations, and cleanups. All tasks are initiated under the contract at the request of the NBP and are budgeted on a not-to-exceed cost basis. The NBP retains environmental services in this method for several reasons:

1. State procurement regulations require the NBP to follow a formal selection process prior to entering a contract to perform services for the State. This selection process would impede the timely consideration and execution of each project if the NBP attempted to hire a consultant for each new project or phase of a project.

2. The NBP has found that by working with consultants on program-wide basis over the course of one or more years, the quality of the project deliverables improves as the consultants gain more knowledge of the NBP, the needs and expectations of the NBP, and the requirements of the QA Plan.

3. The NBP leverages additional marketing and public outreach for the program through the consultant's efforts to generate work for themselves under the contract.

As the primary data generators, the NBP Contractor is responsible for the implementation and documentation of several QC elements to satisfy requirements of the QA Plan. Beyond the elements contained in the QA Plan, the NBP Contractor will be required to prepare a site-specific SAP or FSP for review by the NBP prior to any data collection activities at a Brownfields project site.

The NBP Contractor may also operate under their own, internal QA plans, but all work must still satisfy the approved NBP QA Plan. As the NBP Contractor is contracted to the State for the generation of environmental data, these internal QA plans should be made available for review by request of the NDEP and EPA. Although all necessary QC elements should be covered in this QA Plan and site-specific SAPs/FSPs, the review of the NBP Contractor's data quality documents may be undertaken to supplement the quality dictates of the NBP.

Program Applicants

Program applicants are the primary data users in the NBP; they may also be the primary data generators. Assessments undertaken by the NBP to be used in redevelopment decisions and site cleanups will be guided by intended property reuse. As the primary data generators, the program applicant will play three roles in determining the quality of data generated by the program: First, as part of the application and initial project planning process, the applicant will provide existing site information, including information from prior sampling events. This existing information will be reviewed by the NDEP and the NBP Contractor to determine the appropriateness for its use by the NBP. If the data are of sufficient quality, they may be used in the program. Second,

the program applicant will dictate their project needs by participating in and providing input during all planning efforts. These project needs will determine the amount and type of data to be generated by the NBP Contractor. Planning helps ensure that data of adequate quality and quantity are collected. Third, the program applicant will have the opportunity to review and provide comments on the completed data reports as an essential component in determining if the collected data is of sufficient quantity and quality to meet project needs. Reviewing data in consideration of the project DQOs will help determine if the objectives have been met.

Planning Documentation

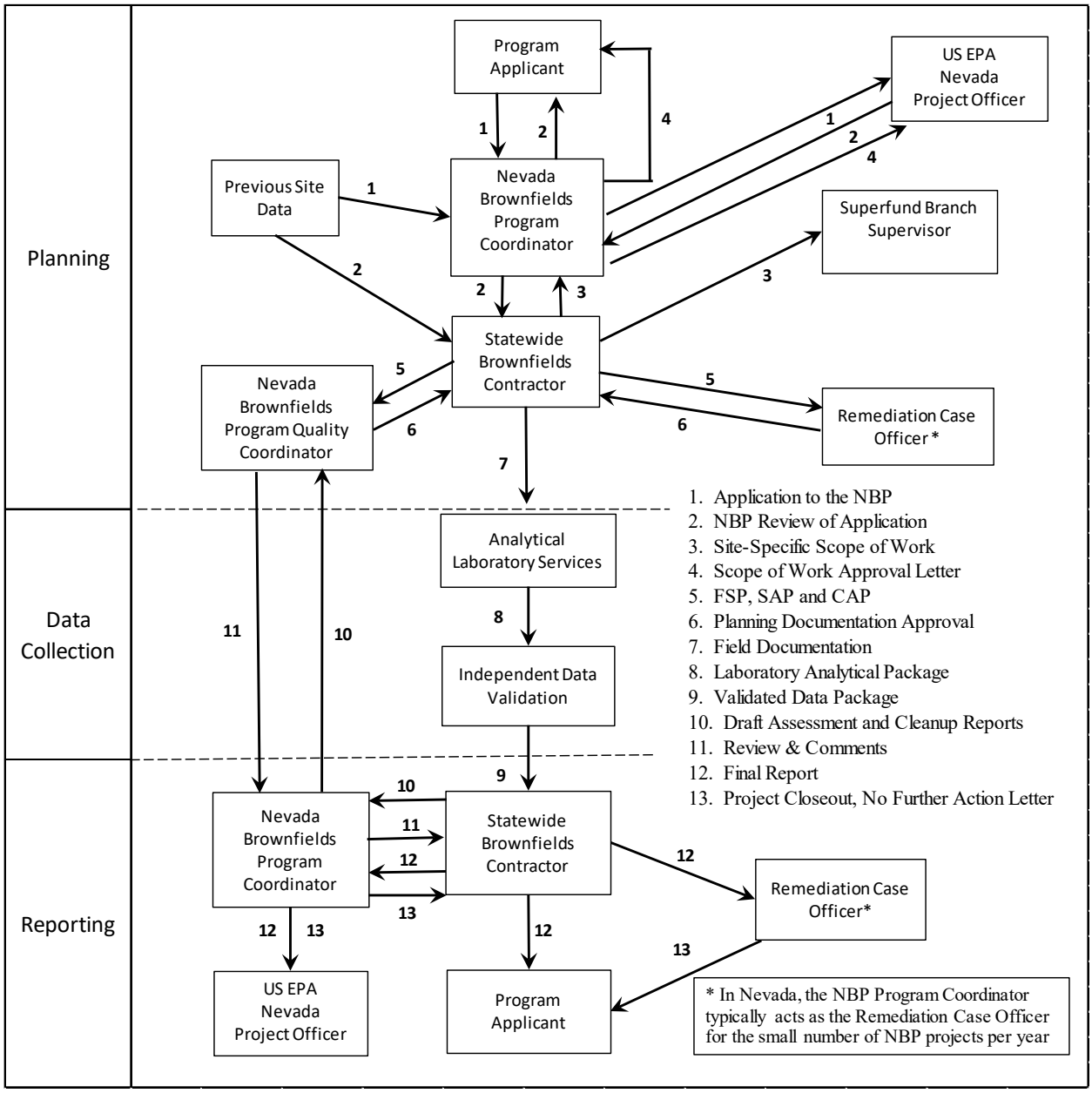
Although all activities undertaken by the NBP will be unique one-time events associated with a site assessment or site cleanup project, those activities will occur within a framework that is well-defined by specific documentation requirements. Most activities will be conducted along a coordinated flow path consisting of the submittal and review of documents. Therefore, each defined document will play a role in establishing QC elements to ensure the production of a usable, reliable, final product. Outlined below are the defined documents and deliverables that constitute a normal Brownfields assessment or cleanup project listed in the order that those documents will be produced during a project. Although the documents required for drafting and transmittal after the SAP, FSP, or CAP are not considered planning documents, they are outlined here. A final section is devoted to the documentation and use of previously generated data and the documentation of projects that deviate from the established process. Later chapters discuss other documentation variances; particularly, the development of audits and program outputs to EPA databases.

A flow chart, corresponding to the flow of documents and data as outlined in this section is included as "**Figure A2: Program Inputs and Deliverable Flow**." Positions with an active role in the generation and review of Brownfields deliverables are included in the flow chart. The numbered arrows correspond to the following documents and inputs:

1. Application to the NBP

NBP projects are initiated through the submittal of a completed application by a Program Applicant. Application must be made in full on an NDEP-approved form (Appendix B). In most instances, the Program Applicant will be an "eligible entity" as defined in Section 104(k) of CERCLA, meaning that the applicant will be a unit of local government or redevelopment agency chartered or sanctioned by the State. Applications by private individuals who are property owners or prospective purchasers of Brownfields sites may also be considered, but they must demonstrate that the project has community benefit and support and must show the active involvement of appropriate local officials. Applications are accepted by the NBP at any time during the year.

Figure A2: Program Inputs and Deliverable Flow for Project Planning Documentation



Nearly all applications are completed by a Program Applicant with the assistance of either a member of the NBP staff or the NBP Contractor. This tends to occur because of the connection between potential applicants and NBP staff or contractors during Program outreach and marketing efforts. The primary purpose of the application is to help the NBP Coordinator determine whether a project meets site and applicant eligibility requirements. To receive funding through the NBP, the application must: (1) demonstrate the site meets the definition of a Brownfield as established by the federal program in CERCLA Section 101(39); (2) not be on the National Priority List (NPL); (3) not be the subject of on-going enforcement actions by the State

or Federal government; and (4) the applicant must not be responsible for the contamination present at the site. These eligibility requirements are dictated by Section 128(a) grant funding Terms & Conditions. At this stage in the process, the NBP determines and notifies the applicant if the project will be fully funded or the level of assistance the NBP is able to provide. This allows the applicant to seek and include other resources available and to indicate the role of those resources in the NBP application. In turn, the existence of additional resources helps demonstrate the likelihood of the success of a proposed project. EPA grant funding has been such that Phase I Environmental Site Assessments (ESAs) and Phase II ESAs are usually fully fundable; however, funding for cleanups is variable depending on the amount requested and the amount the NBP has available.

The application is also used by NDEP to rank sites for funding. Priority is placed on funding projects with well-defined and feasible project goals or re-use strategies. Projects with defined end-uses are more likely to achieve completion within the NBP because project goals and data needs are more easily determined. Other ranking criteria include the extent of environmental contamination and anticipated public benefits.

Along with the completed application form, the program applicant is also requested to submit any previously generated data available for the site. The use of previously generated data will be covered in other sections of this QA Plan. In general terms, these data are used to help define project goals and data needs. The submittal of previously generated data reports is voluntary, and an application can be found to be sufficient based solely on responses to the questions contained on the approved form.

2. NBP Review of Application

In response to an application, the NDEP will determine whether to fund or deny the proposed project. In declining to undertake a project, the NDEP will provide communication to the applicant with an explanation for the denial. A denied application will be kept on file, but no further action will be taken. Approval of an application and acceptance into the NBP will, however, generate correspondence from the NBP Coordinator to the applicant that serves several purposes, as described in the following paragraphs.

The NBP Coordinator receives and performs the first review of an application. If the NBP Coordinator deems the proposed project eligible and believes the project meets other NBP criteria as described above, the NBP Coordinator will complete a **NBP Project Screening Tool form** and provide copies of the completed application and screening tool form to the EPA Region 9 Nevada Project Officer with a recommendation that the NBP supports the proposed project. The Nevada Project Officer may request additional information or documentation from the NBP Coordinator in review of the application and concur with the request to support the project or deny support. If support is denied, the NBP Coordinator will communicate this to the applicant with an explanation as to why the NBP is denying support. If the Nevada Project Officer agrees to support an application, then the NBP Coordinator communicates this message to the applicant, usually by email. If the NBP Contractor was involved in the application submittal, they will be informed of the NBP's and EPA's decision as well.

3. Site-Specific Scope of Work

After a project is accepted into and enrolled in the NBP, the NBP Contractor will be asked to develop a scope of work proposal and not-to-exceed budget for the approved project in writing.

The appropriate course of action is generally understood through the application process and the NBP Contractor is requested to provide the standard services of a Phase I or Phase II ESA. Typically, the site history is sufficient to indicate the probable nature and location of contamination on the site before the Phase I ESA is completed; in these cases, the first assessment on a project may be a modified Phase I ESA to include certain sampling. The proposed scope of work and budget are reviewed for completeness and appropriateness by the NBP Coordinator, the Technical Lead (if required), and the Program Supervisor. The proposal may be modified if the tasks or budgets are determined not appropriate. This discussion will continue until an agreement is reached between the NBP and the NBP Contractor.

4. Scope of Work Approval Letter

Once the scope of work and budgets are satisfactory to the NBP, the NBP Coordinator or their Supervisor will write an approval letter addressed to the NBP Contractor, with copies to the Program Applicant and the EPA Nevada Project Officer. This letter brings all parties to an understanding of the work to be performed and the cost of that work. This letter also provides authorization for the NBP Contractor to begin work on the project under the terms of the Statewide Contract. Scheduling of the work is then largely left between the Program Applicant and NBP Contractor to best meet their needs, unless some programmatic issues dictate that NBP timeframes and deadlines be met. In those cases, the NBP Coordinator will also be involved in setting project timelines and/or benchmarks.

The NBP will try to assist the applicant through all phases of environmental work necessary on the approved project site to make it ready for redevelopment. There is no additional application required of the Program Applicant or concurrence of funding requested by NBP from EPA for subsequent work. When an additional phase of work is required on a project site, the NBP Contractor submits another scope of work and budget proposal for the next phase and the same review process is repeated. The limiting factor is the amount of funding the NBP has available, any programmatic limits placed on funding of a site by CERCLA, and the grant's terms and conditions.

In atypical cases where the assessment or investigation needs of the approved project are not typical for sites of a similar nature, or where other aspects of the project make the proposed scope of work extraordinary, the NBP will request a scoping meeting to be attended by the Program Applicant and the NBP Contractor. The option to attend these meetings will be given to the NBP Quality Coordinator, Region 9 Nevada Project Officer, and EPA QA Manager through an invitation by the NBP Coordinator.

5. Field Sampling Plan (FSP), Sampling and Analysis Plan (SAP), and Corrective Action Plan (CAP)

The primary planning document for data generation activities will be prepared by the NBP Contractor after initial project scoping meetings established and directed by the Program and

Quality Coordinators. The specific type of document submitted and the information required to be presented will be dependent on the type of project being undertaken. Acceptable planning documents include a SAP, FSP, or CAP.

Assessment activities will require the drafting of either a SAP or a FSP by the NBP Contractor, dependent on the anticipated scope of the project and the constituents to be analyzed. Where an assessment project only involves total petroleum hydrocarbons, common chlorinated solvents, metals, or any other constituent for which standard operating procedures (SOPs), analytical methods and measurement quality objectives (MQOs) have been adopted in this QA Plan, that project may be undertaken under the guidance of a FSP. Otherwise, the assessment project must be documented in planning through the development of a SAP.

The FSP or SAP drafted by the NBP Contractor must be in the form of the approved templates as developed by the EPA Region 9 and adapted for use by the NBP. These templates are provided in Appendix C of this QA Plan. Most of the information necessary for inclusion in the FSP and SAP will be discussed during the initial scoping meetings and is the responsibility of the NBP Contractor to accurately record and apply these discussions in the planning documents. Where appropriate, the NBP Contractor may also make reference in these planning documents to information already contained in the QA Plan.

For cleanup projects, the NBP Contractor is required to draft and submit a CAP, required by regulation for all cleanups undertaken in the State (NAC 445A.2271 and 445A.2273). Because nearly all cleanup actions require the collection and evaluation of environmental data, the CAP will need to be accompanied by a FSP or SAP, dependent on the conditions as discussed for assessment projects. When cleanup actions are planned at a site where assessment activities were previously performed by the NBP under an approved SAP or FSP, the CAP will need to be accompanied only by an amendment to cover activities not expressly identified in the SAP or FSP.

The NBP Contractor will submit planning documents to the NBP Coordinator for review. No assessment or cleanup activities involving data generation will be undertaken until approval of the planning documents. Primary responsibility for review of assessment planning documents will reside with the NBP Quality Coordinator. CAPs will be reviewed by both the Program and Quality Coordinators. Draft versions of the planning document will also be transmitted, either in an executive summary format or as a full version, to all other project stakeholders with sufficient time allowed for review and comment.

6. Planning Documentation Approval

After review of the document, the NDEP will take one of three actions through written correspondence to the NBP Contractor. If the SAP or FSP is found to be fully satisfactory, the Quality Coordinator will provide a notification of approval to the NBP Contractor allowing them to proceed with the work. Where there are minor deficiencies, the Quality Coordinator may provide conditional approval while dictating corrections in the plan, without requiring re-drafting of the documentation. These corrections will be considered part of the approved plan. Where there are major deficiencies, a comment letter will be drafted, indicating the plan deficiencies,

and suggesting corrections for re-drafting of the plan. Review and approval of the CAP by the NBP Coordinator shall be handled similarly.

7. Field Documentation

Though largely discussed elsewhere in this document, certain levels of field documentation will be required to be produced and maintained by the environmental NBP Contractor to demonstrate compliance with approved methods and assist reviewers to make QA conclusions. Examples of field documentation that will be a required element, as dictated by this QA Plan (Group B: Data Generation and Acquisition) or by an approved SAP or FSP, would include field logs, monitoring well sampling logs, and chain-of-custody forms for environmental samples. Field documentation will be included as part of the package submitted to independent data validation, along with the analytical laboratory data package for projects. Field documentation will later be submitted as part of the assessment or cleanup report in a hard copy format.

8. Laboratory Analytical Package

The data package produced by the analytical laboratory should be sufficiently detailed to allow for review of analytical methods through data verification and validation processes in making conclusions about appropriateness of data quality. The requirements for the specific content laboratory data packages will be discussed in other sections of this QA Plan. As part of the flow of documentation being discussed in this section, the laboratory package along with the field documentation will be transmitted to those groups hired to undertake independent data validation services, as required by the provisions of this QA Plan. The parties conducting the data validation will be required to be fully independent from the laboratory which produced the data. (Laboratories, however, generally verify the data they produce.) The laboratory analytical package will later be submitted as part of the final assessment or cleanup report in a condensed form in a hard copy format. A full version in an acceptable electronic format (electronic data deliverable, EDD) will also be collected as part of the assessment or cleanup report for submittal.

9. Validated Data Package

The quantitative data resulting from field sampling and laboratory analysis will undergo independent data verification/validation services as dictated by other sections of this QA Plan. The validated data, including any appropriate data qualifications, will be submitted to the NBP Contractor for inclusion in the draft project assessment or cleanup report. The NBP Contractor will use the validated data in their formulation of site assessment and cleanup conclusions. For validated data, the data validation report will be required to be submitted as part of the assessment or cleanup report in an electronic format.

10. Draft Assessment and Cleanup Reports

All site information generated during the assessment or cleanup must be collected, tabulated, and considered in a final report generated by the NBP Contractor to document the project. Before the report is finalized, a draft version must be submitted to the Program and Quality Coordinators and the Program Applicant to allow for comments and consideration of the quality and format of presented data.

The format of the assessment or cleanup report will depend on the project goals established during initial scoping sessions. For Phase I and Phase II ESAs, the format of the report will largely be dictated by the American Society for Testing and Materials (ASTM) standards for those documents. For site characterization and site cleanup projects, there is no definitive guidance or standard for report format. However, general requirements for the final report include the documentation of all work/field activities, presentation of all environmental data in a tabular and/or spatial format, and a section where the NBP Contractor uses their professional judgment to draw conclusions from the site data in the context of project goals. Through review of the draft reports, the Program or the Quality Coordinator will evaluate the acceptability of the presentation.

Supporting documentation relevant to data generation and data quality must be attached to the final report, either in a hard-copy or electronic format. Generally, all field documentation needs to be attached to the report in a hard-copy format including the request for analysis forms and the actual laboratory analytical sheets. The laboratory data package and data validation report should be attached in an electronic format.

11. Review & Comments

If the Quality or NBP Coordinator requires revisions to the draft report, those revisions will be communicated to the NBP Contractor via email. The email will include both suggested and required revisions. The Quality or Program Coordinator determines whether the conclusions made by the NBP Contractor in the report are supported by the data and whether the data are of sufficient quality and quantity to meet project objectives.

Where project objectives are not met, the Quality or Program Coordinator may recommend that additional data be collected to fulfill any data gaps before the final report is issued. Otherwise, the NBP Contractor may make the appropriate revisions as outlined in review email submitted by the NDEP for the submittal of a final deliverable. In those instances where the draft report requires no revisions, the NBP Contractor will still be directed to submit a final version of the report.

12. Final Report

Application to the NBP constitutes a request for service to produce a site assessment/characterization report or to document a completed site cleanup. Therefore, the final output of a project will be the submittal of a final assessment or cleanup report to the NDEP, the program applicant and the EPA Nevada Project Officer. Additional copies of the final report will be provided to the program applicant, as dictated by their needs.

13. Project Closeout, No Further Action Letter

Project closeout from the NBP will be granted upon receipt of the approved final report. Closeout will be in the form of written correspondence to the NBP Contractor, with copies of the correspondence to all project stakeholders. The closeout letter will acknowledge receipt of the approved final deliverable and will request the NBP Contractor submit any outstanding invoices for project work. Under the NBP, project closeout reflects the adequacy of the final deliverable, it does not constitute site closure under state cleanup regulations.

For most cleanup projects undertaken by the NBP, project closeout will not occur until site closure is achieved through the state cleanup program; therefore, a completed cleanup, as determined by the issuance of a "No Further Action" letter by the remediation case officer, will serve as the trigger for project closeout.

PROBLEM DEFINITION AND BACKGROUND

The NBP provides environmental assessment and cleanup services to eligible applicants who are involved in real property transactions or property reuse considerations at sites with potential environmental impacts from previous site operations. The sites specifically undergoing redevelopment or reuse through the NBP constitute a small subset of property transactions, and the services provided by this program and these transactions must be consistent within the realm of well-established real estate practices. It is the purpose of the NBP to help applicants who have redevelopment or reuse projects that will provide benefits for the larger community, either through improving economic or quality of life conditions. The NBP helps these applicants navigate the established real estate process, especially when the transaction is complicated by perceived or suspected contamination on the property.

Environmental contamination on real property can complicate real estate transactions or reuse considerations because liability for site contamination and responsibility for site cleanup must be assessed and understood by all parties prior to the successful completion of any financial deal. The financial responsibility for a costly cleanup can be assessed on a number of different parties, including financial institutions. Because of this responsibility, many privately negotiated agreements will be entered into cautiously, and financing for development of environmentally compromised property can be difficult to obtain. Depending on market forces, the concerns regarding environmental conditions of a site may be handled with very little involvement by governmental entities, with redevelopment or reuse being accomplished solely based on the value of the property and the project being considered. Where these beneficial market factors are not present, the NBP is available to assist with the property transaction.

Under normal circumstances in the State of Nevada, the NDEP as the primary regulatory agency governing environmental issues, has very little direct involvement in the initial stages of property transaction. It is not until an environmental issue is confirmed and concentrations of contaminants are determined to exceed established regulatory levels that the NDEP becomes involved. The State of Nevada does not prescribe specific requirements for performing environmental assessments, except in the case of a known release of a reportable quantity of a regulated substance. Rather, the initial decision-making processes associated with real estate transactions at sites with suspected contamination are governed by the understanding of State and Federal liability structures. The property owner, prospective purchaser, and lending institution need to understand these liabilities.

Participants involved in real estate transactions rely on environmental data to make decisions to secure their interests and limit their potential for losses. Industry standards, driven by laws governing environmental liability, have been developed to help standardize this process. For the majority of sites in the State of Nevada where environmental concerns are present, the NDEP is the lead regulatory authority for cleanup oversight; therefore, determining liability under State law is of primary importance.

Under State environmental regulations, the responsibility for cleanup of contaminated property is nearly always assessed on the current property owner. The current property owner may have recourse through private litigation to seek action for cost recovery against previous owners/operators who may have caused the contamination, but they have the ultimate responsibility to work with the NDEP to ensure that cleanups are conducted and completed appropriately. For this reason, a potential purchaser has an interest in determining that environmental issues are resolved prior to their assumption of that property. A lack of reliable assessment information may discourage a potential purchaser due to the risk of assuming an unknown environmental liability.

For various reasons, private or other public resources may not be available to property owners or prospective purchasers to perform sufficiently detailed environmental assessments that will provide enough comfort for a transaction to proceed. Additionally, property owners may not even have the wherewithal to develop initial property information to attract purchaser or developer interest. These situations serve to limit property reuse and, by extension, property cleanup—a situation that the NBP is intended to prevent. It is the ultimate goal of the NBP to provide environmental information of sufficient quality and quantity to allow property owners and potential purchasers to proceed with property transfer and cleanup. To this end, projects must use analytical laboratories that are certified by the State of Nevada (see Appendix A).

Environmental assessments, as developed in industry standards, are roughly divided into three stages, each of which may be performed by the NBP on behalf of an applicant: (1) initial investigations; (2) site-specific sample collection; and (3) remedy development/cost estimates. These correspond to the ASTM Phase I, Phase II, and Phase III ESAs. Each of these stages has specific goals and objectives tied to property transactions and the local, state, and federal regulations governing environmental liability. These stages of effort are roughly outlined in the following paragraphs. Greater detail regarding the performance of these stages of investigations, in conformance with industry standards and program requirements, are contained in other sections of this QA Plan.

The first and most basic step in determining environmental conditions at a transaction site is the Phase I ESA. The Phase I ESA had previously corresponded to “due diligence” requirements on purchasers of properties and now equates with federally adopted regulations requiring “all appropriate inquiry” to qualify for “bona-fide prospective purchaser” status under CERCLA. The purpose of a Phase I, or an all appropriate inquiry study, is to describe environmental conditions at a site through an investigation of site documents, consideration of observable visual clues during site visits, and the collection of information regarding past site use. Results of a Phase I investigation are used to assess whether environmental contaminants may be present at the site at concentrations requiring a property owner to take action in accordance with environmental regulations. This conclusion is made conservatively using best professional judgment and is based on consideration of the quality and sufficiency of existing information. A property transaction may proceed comfortably if there is no reason to believe contaminants are present; otherwise, suspected environmental contaminants need to be further investigated through the collection of site-specific environmental data.

The most reliable method of determining the presence or extent of environmental impacts on a piece of property is the generation of site-specific environmental data through sample collection

and field monitoring. Site-specific confirmation sampling and analysis are performed as part of a Phase II ESA. Guided by findings of the initial investigations, sampling and monitoring plans are developed to investigate areas of potential concern or areas where no source of reliable information could be obtained. The purpose of the Phase II ESA is to minimize uncertainty associated with "recognized environmental conditions" identified in initial investigations. Although a Phase II ESA is primarily intended for confirming the presence or absence of contamination, the sampling can be quite extensive and may even include activities generally considered to be conducted under the third stage of site assessment.

Beyond confirmation of "recognized environmental conditions," property owners and prospective purchasers will want to know the extent of the contamination and how this translates into cleanup or site reuse costs. The amount of sampling necessary beyond that needed to confirm site conditions is dependent on the required level of certainty to be attached to a cleanup cost estimate. These environmental efforts can come under the aegis of several related documents, including a Phase III ESA, an Engineering Evaluation/Cost Assessment, or any other type of comprehensive site investigation. The objective of this stage of assessment is to place definable boundaries on costs and timelines for cleanup based on detailed information concerning the magnitude and extent of contamination at a piece of property. To accurately estimate cleanup costs, it may also be necessary to fully understand the remedial alternatives available to conduct the cleanup. For this reason, a Phase III ESA may be directly tied to the preparation of site cleanup plans.

The NBP can provide any of these environmental services to eligible applicants accepted into the program. Because the goal of the NBP is to promote the cleanup and reuse of sites, this program will normally only accept sites where there is comfort that land transaction and site re-use will be a likely result of the assessment efforts. To provide the most incentive to accomplish this goal, the NBP will likely perform assessment services at a site, while working with the stakeholder parties to ensure that sites can be directly entered into a cleanup program and site remediation can commence.

In addition to assessment services, the NBP can also provide cleanup services on eligible properties for projects that have a significant public component, defined as active ownership of the property by a local or county government or non-profit agency either for public use or for eventual transition to private ownership as determined by the land holding agency. Site cleanups occur through the state cleanup program collectively referred to as "corrective actions," which comprises consolidated environmental authorities from the CWA and RCRA.

The NBP operates using environmental consultants retained by contract to perform these services (the NBP Contractor). All data generated by the NBP Contractor at the direction of the NBP staff are collected in consideration of the program applicant's project needs. The NBP operates as an independent control on data quality as generated by the NBP Contractor. The end product of a Brownfields assessment is a usable document by the site owner and prospective purchaser to define transaction conditions and determine site re-use options. At the completion of a Brownfields cleanup, certification, and issuance of a "No Further Action" letter is the responsibility of the NBP Coordinator.

PROGRAM/TASK DESCRIPTION

The NBP generates environmental data in support of real property transactions on behalf of program applicants. The type and quality of data are generally dictated by the needs of the applicants. Generally, the NDEP, through the NBP, will provide contract services for performing Phase I and Phase II ESAs, which are defined by industry standards. Where applicants require greater technical assistance, the NBP may offer more comprehensive assessment services, including performing a Phase III ESA, providing accurate estimates of cleanup costs, or developing cleanup/remediation plans. In the case of an eligible applicant holding properties with potential community benefit, the NBP may provide site cleanup services and generate confirmation data at completion to demonstrate regulatory compliance with the Bureau of Corrective Actions.

The NBP is driven entirely by applicant needs, so data collection is not dictated by a regular schedule. Rather, as applicants enter the program, individual project goals are defined, including the types of environmental measurements, deliverables, and reports that will be completed. Therefore, at the most functional level, this QA Plan has been developed to guide data collection associated with one-time events for the assessment and cleanup of participating sites.

Site assessments under the NBP will be performed within the established framework for real estate transactions operating in the State of Nevada. To satisfy these purposes, three types of assessment services may be conducted, though the most frequent will likely be a fully comprehensive site investigation:

- Phase I ESA—the collection and review of available information regarding a property, in satisfaction of "due diligence" or "all appropriate inquiry" requirements, conducted prior to completion of a transaction to determine the presence or likely presence of environmental contaminants. These assessments shall be conducted in accordance with the ASTM E1527 standard.

- Phase II ESA—a focused site investigation conducted to confirm the presence or absence of environmental contaminants at a site, typically completed prior to a property transaction to assess environmental liability issues as part of property negotiations. These assessments will be conducted in accordance with the ASTM E1903 standard.

- Phase III ESA, Comprehensive Site Investigation, Cleanup Cost Estimate—an industry standard has not been developed for a comprehensive site investigation to determine the full nature and extent of environmental contaminants at a site. Where an applicant requests assistance in this regard, a site-specific scoping process will be used to guide the project. This QA Plan is primarily geared toward performing these comprehensive site assessments.

Site cleanups are conducted under the authorities of the State cleanup program contained in regulations (NAC 445C.200 to 445C.390). The state cleanup program requires the submittal of a CAP to the NDEP, Bureau of Corrective Actions. The CAP must be reviewed and approved by the NBP Coordinator, prior to initiation of cleanup activities. The completion of the cleanup will

be documented in a request for closure report containing all generated site data including confirmatory sampling and disposal manifests. The NBP Coordinator, acting as the case cleanup officer, determines the adequacy of completed cleanup in the issuance of a "No Further Action" letter.

The NBP decides when to undertake an assessment or cleanup project at the time of receipt of a completed application and in consideration of program funding. At the time of project acceptance, planning activities commence through a collaborative process involving all project stakeholders and directed by the Program and Quality Coordinators. The primary responsibility of the NBP staff is to oversee and ensure that data of adequate quality and quantity are collected to satisfy project objectives, as defined in the project-specific DQOs. To assure that analytical data are of adequate quality, state-certified laboratories must be used, and the items relevant to data validation (see the Planning Documentation Section, items 7 through 10) must be addressed.

QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

This section is broken into two parts, consistent with EPA Region 9 guidance for QA Plans. The first section documents regulatory action levels that are specific to the NDEP; these action levels serve as the driver for site assessments and cleanup. The second section discusses MQOs and data quality indicators (DQIs) under the NBP.

DQIs are the quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of information to the user. DQIs are measures of individual data characteristics (the quality attributes) that together are called "analytical data quality." The principal DQIs are precision, bias (accuracy), representativeness, comparability, completeness, and sensitivity (also known as the PARCCS parameters). Each DQI has defined acceptance criteria for the quality parameters, as specified in the MQOs.

MQOs are the acceptance thresholds or goals for project data, usually based on the individual DQIs for each matrix and analyte group or analyte. MQOs are project- or method-specific quality acceptance criteria established to support project-specific DQOs, as well as the decisions that will be made based on the quality of the data. MQOs define whether the data are usable and meet project needs. Like DQOs, MQOs can be quantitative or qualitative statements.

MQOs specify what the level of performance should be, but not how it will be achieved by each laboratory. That is, there are acceptance limits that are required to meet project goals; however, the laboratory determines how it will measure precision and accuracy. Regardless of how the laboratory evaluates performance, the laboratory's acceptance criteria must meet the needs of each project. This QA Plan provides general requirements, but individual SAPs and FSPs will provide project- or site-specific requirements if different acceptance criteria are required for a specific project or site.

Regulatory Action Levels

Services provided by the NBP are intended to help applicants satisfy environmental laws and regulations as established by the State of Nevada. These services are intended to help to reduce

obstacles for property transfer, redevelopment, or reuse that can result from these regulations. For the purposes of the NBP, the only regulations determined to be relevant in establishing site action levels come from State law sources; the NBP does not accept projects or work on sites of such significant magnitude that they may come under federal CERCLA authorities, either through placement on the NPL or through a federal enforcement action.

Objectives of specific projects will be determined through initial scoping sessions held with the participation of all involved stakeholders and following EPA's DQO process (EPA 2006a). There are two firm areas in State law that will govern much of the project objective formulation. These two areas are: (1) the release reporting regulations, which govern the initiation of a site cleanup project, and (2) the establishment of action levels specific to site media. These two topics are discussed below.

NDEP Release Reporting Regulations

The State Environmental Commission has adopted regulations that govern the reporting of releases of pollutants, contaminants, petroleum products, and hazardous substances. These regulations are contained in NAC 445C.200 to 445C.390.

The enabling authority for these regulations is contained in several statutes adopted by the Nevada Legislature. The Nevada Water Pollution Control Law, NRS 445A.300 to 445A.730, required the Commission to adopt regulations governing the amount of waste that may be discharged into the waters of the State (NRS 445A.565) and requiring owners and operators of any source of discharge to waters of the State (including groundwater and surface water) to notify the NDEP (NRS 445A.940). State law governing the disposal of hazardous waste has designated the NDEP as the state agency responsible for overseeing (NRS 459.470) and has required the Commission to adopt regulations for hazardous waste management (NRS 459.485) that must be based on studies, guidelines, and regulations of the Federal Government (NRS 459.490).

These enabling authorities allowed the Commission to adopt reporting requirements that would be protective of state water resources and would also be consistent with federal hazardous waste requirements. The model for the State release reporting regulations comes from two federal sources: (1) reportable quantities of hazardous substance as contained in CERCLA, and (2) reportable quantities of petroleum product described in RCRA Subchapter IX. The Commission also added state-specific requirements for those substances and situations not covered by these two federal sources.

For hazardous substances, the State of Nevada has adopted by reference the reportable quantities established in 40 Code of Federal Regulations (CFR) Part 302. NAC 459.996 requires owners or operators of facilities where a release above these quantities has occurred, to notify the NDEP with details of the event within one working day of the release. This regulation has been interpreted to include both current releases and the discovery of historical contamination. In the event of historical contamination, where the initial volume of release cannot usually be determined, any discovery of contaminated soil, groundwater, or surface water is generally a reportable event.

For petroleum products, the State of Nevada has adopted reportable quantities of 25 gallons or 3 cubic yards of contaminated soil; these quantities were established by the Federal government as the reportable quantity of an underground storage tank (UST) overfill in 40 CFR 280.53. The reportable volume has been used by the NDEP to establish a reasonable quantity for all petroleum releases that must be reported regardless of source or circumstance. In addition to the reportable quantity for petroleum releases to soil or other land surfaces, any release to or discovery on or in groundwater or surface water is a reportable event (NAC 459.996).

For those State-defined pollutants, contaminants, and hazardous wastes that are neither listed hazardous substances according to 40 CFR Part 302 nor classified as petroleum products, any release to the environment would constitute a reportable event. A "pollutant" as defined in NRS 445A.400 includes:

> *Dredged soil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.*

A "contaminant" as defined in NRS 445A.325 includes any physical, chemical, biological, or radiological substance or matter that is added to water. A "hazardous waste" as defined in NRS 459.430 means any waste that poses a threat to human health, public safety, or the environment if not properly stored, transported, disposed, or otherwise managed. These three definitions give the NDEP a broad range of authority to require release notification for any material which is not specifically listed as a hazardous substance in 40 CFR Part 302.4.

The spill reporting regulations and associated reportable quantities have been developed to ensure that a release or the discovery of historical contamination that has the potential to negatively affect human health or the environment are immediately brought to the attention of the NDEP. Release notification is the trigger point for the Bureau of Corrective Actions to initiate its assessment and remediation authorities.

Establishment of Media-Specific Action Levels

The NDEP Bureau of Corrective Action has authority to require owners and operators to conduct corrective actions at the site of a release. A "corrective action" has been defined in NAC 459.9924 as:

> *A permanent remedy that an owner or operator is required to take after a release of a hazardous substance, hazardous waste or a regulated substance to prevent the substance or waste from posing a threat or potential threat to public health or the environment.*

Therefore, a corrective action must be both permanent and protective of human health and the environment. The Bureau has the authority to require corrective action and to set action levels for both soil and groundwater, as discussed in the following subsections. Surface water is also discussed, but only briefly, because most Brownfields assessment and cleanup projects do not address surface water issues. A detailed site-specific SAP will be required for sites with surface water contamination.

Action Levels for Soils

Action levels for soils are established in NAC 445A.2272. Except for petroleum products, which have an established action level of 100 mg/kg in soil, the Bureau has no specified numeric action level for each hazardous substance, pollutant, or contaminant. Instead, a site-specific action level can be selected using one of three methods, depending on the constituent and exposure pathway. A site-specific action level for a hazardous substances, hazardous waste, or regulated substance can be established using one of the following methods:

1. The background concentrations of metals or other naturally occurring chemicals;

2. The concentration for that substance or waste listed in the Toxicity Characteristics Leaching Rule, 40 CFR Part 261.24, if the potential for human exposure or damage to the environment from contaminated surface water or groundwater is the primary pathway of concern; or

3. An appropriate concentration that is based on the protection of public health and safety and the environment, as determined using the Integrated Risk Information System (IRIS) adopted by the EPA. Regional screening levels (RSLs) published by EPA provide screening concentrations based on the data in IRIS. IRIS data are used when inhalation, ingestion, or dermal exposure is the primary pathway of concern or if an applicable concentration is not listed in the Toxicity Characteristics Leaching Rule.

These methods rely on established Federal guidelines and studies for the development of site-specific action levels. The Bureau must select the most restrictive action level if more than one of these methods is applicable to the hazardous substance or waste, but in no instance shall the Bureau select an action level that is less than the established background concentration for that chemical. The background concentration of a chemical is typically established based on a statistically-based, site-specific analysis with which the Bureau concurs.

Generally, an owner or operator responsible for corrective action at the site of a hazardous substance release will allow the Bureau to establish an action level for that hazardous substance using values generated by the EPA Region 9 for its published RSLs, formerly known as preliminary remediation goals (PRGs), available on-line at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. The Bureau may use the RSL values as a default action level for a hazardous substance because these values were computed in a manner consistent with the third method listed above for selecting an action level under state regulations.

Rather than using a default RSL (which relies on several conservative exposure assumptions) as an action level for a particular hazardous substance, an owner or operator may collect site-specific data for use in IRIS. By providing site-specific data, the owner or operator can eliminate some of the conservative assumptions used in the development of the RSLs and can develop an action level that better reflects site conditions, exposure pathways and risk.

Site-specific data can also be collected to support an action level for petroleum products or hazardous substances developed through an ASTM Method E1739-95(2015) Risk-Based Corrective Action (RBCA) assessment (NAC 445A.22705). Under State regulations, an owner or operator can use the RBCA guidelines to develop a site-specific action level for soils only; this approach is not available for groundwater contamination.

Regardless of action levels, the Bureau has the authority to require corrective action in any instance where a release to soil is determined to have an actual or imminent impact on groundwater or is hazardous to public health and safety (NAC 445A.890). This gives the Bureau authority to deal with issues that would otherwise not require action, but where sensitive populations or receptors could be threatened and immediate action would be prudent. These special circumstances can be determined on a site-specific basis through the initial scoping sessions and development of project DQOs.

Action Levels for Groundwater

Except in specific situations, the Bureau will require corrective action if the release of a hazardous substance, hazardous waste, or regulated substance contaminates groundwater in excess of the State-established action levels (NAC 445A.22725). An owner or operator may submit a request to the Bureau to waive the requirements for corrective actions in the following instances:

1) The groundwater contaminated by the release is not a source of drinking water and is not likely to be a source of drinking water because it is economically or technologically impractical to recover the water for drinking, either because of the depth, quality, or location of the water;

2) The concentration of total dissolved solids (TDS) in the groundwater is greater than 10,000 milligrams per liter (mg/L) and the groundwater is not reasonably expected to be used as a source of drinking water; or

3) A study demonstrates that, based on a review of available technology and the prohibitive cost of the corrective action, it is not technically feasible to achieve the required remediation standard.

In practice, these exceptions are rarely granted by the Bureau, but they do provide some flexibility for the Bureau to make decisions that are informed by risk and cost factors.

Action levels for groundwater (NAC 445A.22735) are set through similar methods as those created for soil contamination. This includes a specific action level for petroleum products (1/2 inch of free-floating product on the surface of groundwater) and prescribed calculations for hazardous substances consistent with Federal studies and guidelines. The most common method for the establishment of a state action level for a hazardous substance is the use of the maximum contaminant level (MCL) established pursuant to the SDWA, 42 U.S.C. § 300f et seq. and 40 CFR Part 141. If no MCL has been established for a particular hazardous substance, hazardous waste, or regulated substance, the action level can be set as an appropriate concentration based on the protection of public health and safety and the environment as determined using IRIS. If background concentrations of inorganic chemicals are greater than the MCLs or another established action levels for those chemicals, then the background concentration may be used as the appropriate action level. The method used to determine the background concentration of any chemical should be based on established principles and discussed in advance with the NDEP. The NDEP may accept or revise the proposed background value.

The Bureau is also able to use these regulations to develop interim-action guidelines for contaminants for which there is no established MCL. The establishment of an interim-action level has been pursued for common fuel oxygenates, specifically methyl *tert*-butyl ether (MTBE). Because of the increasingly common presence of MTBE at sites, and because no MCL has been established for MTBE, the NDEP undertook a process to develop a "default" interim-action level for MTBE that could be used at any site in the State without the need to perform site-specific calculations. The only consideration to be made for each site is the proximity to "sensitive receptors." An action level of 20 micrograms per liter (µg/L) has been established for sites within 1,000 feet of a sensitive receptor (including drinking water wells); all other sites may use an action level of 200 µg/L. These numbers were based on the lower limit of the lifetime health advisory for consumption of water by an adult from the EPA Office of Water.

State regulations specifically list factors that the Bureau should consider in establishing groundwater action levels; these factors include the following:

1. *The presence of more than one hazardous substance, hazardous waste, or regulated substance in the groundwater;*

2. *Any potential threat the contamination may pose to sensitive areas of the environment; and*

3. *Any other threat or potential threat to groundwater that is specifically related to the site.*

These factors allow the Bureau to establish action levels that will be protective of human health and the environment when dealing with multiple contaminants or in situations where special environmental conditions dictate that a more restrictive action level is warranted.

Action Levels for Surface Water

The Bureau of Corrective Actions, under its cleanup authorities, has the ability to require an owner or operator to take corrective action if the release of a hazardous substance, hazardous waste, or regulated substance contaminates surface water (NAC 445A.2275). However, in most instances, contaminants in surface waters of the State are handled entirely by the Bureau of Water Pollution Control (BWPC) of the NDEP, where the state-delegated CWA programs reside.

The BWPC operates under delegated CWA authorities and under statutes and regulations passed by the Nevada legislature. The primary regulatory functions of the BWPC that are relevant to response actions as discussed in a Baseline Assessment report include issuing (1) National Pollutant Discharge Elimination System (NPDES) permits, (2) groundwater protection orders, and (3) Underground Injection Control permits. The BWPC also has compliance and enforcement authorities for storm-water systems and surface-water bodies. Enforcement and permit authorities rely on surface-water standards developed and adopted by the NDEP. Surface-water discharges and cleanups performed at sites undertaken by the NBP will be conducted with full participation of the BWPC for the selection of appropriate standards, permitting of discharges, and selection of remedial actions. These standards and appropriate sampling methods for surface water must be detailed in a site-specific SAP.

Summary of Regulatory Action Levels

Site-specific planning using EPA's DQO process prior to initiation of data collection is typically used to determine the chemical-specific action levels that will apply to the site response. As part of the DQO process, the regulatory methods for establishing action levels should be reviewed to determine which approach will best suit the goals of the property owner or program participant. Project planning discussions between NDEP, EPA, and all parties will help assure an appropriate sampling design that can guide data collection for each site. The NBP Contractor will be responsible for documenting all steps of the DQO process in their site-specific SAP or FSP.

Measurement Quality Objectives and Data Quality Indicators

MQOs are qualitative and quantitative statements developed by data users to specify the quality of data needed to support specific decisions for a specific project. MQOs are project- or method-specific quality acceptance criteria established to support project-specific DQOs, as well as the decisions that will be made based on the quality of the data. MQOs define whether the data are usable and meet project needs and are defined in terms of acceptance criteria for DQIs. The MQOs provide project-specific limits for the DQIs of precision, accuracy, representativeness, completeness, and comparability parameters. Limits for precision and accuracy are defined on a method- and analyte-specific basis. The MQOs also describe specific targets for sample holding times, sample preservation, detection limits, equipment calibration frequencies, and other QC elements.

To ensure that data of adequate quality are generated, the NBP has established QC acceptance criteria for DQIs for specific analytes, commonly the focus of NBP project investigations. These analyte-specific MQOs are presented in Appendix D Tables D-1 through D-7. These established criteria serve as the foundation for the review of laboratory generated data by independent data validation services and by the NBP Quality Coordinator. For projects where constituents or media are to be sampled and MQOs have not been established in the Appendix D tables, appropriate MQOs will be determined in consultation with the NBP Quality Coordinator prior to the collection of data. Data that meet these quality criteria can be used to justify decisions on the basis of regulatory action levels. The MQOs and DQIs specifically adopted in this QA Plan are presented in Appendix D. The tables in Appendix D include only those analyses that are anticipated during a routine Brownfields assessment or cleanup. These analyses include the following:

- Total Dissolved Solids (TDS) by EPA Method 160.1
- Total Suspended Solids (TSS) by EPA Method 160.2
- Metals by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP) by EPA Method 200.7
- Carbonate, Bicarbonate, and Total Alkalinity by Standard Method 2320
- Total Petroleum Hydrocarbons (TPH) by SW-846 Method 8015B

- Volatile Organic Compounds (VOCs) by SW-846 Method 8260
- Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270
- Polynuclear Aromatic Hydrocarbons (PAHs) by SW-846 Method 8310
- Toxicity Characteristic Leaching Procedure (TCLP) for VOCs, SVOCs, and Metals by SW-846 Method 1311

The analyses listed above cover most of sites evaluated under the NBP and serve as the basis for the development and adoption of approved SOPs and Analytical Methods in Group B of this QA Plan. Any assessment or cleanup project involving only these analyses can be undertaken through the drafting of a FSP during the project planning phase of work.

A site-specific SAP will be required to be drafted in cases of unusual media, analytes, or analyses, where there are no adopted MQOs included in this QA Plan. Where available, the NBP Contractor may use and include in their SAP any MQO adopted by EPA Region 9. Otherwise, acceptance criteria for DQIs will need to be developed as part of the project planning phase and appropriately documented. Analyses for constituents or media not included in the DQIs, established in Appendix D Tables D-1 through D-7, a project, or analyte-specific DQI will be established by the NBP.

It is the responsibility of the NBP Quality Coordinator to ensure that the latest versions of the adopted MQOs are included in this QA Plan and are referenced by the NBP Contractor in their plans. This function will be completed in conjunction with the YSA. Changes made to the MQOs will require revisions to the QA Plan and the revised information will be provided to all relevant parties, as indicated by the document distribution list.

As part of the development of a FSP or SAP, the NBP Contractor will be required to present the project MQOs to those analytical laboratories intended to analyze the collected field samples. Those laboratories will be required to meet these criteria and supply a data package sufficient to document those QC elements. If the laboratory is unable to satisfy these requirements, alternate laboratory services must be sought out and selected by the NBP Contractor. Under certain conditions, deviations by the laboratory to the MQOs on a project-specific basis can be considered, but those deviations must be included in a SAP for approval by the NBP Quality Coordinator prior to project initiation.

For all projects involving laboratory analytical services, the laboratory will be required to submit a data package of sufficient documentation to allow for review by independent validation services. This documentation will be equivalent to a Level 3 Data Package for all samples. All independent data validation services will be provided with the MQOs and DQIs for all analytes for consideration of data verification and with guidelines to establish appropriate data qualifiers.

SPECIAL TRAINING/CERTIFICATION

Statewide training policy directs that each Department of the Executive Branch of Nevada's government must develop training procedures that will provide orientation and on-the-job training as well as the continued training and development of each employee within the agency. The Department of Conservation and Natural Resources has published its Formal Training Policy in a memo dated July 14, 1992. This memo has been made available to all employees.

It is the responsibility of employees to improve their own professional competence by freely requesting training opportunities. Employees must identify training requests by showing the relationship of the training to their job and by showing the benefits to the agency. Additionally, employees must take training required by the agency. Employees must show satisfactory completion of all approved training.

Brownfields and QA-Specific Training

In addition to the general training procedures established by the State of Nevada, the NBP will set forth program-specific training requirements targeted specifically to developing and maintaining an appropriate skill level in the Quality Coordinator position.

The NBP Quality Coordinator should receive training equivalent to that required for EPA QA Managers, to include participation in the week-long introductory course on quality assurance offered by the EPA, when available. Where no reasonable date for this training is available, the NBP Quality Coordinator will be required to work through the training course and materials on-line prior to initiation of any quality assurance work. The on-line training should only serve as a temporary substitute to the classroom training, and every effort should be made to identify and attend appropriate EPA-sponsored coursework.

In addition to the initial week-long (or equivalent) training, the Quality Coordinator should be responsible for attendance at a minimum of 2 days of QA-specific training every year after completion of initial training. These additional training opportunities can be identified by the NBP Quality Coordinator, the NBP Supervisor, the EPA Nevada Project Officer, or an EPA QA Manager. The training requirement can be satisfied either by coursework or by participation in QA conferences. The satisfaction of training requirements must be documented in the YSA.

The Quality Coordinator is also responsible for identifying any mandatory training to be attended by the NBP Contractor. Although the NBP Contractor is responsible for maintaining an appropriate level of professional experience through its own initiative, certain training opportunities may be found necessary by the NBP Quality Coordinator for the proper operation of the NBP. These may include quality assurance training sessions, covering the relevant aspects of the NBP QA Plan, to be hosted by the NDEP. Training for using the QA Plan may be held whenever a new consultant firm or staff becomes involved with the NBP. Reimbursement through the Brownfields contract for consultant training will only be considered for mandated training sessions and at the discretion of the NBP Quality Coordinator; the NBP Contractor will be responsible financially for all other professional development necessary for its operation in the NBP.

Employee Evaluations

Employee evaluations are required to be prepared by supervisory staff once per year and are designed to establish, among other things, a constructive dialog between the employee and their supervisor regarding work performance. To ensure objectivity and accuracy of employee evaluations, the NDEP policy requires all substandard evaluations and all above standard and outstanding evaluations be prepared by the employee's supervisor and reviewed by the next line supervisor for concurrence. This review shall be conducted on draft evaluations and prior to release or discussions of the final evaluation with the employee. Supervisors are encouraged, but not required, to discuss standard evaluations with upper-level supervisors as well.

Evaluations are prepared based on previously agreed upon work performance standards. Work performance standards are written statements of principal assignments, responsibilities, and the results expected by both the supervisor and employee when the employee's job is satisfactorily performed under existing working conditions. It is required that each employee in classified State service be provided with a current set of work performance standards for their position.

NBP Contractor Certification

The NDEP operates a program for the certification of Environmental Managers. Any person performing environmental services for a fee must meet the certification qualifications and be actively enrolled as a CEM. The Certification Program is undertaken by the Bureau of Corrective Actions, separately from the NBP; however, all work submitted by the NBP Contractor must satisfy the certification requirements as contained in regulations NAC 459.970 to 459.9729.

Certification as a CEM requires three components: qualifications, examination, and application. To qualify for application into the program, an individual must meet minimum qualifications as established in one of three ways:

1. A bachelor's or advanced degree from an accredited college or university in an area relating to the environment including, but not limited to, environmental science, engineering, geology, hydrology, hydrogeology, biology, toxicology, environmental health, physics, industrial hygiene, or chemistry and at least 3 years of relevant environmental experience within the 5 years immediately preceding the date of the application;

2. A relevant professional registration or certification recognized by the Division and at least 3 years of relevant environmental experience within the 5 years immediately preceding the date of the application; or

3. An equivalent combination of appropriate education or experience, or both, as determined by the Division.

By meeting these qualifications, an individual may then seek certification by passing an examination, as administered by the NDEP, to demonstrate a sufficient knowledge of current environmental practices. A CEM must also adhere to NAC 459.9729, Standards of practice, (1)(a-i). NAC 459.9729(2) allows that "*Certification may be suspended, revoked or denied for*

renewal if the Division determines that the certificate holder has not performed in accordance with these standards."

All environmental work, relating to services for which certification is required, must include a jurat or affidavit by the person responsible for the work as specified in regulations. The jurat is intended to clearly delineate who is in responsible control of the work conducted by the consultant, the level of care utilized, the scope of services performed and the individual's certification number and expiration date. The certification laws and regulations allow for non-certified individuals to conduct activities at a site without the presence of someone certified; however, the overall work activities must be performed within the responsible control and oversight of a certified individual. The format of the certification jurat is as follows:

> *"I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state and local statutes, regulations and ordinances."*

The jurat must be accompanied by a description of the services provided, the signature of the holder of the certificate with the date on which the document was signed, the number of the certificate, and the date of expiration of the certificate.

All documents prepared and submitted by the statewide NBP contractor must be overseen by a CEM. All documents must include the appropriate jurat in order to be accepted as a deliverable under the contract. The NBP Contractor will be responsible for ensuring the availability of a CEM for work services throughout the life of the contract.

DOCUMENTS AND RECORDS

The NDEP has adopted by reference the General Records Retention Schedule, dated September 8, 2021, as prepared by the Nevada State Records Committee for the distribution, retention, access, preservation, and disposition of official state records. Official state records are defined as all papers, unpublished books, maps, photographs, machine readable materials or other documentary materials regardless of physical form or characteristics, made or received by an agency of the state government under state law or in connection with the transaction of public business and preserved, or appropriate for preservation, by that agency or its legitimate successor as evidence of the organization, function, policies, decisions, procedures, operations, or other activities of the state government or because of the informational value of data in them.

The Records Management Section of the Nevada State Library and Archives is responsible for promulgating the General Records Retention Schedule, which is binding for the Executive Branch of Nevada State Government. An approved records retention schedule identifies each record series in the legal custody of an agency and refers to the Records Disposition Authorization, which is approved by the State Records Committee. All official records stored off-site will be stored in facilities that meet the provisions of the *State Administrative Manual: Revised September 14, 2021*, to the extent that qualifying space is available, affordable, and conveniently located to Division offices. All official state records, either paper or electronic

versions, will be disposed of in accordance with the General Records Retention Schedule. Official state records will not be destroyed without an approved Records Retention Schedule on file with the State Library and Archives.

Records for the Nevada Brownfields Program

The NDEP has identified two records series which, due to specific federal regulations, require retention schedules beyond those contained in the State's General Records Retention Schedule. One of these schedules governs the retention of documents relating to programs operating under a CERCLA (or "Superfund") cooperative agreement with the EPA. The NBP operates under a CERCLA cooperative agreement, so all documents will follow the retention schedule developed in accordance with the CERCLA federal regulations 40 CFR 35.6700 and 40 CFR 35.6705.

The Superfund records series is defined in an Inventory Worksheet Form reviewed and approved by the States Records Manager. It identifies financial, program and specific site activities records, correspondence, supporting documents, statistical records, and other documentation required relevant to Superfund (CERCLA-funded) cooperative agreements. These documents are to be maintained as public records in accordance with citation NRS 239.010: all public books and public records of a governmental entity, the contents of which are not otherwise declared by law to be confidential, must be open at all times during office hours to inspection by any person, and may be fully copied or an abstract or memorandum may be prepared from those public books and public records; a person may request a copy of a public record in any medium in which the public record is readily available; an officer, employee or agent of a governmental entity who has custody of a public record shall not refuse to provide a copy of that public record in a readily available medium because he has already prepared or would prefer to provide the copy in a different medium.

The Records Disposition Authorization (RDA) form for Superfund records was submitted to and approved by the State Records Committee. The RDA governs how a document will be retained and disposed of after the required retention period. Superfund documents have been assigned an RDA code of 95-038 and are required to be retained for a minimum period of ten calendar years following submission of the final Financial Status Report unless otherwise directed by the EPA award official. Written approval must be obtained from the EPA award official before destroying any records. If any litigation, claim, negotiation, audit, cost recovery, or other action involving the records has started before the expiration of the ten-year period, the records must be retained until completion of the action and the resolution of all the issues which arise from it.

The NDEP has entered into an Interlocal Agreement with the Department of Administration, Internal Audit and Purchasing Divisions for the retention of Superfund documents. The terms of the agreement state that NDEP will clearly mark each relevant document as "SUPERFUND OR BROWNFIELDS SITE, must be filed separately." The Department of Administration, Internal Audit and Purchasing Division will file separately all original Superfund or Brownfields documents, and after the normal retention period expires, the documents will be forwarded to NDEP. The NDEP will be responsible for maintaining the originals for the remainder of the ten-year retention period.

Responsibilities

The Administrator of the NDEP must make, receive, and preserve records containing adequate and proper documentation of the organization, functions, policies, decisions, procedures, and essential transactions of the agency. Prior to the creation of electronic records, the Administrator must consult with the Department of Information Technology on the implementation of its strategic plan for information resources and information technology, the purchase and implementation of hardware and software and the establishment of security and training programs. He/she must also work with the State Records Management program to ensure the proper use, maintenance, retention, preservation, and disposal of electronic records.

The Administrator must establish and be responsible and accountable for the implementation of written safeguards against the unlawful removal, misuse, damage, alteration, and destruction or loss of records. He/she must inform the Attorney General of any actual, impending, or threatened unlawful act regarding records in the legal custody of the agency. The Administrator shall take all measures possible to protect the records in the agency's legal custody from a natural or other disaster. He/she shall be responsible and held accountable to procure the proper supplies, equipment, and personnel to protect the records in the agency's custody. If any damage comes to the records, this must be reported to the Assistant Administrator for Archives and Records.

In compliance with the *State Administrative Manual: Revised September 14, 2021*, the Division has designated Administration's Management Assistant IV as the Records Management Officer. All questions, request for information, requests to make changes to retention schedules, or requests for extraordinary retention schedules shall be coordinated through this position.

It is the responsibility of each NDEP employee to ensure that either a paper or electronic copy of all public records generated and/or signed by them are retained in the Bureau's files in accordance with procedures. It is also the responsibility of each employee to back-up any electronic data files generated by them including memos, letters, and directives created and sent by email.

It is the responsibility of the Division's Bureau of Administrative Services to back-up the Cash Receipts database on a no less than daily basis (this information is also backed-up by transferring the information onto the file server located at 901 South Stewart Street), backup the remainder of the system on a weekly basis (starts at Midnight every Friday), and transfer the monthly tape-backup (contains all electronic files saved to the Local Area Network) to the main Office of Fiscal and Personnel Management safe (2-hour fire protection) no later than five days after the end of the month.

The staff providing direct NDEP oversight on a project is responsible for assuring that field and analytical records are in the project file. A unique, seven-digit alpha-numeric identification code will be assigned for each investigation or project, known as the Facility ID. Custody tags, custody records, field notes, and analytical records are labeled with this code. Each record is required to have the project number, date, and an agency person's initials or signature.

Project Files for NBP Sites

Although the NBP undertakes a variety of unique projects, most of the documents in a project file and the contents of the file itself are standard. The NBP Coordinator will be responsible for the maintenance of the project file, from the opening of an assessment or cleanup case, to its eventual closing. The project file will be referenced by the seven-digit Facility ID number, assigned at the time of acceptance of the site into the NBP. When closure has been granted by the NBP Coordinator on a Brownfields cleanup, the separate files maintained by the NBP Coordinator and the NBP Quality Coordinator will be merged for archival filing. The merging of the files will be the responsibility of the NBP Coordinator.

The project file will consist of all site documents specifically listed in the Program/Task Organization section of this QA Plan. Additionally, the NBP Quality Coordinator will collect and include in the project file all other relevant project documentation in the file. These additional documents may include any official correspondence that does not correspond to any of those previously listed documents. The project file will also include all information not related to data generation, including documentation of all public involvement or community notification efforts.

Project-specific accounting information, excluding site-specific SOWs and SOW approval letters, will not be maintained in the project file. Invoices, invoice tracking, and payment information will be maintained in a separate contract file associated with all contract-specific functions. Certain documents, including the SOW, SOW approval letter, and project closeout letter will be maintained as an original in the project file with a carbon copy to the contract file for completeness of each separate file. The contract file will be subject to the same records retention schedule as the project file. It is the responsibility of the Superfund Branch supervisor to ensure that this file is properly created and retained.

Electronic information relevant to the project will be maintained on NDEP's Local Area Network. An electronic folder will be created with reference to the assigned seven-digit Facility ID number and will be maintained in the Bureau of Corrective Action's facility directory. However, hard-copy versions of all electronic documents will be required to be printed out and included in the project file for archival purposes. It is the responsibility of the NDEP's Bureau of Administrative Services to provide secure access to electronic information and to maintain appropriate back-up procedures for recovery of any lost information. The functioning of the Bureau of Administrative Services is laid out in policies required to be reviewed by all NDEP employees. These policies are also available to any other party who may wish to familiarize themselves with the NDEP informational security and backup capabilities.

GROUP B: DATA GENERATION AND ACQUISITION

SAMPLING DESIGN/EXPERIMENTAL DESIGN

Brownfields site assessments are conducted to facilitate the reuse of properties by determining if site media are contaminated. If the initial phase of the assessment finds evidence of contamination, then follow-on phases are conducted to determine characteristics of the contamination. Characterization includes evaluating the threat posed by the contamination, determining potential solutions for cleanup of the contamination, and estimating the cost of solutions necessary to prepare the site for redevelopment. This QA Plan documents the planning, implementation, and assessment procedures for the NBP and describes how specific QA and QC activities are applied throughout the course of the site investigations.

A Brownfields site assessment routinely involves one or more of the following activities: a background investigation on the history of site use, a field investigation that includes sample collection and analysis, an evaluation of cleanup options and costs, and an assessment of the usability of resulting data. Typically, the first step is to investigate the site history to identify past uses of the property, including types and amounts of chemicals that may have been used onsite and any disposal activities that may have contributed to contamination.

This QA Plan includes requirements for measurements collected for a typical Brownfields project (Table B1) and describes what types of activities or projects specifically require a SAP and what types require a FSP. The specific design and extent of a Brownfields site assessment will be dictated largely by the conceptual site model (CSM), the availability of resources, and the required level of data quality and QC. Project-specific DQOs and sampling design should be documented in the site-specific planning documents that are developed for each Brownfields site.

The following sections describe the sampling and analysis requirements under the NBP. Site-specific information required in the FSP or SAP for each Brownfields site includes the number and location of monitoring samples, types of samples to be collected, measurement parameters, sampling frequencies, design of sampling networks for monitoring, and the time period over which sampling activities are to occur. All SAPs and FSPs prepared for the NBP must be reviewed and approved by the Program and Quality Coordinators.

Sampling Design

A sampling design specifies the number and location of samples to be collected at a site. Sampling design strategies are guided by study objectives and should factor in the conditions unique to the site being considered for redevelopment, including data gaps in the CSM, exposure potential, projected site reuse, and available resources. As noted above, possible sampling design strategies are identified during the DQO process, and the details of the sampling design strategy are described in the site-specific SAP or FSP.

Typical designs for the collection of samples at Brownfields sites include biased sampling, statistically based sampling, one-time events, and ongoing (multi-phase) events. Biased sampling specifies sampling locations based on the judgment of the field team leader and sampling plan designer. Statistically based sampling designs use random or systematic sampling

locations designed to avoid bias. A single sampling event may not provide an adequate characterization of the contamination onsite, especially when the CSM contains significant data gaps. In these situations, multi-phase sampling may be helpful. The need for this sort of investigation should be identified during the DQO process.

Additional information on the development of sampling strategies is available in EPA's Quality Assurance Guidance for Conducting Brownfields Site Assessments (EPA 1998), EPA's Guidance on Choosing a Sampling Design for Environmental Data Collection (EPA 2002), EPA's Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA 2006a), and EPA's Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (November 2001). Visual sample plan (VSP) can be used to assist with statistically based sampling designs. The VSP software is free and available at http://vsp.pnnl.gov; version 7.12 of VSP was available as of February 2020. VSP is a software tool for selecting the number and location of environmental samples so that statistical tests performed on the data have the required confidence and power for decision making.

Sample Types and Matrices

Sample types typically include surface soil, subsurface soil, groundwater, and surface water. Some sites require sampling of sediment, pore water, sludge, air (soil gas or vapors), and other non-routine matrices such as building materials. Samples may be collected as discrete (grab) or composite samples. Discrete samples are useful for identifying and quantifying chemicals in areas of a site where contamination is suspected. The number of discrete samples should be determined during the DQO process. Composite samples are useful for identifying the average concentrations of contaminants across a site. Composite samples are composed of more than one discrete sample collected from different locations; the samples are mixed into a single homogeneous sample and submitted to the analytical laboratory as a single sample. Multi-increment (MI) samples represent a specific type of composite. The number of composite samples and the number of individual samples within a composite sample should be based on the goals established during the DQO process.

Background samples should be collected from the same media as site samples, from areas on or near the site that are unlikely to be contaminated by site-related chemicals. Background samples are analyzed for the same parameters as the site samples to establish background concentrations of chemicals. Typically, background data are collected for naturally occurring inorganic chemicals, such as metals, whereas the background concentrations of manmade organic chemicals are assumed to be zero. It is the responsibility of the applicant to demonstrate if there is an "anthropogenic background" for organic chemicals that is unrelated to site activities.

Sampling Locations and Frequencies

The sampling locations and the schedule for sampling are also specified during the DQO planning process. The duration over which samples are collected and the frequency of sampling or whether the work will be done in phases is also determined during the DQO process.

Parameters of Interest

The measurements to be collected at a site depend on the characteristics and history of the site. This QA Plan provides QA/QC information for parameters and media typically analyzed for Brownfields sites. Unusual parameters and matrices will necessitate preparation of a site-specific SAP. This topic is discussed in more detail in the Sampling Methods Section of this QA Plan.

Sampling Event Planning

Advanced planning for field sampling events is required to ensure that the necessary arrangements are in place and that equipment is ready. The following will be considered when planning the sampling event:

1) Sample Handling and Custody Procedures — Field personnel will make arrangements with the appropriate laboratory for proper sample containers and custody procedures (described further in the Sample Handling and Custody Section).

2) Equipment — Field personnel will ensure that all sampling equipment has been properly assembled, decontaminated, calibrated, and is functioning properly prior to use. Equipment will be used according to manufacturer's instructions and should generally be decontaminated according to the EPA SOP-Sampling Equipment Decontamination (see Appendix E of this QA Plan).

3) Field Forms — Field personnel will need to ensure that all necessary field forms, such field log books, soil and groundwater sampling forms, and boring logs are assembled prior to the sampling event. Such field forms will be developed individually for each site based on the site's specific needs.

4) Health and Safety — Field personnel will ensure that a site-specific health and safety procedures are considered and that personal protective equipment (PPE) is gathered.

5) Investigation-Derived Waste — Field personnel will plan for the generation of investigation-derived waste (IDW) and should assemble the appropriate IDW containers prior to the sampling event.

6) Field Audits — Field personnel will plan to conduct periodic field system audits for ongoing sampling events.

7) Paperwork and Permits — Field personnel will also ensure prior to the sampling event that other applicable paperwork is in order, such as permits and access agreements.

SAMPLING METHODS

Site-specific sampling methods as well as the numbers and types of samples are specified during the DQO process and documented in the site-specific SAP or FSP. Details of sample collection methods will depend upon site conditions, equipment limitations, chemicals of concern, sample matrices and cost, and will be described in a site-specific SAP or FSP. Collection methods

should generally follow an NDEP- or EPA-approved sampling protocol. The following sections present general information on sampling methods for various media, including surface water, groundwater, drinking water, soil, sediment, pore water, sludge, air, and non-routine matrices, such as building materials. Additional methods may be used with approval of the Program or Quality Coordinator. General guidelines for field sampling are included in the EPA SOP on General Field Sampling Guidelines. EPA SOPs for field sampling methods are available for download at https://www.epa.gov/quality/field-sampling-procedures-region-9.

Soil Samples

Soil samples collected at Brownfields sites may include surface and subsurface samples. Sample types may be discrete or composite samples. There are a variety of acceptable methods for collection of soil samples, and selection of an appropriate method will depend on site conditions and the sampling design. Methods commonly used to collect soil samples include drilling soil borings, digging test pits, sampling via hand auger, and digging with a shovel or trowel. Additional information on the collection of soil samples can be found in EPA's Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies (1992) and in the referenced EPA SOP for soil sampling (see Appendix E of this QA Plan).

Groundwater Samples

Samples of groundwater may be collected during Brownfields site assessments and cleanups. Collection of groundwater samples may be one-time, ongoing, and periodic or may continue as part of the post-development obligations. Groundwater samples can be collected from soil borings, temporary well points, monitoring wells, and existing wells (e.g., municipal or community supply wells, domestic water wells, irrigation wells, or industrial supply wells). Groundwater samples may also be collected from shallow, intermediate, deep, and perched aquifers.

Groundwater samples collected using soil borings allow for the collection of one-time discrete groundwater samples at a specific depth interval at a point in time. One-time groundwater samples are often used to help select locations for future monitoring wells. These one-time samples may be collected using a direct-push method, which is described in the SOP for direct-push groundwater sampling (see Appendix E of this QA Plan).

Groundwater samples may also be collected from permanently installed monitoring wells. All monitoring wells should be properly installed according to state regulations (see NAC 534.4351-4365) and developed according to an NDEP- or EPA-approved protocol. Nonstandard wells or problems encountered during well installation and sampling should be noted in the field logbook and in subsequent reports. Collection of groundwater samples from monitoring wells is described in the EPA SOPs for groundwater well sampling, monitoring well installation, and monitoring well development (see Appendix E of this QA Plan).

The following procedures should be employed when sampling residential water supplies or water-supply wells of any kind:

- Obtain permission to access property and obtain samples for analysis;

- Inspect the water system to locate the tap nearest to the wellhead. Samples should be collected prior to any treatment units (e.g., ultra-violet light, reverse osmosis, etc.) if possible; and

- Purge the water lines to flush the plumbing and holding tanks before collecting samples from drinking water, irrigation, or industrial wells, so that the sample collected is as representative as possible. Remove any faucet aerators and reduce water flow before collecting samples.

Surface Water Samples

Surface water sampling may be conducted during Brownfields site assessments and cleanups to evaluate whether contaminants have migrated to nearby surface water bodies. Physical evidence such as odors, organic films on water surfaces, and soil discoloration in the vicinity of surface water are indicators of possible contamination. Surface water samples include representative liquid samples collected from streams, brooks, rivers, lakes, ponds, lagoons, seeps, estuaries, drainage ways, sewers, channels, wetlands, surface water impoundments, and other surface water bodies. These samples can also be collected from the surface or at depth within the water body. Surface water samples should be collected in general accordance with the EPA SOP for surface water sampling (see Appendix E of this QA Plan).

Pore Water Samples

Pore water is water contained within the upper few centimeters of sediments just below the surface water / sediment interface. This interface is known as the hyporheic zone. Sampling of this zone can be done with equipment such as seepage meters and push-point pore water samplers or lysimeters. Discharge of groundwater to surface water through the hyporheic zone is unlikely to be homogeneous; therefore, determining locations for pore water sampling can involve additional investigative steps.

Sediment Samples

Sediment samples can be collected for analysis of biological, chemical, or physical parameters. There are many factors to consider when choosing sediment sampling equipment, including, but not limited to, site access, sample volume requirements, sediment texture, target depth for sediment collection, and flowing versus standing water. In general, piston samplers are best used for soft, fine-grained sediments where sediments at depth are required. Grab/dredge samplers are best for coarse, shallow sediments and where large volumes of sediment are required. Additional information on the collection of sediment samples is provided in EPA's SOP for sediment sampling (see Appendix E of this QA Plan).

Sludge Samples

Sampling of sludge could involve a number of different situations and will likely depend upon site conditions. Therefore, details of collecting sludge samples should be described in a site-specific SAP. Common settings where sludge is sampled include catch basins and drywells.

Air Samples

Air sampling is typically conducted at sites where vapor intrusion may be an exposure pathway for contaminants. Air sampling is more complex than soil or water sampling because of the reactivity of chemical compounds in the gas matrix and sample interaction with the sampling equipment and media. Air sampling equipment is selected based on a number of factors including site conditions, sampling objectives, chemicals of concern, analytical methods, and cost. Methods to sample air at active facilities include (but are not limited to) soil gas sampling or sampling with flux chambers. Typical sampling containers include tedlar bags, stainless steel Summa canisters, and glass sorbent traps used with sampling pumps. More information on air sampling and analysis can be found in EPA's SOP for general air sampling guidelines (see Appendix E of this QA Plan).

Building Materials Samples

Because sampling at Brownfields sites can often involve buildings slated for reuse, there is a potential for non-routine sampling of unusual sample matrices, such as building materials. These matrices include lead-based paint, asbestos-containing materials, and other types of building materials. Site-specific sample collection procedures will likely need to be developed for sampling such non-routine matrices. Sampling personnel should coordinate with the analytical laboratory on the anticipated sample collection and handling methods to ensure that the sample data will not be rejected. Additional information on the collection of non-routine sample matrices is in EPA's SOP for chip, wipe, and sweep sampling (see Appendix E of this QA Plan).

SAMPLE HANDLING AND CUSTODY

Custody procedures differ among laboratories. Custody procedures of the analyzing laboratory are identified prior to field activities. Field personnel are responsible for prearranging with the appropriate laboratory for proper sample containers, preservatives, holding times, and sampling request forms. Sample custody must be traceable from the time of sample collection until results are reported. Sample custody procedures provide a mechanism for documenting information related to sample collection and handling. A chain-of-custody form must be completed after sample collection and prior to sample shipment or release. The chain-of-custody form, sample labels, and field documentation must be crossed checked to verify sample identification, type of analyses, number of containers, sample volume, preservatives, and type of containers. Additional information on sample handing and custody procedures can be found in EPA SOPs for specific sample collection methods, Section 4 of EPA's Quality Assurance Guidance for Conducting Brownfields Site Assessments (EPA 1998) and in Section 3 of EPA's Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (2001). SOPs and forms for sample handling, custody (chain-of-custody forms), and transport are referenced in Appendix E of this QA Plan.

The following sample control activities must be conducted at the laboratory:

- Initial sample login and verification of samples received with the chain-of-custody form;

- Document any discrepancies noted during login on the chain of custody;
- Initiate internal laboratory custody procedure;
- Verify sample preservation (e.g., temperature);
- Notify the project coordinator if any problems or discrepancies are identified; and
- Proper samples storage, including daily refrigerator temperature monitoring and sample security.

ANALYTICAL METHODS

All analytical methods used for samples from Brownfields site assessments must comply with relevant requirements of applicable federal or state programs for which they were collected, such as the CWA, SDWA, RCRA, Clean Air Act, or use other EPA-approved alternate methods. The most recently approved methods under the CWA and SDWA were promulgated in 40 CFR Part 136 on July 21, 2003. Currently approved methods under RCRA SW-846 can be obtained from the EPA website at https://www.epa.gov/hw-sw846. Appendix F lists all the currently approved methods under RCRA SW-846. The list of approved analytical methods is subject to routine update, so contact the NBP Quality Coordinator for a list of currently approved methods.

Table B1 lists the classes of analytes that are typically of the greatest interest during Brownfields site assessments, as well as the NDEP's preferred analytical methods. This table provides a starting point for selecting analytical methods for Brownfields site assessments. Additional methods may be available and appropriate; consult with the Program or Quality Coordinators for approval of alternate methods. The site-specific SAP or FSP should identify analytical methods and equipment, decontamination procedures, waste disposal requirements, and performance requirements.

Detection and Quantitation Limits

The method detection limit (MDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The quantitation limit represents the lowest concentration of an analyte that can be accurately and reproducibly quantified in a sample matrix. Project-required quantitation limits (PRQLs) are contractually-specified maximum quantitation limits for specific analytical methods and sample matrices, such as soil or water, and are typically several times the MDL (to allow for matrix effects). PRQLs, which are established by the NDEP in the scope of work for subcontract laboratories, are set to establish minimum criteria for laboratory performance; actual laboratory quantitation limits may be substantially lower. Each laboratory performing analyses under this program must routinely conduct MDL studies to document that the MDLs are less than the PRQLs. If any analytes have MDLs that do not meet the PRQLs, the following steps must be taken:

1. Perform a new MDL study using concentrations sufficient to prove analyte quantitation at concentrations less than the PRQLs per the procedure for the Determination of the Method Detection Limit presented in Revision 1.1, 40 CFR 136, 1984.

2. No samples may be analyzed until the issue has been resolved. Results of MDL studies must be available for review during audits, data review, or as requested. Current results of MDL studies must be reported at the beginning of every project for review and inclusion in project files. An MDL is developed from seven aliquots of a standard containing all analytes of interest spiked at five times the expected MDL, which are taken through the analytical method sample processing steps. The data are then evaluated and used to calculate the MDL. If the calculated MDL is less than three times below the spiked concentration, another MDL study must be performed using a lower concentration

Laboratories generally establish quantitation limits (QLs) that are reported with the analytical results; these may be called reporting limits, detection limits, reporting detection limits, or other terms. These laboratory limits must be less than or equal to the PRQLs. The laboratories must have documentation to support quantitation at the required levels. Laboratories must report analytical results between the MDL and QL. These results must be reported as numerical valued and qualified as estimates. Reporting as "trace," "<QL," or "<PRQL" is not acceptable.

Laboratory Standards and Reagents

All stock standards and reagents used for extraction and standard solutions must be tracked through the laboratory. The preparation and use of all working standards must be recorded in bound laboratory notebooks that document standard tractability to EPA, A2LA, or National Institute for Standards and Technology (NIST) criteria. The record must have sufficient detail to allow determination of the identity, concentration, and viability of the standards including any dilutions performed to obtain the working standard. The date of preparation, analyte or mixture, concentration, name of preparer, lot or cylinder number, and expiration date, if applicable, must be recorded on each working standard.

QUALITY CONTROL

QC requirements are integral to the success of a QA program. QC covers the overall system of technical activities that measure the performance of a process against defined standards to verify that they meet predefined requirements. Because errors can occur in the field, laboratory, or office, it is necessary for QC to be part of each of these functions. This QA Plan describes and defines the general quality objectives of the NBP. Site-specific quality objectives are further defined in project-specific SAPs. This approach to quality system management ensures that quality activities are conducted throughout the project but allows for the flexibility to tailor quality-related activities to individual projects, depending on the complexity of the Brownfields site.

QA and QC parameters apply to the two primary types of data — definitive and nondefinitive data — regardless of whether the data collection activity is associated with field measurements or laboratory measurements. Nondefinitive data are frequently collected during the first stage of a multi-phase screening assessment, using rapid, less precise methods of analysis with less rigorous sample preparation. Nondefinitive data can provide analyte identification and quantification, although both may be relatively imprecise. Typically, 10 percent of nondefinitive samples or all critical samples are confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. Nondefinitive data without associated confirmation

data are of unknown quality. Qualitative, nondefinitive data identify the presence of contaminants and classes of contaminants and can help focus the collection of definitive data, which is generally the more expensive of the two. Some data uses, such as risk assessments, require definitive data.

Quality Control in the Field

QC parameters should be described in detail for each step of field work and should also include specific corrective actions to be taken if difficulties are encountered in the field. Evaluation of field sampling procedures requires the collection and evaluation of field QC samples. Trip blanks, rinsate blanks, field duplicates, and extra volume for matrix spikes and matrix spike duplicates will be collected and submitted to the analytical laboratory to provide a means of assessing the quality of data resulting from the field sampling program. Collection frequencies for field QC samples are summarized in the Table B2 at the end of Section B of this QA Plan.

Field QC requirements and documentation of all field sampling and observations are critical for providing a historical record for analysis of the usability of the data produced. The official field logbook will contain documentation of field activities that involve the collection and measurement of environmental data. Additional forms may be used in the field to record related activities as explained below.

SOPs delineate the step-by-step approach that field personnel must follow in collecting samples, taking field measurements, decontaminating equipment, handling IDW, and calibrating instruments. Most qualified sampling contractors and State- and federally-certified laboratories develop SOPs and analytical methods as part of their overall QA program. SOPs should be developed following "Guidance for Preparing Standard Operating Procedures" (EPA 2007) https://www.epa.gov/quality/agency-wide-quality-program-documents. The field team should document which SOPs they are using in the field and any deviations from an SOP.

Nondisposable equipment used for sample collection must be cleaned according to the specific procedures documented in each sampling SOP. Sampling SOPs will be prepared by the group responsible for sampling and will be submitted to Program or Quality Coordinator for review and approval as part of the sampling plan. All sampling tools will be decontaminated before sampling begins and between sample locations. Soil and water sampling tools, including stainless-steel spoons, bowls, hand augers, split spoons, pumps, and Hydropunch equipment, will be decontaminated by scrubbing in a solution of potable water and nonphosphate detergent (Alconox or Liquinox). EPA SOPs call for use of a 10 percent nitric acid (for metal analytes) or a solvent such as acetone for organic compound analytes (see Appendix E). Next, double-rinse tools with distilled water. Sampling tools that are not used immediately after decontamination will be allowed to air dry and wrapped in aluminum foil. Larger equipment, such as the drilling rods and augers, will be decontaminated between boring locations. A temporary decontamination pad will be constructed near the site and a high-pressure steam cleaner will be used to clean the end of the rig and all augers, drill rods, and core samplers. Decontamination fluids will be placed in containers and disposed of in accordance with the procedures outlined in the SOP for IDW.

Field Instrument/Equipment Inspection and Calibration

Sampling and analysis generally requires the use of different pieces of equipment and tools in the gathering of environmental data. A field preventive maintenance protocol involves ensuring that all field equipment has been properly calibrated, charged, and inspected prior to and at the end of each working day and that replacement parts are available.

Field equipment needs to be inspected to determine if it is adequate and appropriate for the media, parameters, and tests to be performed. Data may be generated onsite using real-time equipment, such as photoionization detectors (PIDs), organic vapor analyzers, and pH meters. A more detailed analysis may call for relevant to later assessments of the usability of data generated by a mobile laboratory.

For field-testing and mobile laboratories, the team should track the transfer of samples and equipment should be examined to ensure that it in working condition and properly calibrated. Perform the calibration of field instruments according to the method and schedule specified in an SOP, which is usually based on the manufacturer's operating manual. Perform calibration of field equipment more often than specified in the SOP if equipment is used under adverse or extreme field conditions.

Field Documentation

The field team should record field activities in ink, in a bound notebook with prenumbered pages or on a preprinted form. For each sampling event, the field team must provide the site name and location, date, sampling start and finish times, names of field personnel, level of protection, documentation of any deviation from protocol, and signatures of field personnel. For individual samples, field teams should ensure that field logbooks document the exact location and time the sample was taken, any measurement made (with real-time equipment), a physical description of the sample, sample ID number, sampling depth, sample volume and type of sample, and the equipment used to collect the sample. This information can be critical to later evaluations of the resulting data's usability.

Complete and accurate documentation is essential to demonstrate that field measurement and sampling procedures are carried out as described in this QA Plan or the SAP/FSP. Field personnel will use permanently bound field logbooks with sequentially numbered pages to record and document field activities. The logbook will list the contract name and number, the project name, the site name, and the names of subcontractors, the service client, and the project manager. At a minimum, the following information will be recorded in the field logbook:

- Name and affiliation of all on-site personnel or visitors
- Weather conditions during the field activity
- Summary of daily activities and significant events
- Notes of conversations with coordinating officials
- References to other field logbooks or forms that contain specific information

- Discussions of problems encountered and their resolution
- Discussions of deviations from the SAP or other governing documents
- Description of all photographs taken

The field team will also use various field forms in Appendix G (or equivalent forms developed by the contractor) to record field activities.

Label individual samples in the field. Include sample location, sample number, date and time of collection, sample type, sampler's name, and method used to preserve the sample, if applicable. (Sample preservation involves the treatment of a sample usually through the addition of a compound that adjusts pH to retain the sample properties, including concentrations of substances, until it can be analyzed.) The field team should follow the sample summary table (see Appendix G) for each sampling event. The table should include a listing of the total number of samples, types of sample matrices, all analyses planned for each sample differentiating critical measurements, and other information that may be relevant to later assessments of the data usability.

Trip Blanks

Trip blank samples are used to evaluate whether the shipping and handling procedures are introducing contaminants into the samples or if cross-contamination in the form of migration of VOCs between the collected samples. One trip blank will be submitted to the laboratory for analysis each day that samples are collected. Trip blanks for soil and water samples are VOA vials filled with purged deionized water that are transported to the field and then returned to the laboratory without being opened. Trip blanks for air samples are empty Summa canisters or tedlar bags, filled with zero air, which are transported to the field and then returned to the laboratory without being opened.

Trip blanks should not contain detectable concentrations of target analytes greater than the PRQL for the compound. Any detection of target analytes in a trip blank will result in an investigation to determine effect on overall data usability and affected results may be qualified as estimates or as nondetects at an elevated MDL as appropriate.

Rinsate Blanks

Rinsate blanks are collected to evaluate the potential for cross-contamination of samples during collection. Rinsate blanks will be collected at a rate of one per day per matrix when non-dedicated and non-disposable sampling equipment is used in the field. Equipment rinsate blanks will be obtained by passing organic-free water through or over the decontaminated sampling equipment and collecting the rinse water in appropriate sample containers.

Rinsate blanks will be analyzed for the same parameters as the associated field samples. Rinsate blanks should not contain detectable concentrations of target analytes greater than the PRQL for the compound. Any detection of target analytes in a rinsate blank will result in an investigation to determine effect on overall data usability and affected results will be qualified as estimates or as nondetects at an elevated PRQL as appropriate.

Field Duplicate Samples

Field duplicate samples of water and air samples are samples that are collected simultaneously in separate containers. The purpose of field duplicates is to allow evaluation of the contribution of random error from sampling to the total error associated with the data.

Soils and sediments are generally too heterogeneous to assess the precision of sample collection, so duplicate soil samples from a site are generally no different (statistically) from independent samples. However, the size, complexity, and objectives of each project determine the sampling design for each Brownfields site. As a result, the collection of field duplicates for soils and sediments will be evaluated on a project-specific basis. Each project-specific SAP will specify as to why field duplicate samples of soil and sediment media are, or are not, needed.

For water and air samples, one set of field duplicates will be collected and submitted for every twenty field samples collected. Field duplicate precision will be evaluated as described below.

Matrix Spike/Matrix Spike Duplicates (Field Requirements)

Double sample volume should be collected at a rate of one per twenty samples per matrix (minimum of once per sampling event) to ensure that the laboratory has sufficient volume to perform matrix spikes and matrix spike duplicates (MS/MSDs).

Interlaboratory Split Samples (Field Requirements)

Interlaboratory split samples are field duplicates (liquid matrices) or split samples (solid matrices) that are submitted to both the primary laboratory and a secondary or QC laboratory. Interlaboratory split samples are collected simultaneously with a sample from the same source under identical conditions into separate containers. Results from the split samples are used to assess laboratory performance by comparison of qualitative and quantitative results from the two laboratories, including indications of matrix interferences such as elevated PRQLs. To provide useful information, however, the split sample must be directly associated with the original (primary) sample to evaluate laboratory performance. The association will be determined by field personnel and maintained during the data import process.

Quality Control in the Laboratory

Laboratory QC samples are used to monitor the laboratory's precision and accuracy of the analytical procedure results. Laboratory QC samples are analyzed as part of the standard laboratory QC protocols and are accomplished through analyzing method blanks, laboratory control samples (blank spikes), surrogate spikes, and internal standards. Not all analyses require the above QC sample types. Typically, these QC samples are not required for non-SW-846 methods. Method-specific laboratory QC samples and acceptance limits specified in this QA Plan are summarized in Tables D-1 through D-7 in Appendix D.

Method Blanks

Method blanks will be used to check the level of background contamination in the laboratory. Laboratory method blanks will be analyzed with each sample batch. Results will be compared to all samples within the same analytical batch.

QC criteria require that no contaminants be detected in the blank(s) above the PRQL. If an analyte (contamination) is detected, the action taken will follow the laboratory SOPs and QA manuals. Blank samples will be analyzed for the same parameters as the associated field samples.

Laboratory Control Samples

Laboratory control samples (LCSs) are used to monitor the laboratory's day-to-day performance of routine analytical methods, independent of matrix effects. The LCSs are prepared by spiking reagent water or silica sand with standard solutions prepared independently of those used in establishing instrument calibration. The LCSs are extracted and analyzed with each batch of samples. Results are compared on a per-batch basis to pre-established control limits and are used to evaluate laboratory performance for precision and accuracy.

Laboratory Duplicates

Precision of the analytical system is evaluated by using laboratory duplicates for inorganic parameters only. Laboratory duplicates are two portions of a single homogeneous sample digested and analyzed for the same parameters. LCS duplicates will be prepared and analyzed for all batches when MS/MSDs are not available. Laboratory duplicates (primary sample split into two) will be prepared and analyzed for all batches requiring duplicates as specified per method in the laboratory QA manuals. The calculations for relative percent difference (RPD) (precision) are described in the Trip Blanks Section. Not all methods require laboratory duplicates, and MSDs are generally preferred for analysis of organic chemicals.

Surrogate Spikes

Surrogate spikes are used to evaluate accuracy, method performance, and extraction efficiency. Surrogate compounds are compounds not normally found in the environmental samples; however, they are similar to the target analytes in chemical composition and behavior in the analytical process. Samples for organics analysis will be spiked with surrogate compounds consistent with the requirements described in the laboratory's SOPs and QA manuals.

Because sample characteristics will affect the percent recovery (%R), the %R is a measurement of accuracy of the overall analytical method on each individual sample. The %R of surrogates is calculated concurrently with the analytes of interest, using the equation in the Accuracy Section.

Matrix Spike/Matrix Spike Duplicates

Matrix spikes are used to evaluate analytical precision and accuracy on a specific sample matrix. Because MS/MSD samples measure the matrix interference of a specific matrix, the laboratory

should perform MS/MSDs on site-specific samples. This requirement will be waived if insufficient sample volume is collected.

MS/MSDs should be analyzed for the same parameters as the associated field samples in the same analytical QC batch and the results will be expressed as percent recoveries of known spiked amounts and as RPDs for the MS/MSD pairs.

Internal Standards

Internal standards are used in gas chromatography/mass spectrometry (GC/MS) and inductively coupled plasma (atomic emission spectroscopy)/mass spectrometry (ICP/MS) analyses. A constant amount of internal standard is added to all standards, samples, extracts, or digestates. The ratio of the peak area, height, or intensity of the target analyte to the peak area, height, or intensity of the internal standard in the sample, extract, or digestate is compared to a similar ratio derived for each calibration standard. The target analyte response is calculated relative to that of the internal standard.

For GC/MS analyses of soil and water samples, internal standard areas or heights for all blanks, samples, and spikes must be 50 percent to 200 percent of the internal standard areas or heights from the last passing continuing calibration (CCAL). The laboratory must re-prepare and/or reanalyze any blank, sample, or spike that does not meet this goal. If the internal standard area or height does not meet the goal upon reanalysis, the laboratory must include a discussion of the possible cause and effect on data usability in the case narrative.

For high-resolution gas chromatography and high-resolution mass spectrometry (HRGC/HRMS) analyses of soil and water samples, internal standard recoveries for all blanks, samples, and spikes must be between 40 percent and 135 percent in 8290 analyses or 25 percent to 150 percent in 1613B analyses. If the internal standard recovery does not meet this MQO, the laboratory must include a discussion of the possible cause and effect on data usability in the case narrative.

For TO-15 analyses of air samples, internal standard areas for all blanks, samples, and spikes must be 60 percent to 140 percent of the internal standard areas from the last valid initial calibration (ICAL). The laboratory must re-prepare and/or reanalyze any blank, sample, or spike that does not meet this goal. If the internal standard area does not meet this MQO upon reanalysis, the laboratory must include a discussion of the possible cause and effect on data usability in the case narrative.

For ICP/MS analyses, the intensity of each internal standard must fall between 30 percent and 120 percent of the intensity of that internal standard in the initial calibration standard. If the intensity is outside of acceptance limits, then dilute the sample fivefold and reanalyze with the addition of appropriate amounts of internal standard. Repeat this procedure until the internal standard intensities are within acceptance limits. Internal standard intensity levels for calibration blanks and instrument check standards must agree within ±20 percent of the intensity level of the internal standard in the original calibration solution. If the internal standard intensity level for any calibration blank or instrument check standard is outside of acceptance limits, analysis must be terminated, the problem corrected, the system recalibrated, the calibration verified, and all affected samples must be reanalyzed.

Performance Evaluation Samples

The team may also decide to audit its laboratory by submitting PE samples to the laboratory along with the other environmental samples collected at the Brownfields site. A PE sample is a sample of known composition provided for laboratory analysis to monitor laboratory and method laboratory performance. A PE sample can be used to rate the laboratory's ability to produce analytical results within the pre-set limits documented in the QA Plan or SAP. PE samples may be the simplest and most cost-effective way to audit a laboratory. Laboratories that participate in EPA's Contract Laboratory Program (CLP) and State programs typically analyze PE samples on a routine basis. The team should request a copy of the laboratory's PE results as part of its audit program and may rely on existing audit information.

Data Quality Indicators

Data processing, verification and validation are the quality management tools used to determine if project data meet the planned DQOs and requirements defined in this QA Plan and in site-specific SAPs. During data processing, verification and validation, project data should be evaluated for completeness, correctness, and compliance against the method, procedural, or contractual requirements of the project. Verified data can then be validated against performance measures and DQOs established in this QA Plan and in site-specific SAPs.

The following data qualifiers ("flags") should be used by analytical laboratories providing services on Brownfields site assessments. Laboratories may use additional data qualifiers and subqualifiers; however, each qualifier must be defined unambiguously in the analytical report.

- **J** - The analyte was positively identified, but the associated numerical value is the approximate analyte concentration in the sample. Analytes must be J qualified when detected concentrations are less than the PRQL but greater than the MDL.

- **U** - The analyte was analyzed for but was not detected. The associated numerical value is provided as the sample-specific MDL, also called the sample quantitation limit (SQL).

- **N** - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration. When analytical methods requiring second column confirmation are performed, analytes must be N qualified when there is greater than 40 percent difference between analyte concentrations on the primary analytical column and secondary (confirmation) column.

- **R** – The datum is rejected if quality control samples and procedures do not meet control limits, as described in the functional guidelines. These data are unusable for decision-making and any other purposes. An explanation of the rejected data should be included in the data validation report.

Data validation is accomplished by evaluating the data against the following DQIs:

- Precision

- Accuracy (Bias)
- Representativeness
- Comparability
- Completeness
- Sensitivity

The generic data assessment criteria for data from Brownfields project are discussed and defined in the following subsections and in Appendix D of this QA Plan. The laboratory should be contacted when developing site-specific SAPs to verify that quality and measurement criteria can be met.

Precision

Precision is defined as the agreement between or among repeated measures of the same sample; that is, precision is the degree of analytical reproducibility. Precision will be measured as the RPD between duplicate analyses when analyte concentration is greater than five times the MDL and as an absolute concentration based on the MDL when analyte concentration is less than five times the MDL.

When analyte concentrations are more than five times the MDL, precision will be calculated as the RPD as follows:

$$\%RPD_i = \left(\frac{2 \times \left| O_i - D_i \right|}{\left(O_i + D_i \right)} \right) \times 100$$

Where:

$\%RPD_i$ = Relative percent difference for compound i

O_i = Concentration of compound i in original sample or MS

D_i = Concentration of compound i in duplicate sample or MSD

For laboratory precision, performance goals will be:

- RPD between duplicate blank spikes less than or equal to 20 percent.
- RPD between laboratory duplicate samples less than or equal to 30 percent for analyte concentrations greater than or equal to five times the MDL, and the absolute concentration difference less than or equal to the MDL for analyte concentrations less than five times the MDL.

- RPD between MSDs less than or equal to 40 percent.

If these goals are not met, the laboratory will investigate why the criteria were exceeded and will include a discussion of the exceedance and any effects on data usability in the case narrative. If the cause of the exceedance is determined to be laboratory error, the laboratory will reanalyze the sample, as appropriate.

Precision related to sample collection in the field will be monitored as the difference between field duplicates for water and air samples. The RPD between field duplicates for samples with analyte concentrations greater than the MDL will be less than or equal to 40 percent for aqueous and air samples. The absolute concentration difference between duplicate samples with concentrations less than five times the MDL will be less than or equal to the corresponding MDL.

Accuracy (Bias)

Accuracy is the amount of agreement between a measured value and the true value. It will be monitored as the %R of the MS or MSD, laboratory control samples (also known as blank spikes), and surrogate spike compounds. It will also be measured using the analytical results of instrument calibration and other laboratory internal standards. Project-specific goals for each type of sample and analytical method are discussed below and will be applied unless an analytical method contains other defined performance criteria.

Accuracy will be calculated as the %R of analytes as follows:

$$\%R_i = \left(\frac{Y_i}{X_i} \right) \times 100$$

Where:

$\%R_i$ = percent recovery for compound i

Y_i = measured analyte concentration in sample i (measured - original sample concentration)

X_i = known analyte concentration in sample i

The accuracy goal for organic analytes and surrogate spike recovery in LCSs is 70 to 130 percent of the true value for all compounds. Recovery in this range should be routinely achievable as the spike is added to an interference-free matrix. Sporadic failure of a single organic analyte to meet the 70 to 130 percent recovery goal may be tolerated if the laboratory can prove that exceedance of the QC limit does not indicate a systematic recovery problem for the analyte. As much as 5 percent of the organic analytes may fail to meet the 70 to 130 percent recovery goal without requiring re-extraction/reanalysis, as long as the laboratory can demonstrate that the recovery outside of acceptance limits does not indicate a systematic recovery problem but is sporadic in nature. The laboratory case narrative must include a discussion of the effect of any recovery outside the 70 to 130 percent limits set for organic analytes.

The %R goal for inorganic analyte recovery in LCSs is 80 to 120 percent of the known value for all compounds. Recovery in this range should be routinely achievable as the spike is added to an interference-free matrix. The %R goal for recovery of analytes and surrogate compounds spiked into the sample matrix is 60 to 140 percent recovery. Results outside these limits must reflect complexities in the sample matrix rather than procedural bias in the laboratory. All matrix-related recovery problems must be adequately documented in the laboratory report and raw data. Compliance with this %R goal will be assessed by comparison of analyte and surrogate recovery in the sample matrix to laboratory performance on method blanks and blank spikes and through the data validation and verification process.

Representativeness

Representativeness is the degree to which data accurately and precisely represent a parameter variation at a sampling point or for an environmental condition. The results of all analyses will be used to evaluate the data to determine if the samples were collected in such a manner that the results appropriately describe the area investigated.

Field procedures to ensure that samples are representative of the project site are discussed in the site-specific SAP or FSP. Representativeness of laboratory data will be achieved by following standardized procedures for subsampling, which will include the following elements at a minimum:

- If an aqueous sample is subsampled for analysis, the sample will be mixed by inversion prior to removal of the analytical aliquot unless doing so would compromise analytical results.

- Soil samples will be thoroughly mixed prior to removal of analytical subsamples for all analyte classes except for VOCs. If analysis for VOCs must be performed on bulk soil samples, the sample core must be taken from the center of the bulk container and all results must be qualified as exhibiting a possible low analytical bias.

Comparability

Comparability is the degree to which data from one study can be compared with data from other similar studies, reference values (such as background), and screening values. Field procedures to promote comparability of collected samples are discussed in the project planning documents, including SOPs. Comparability of laboratory results will be achieved by following standardized analytical procedures, using traceable reference materials, using Class A volumetric glassware or correctly calibrated pipettes for volumetric procedures, using correctly calibrated balances for gravimetric procedures, and following good laboratory practices.

The NDEP requires strict adherence to method QC and procedural requirements and the requirements of this QA Plan, or proper documentation by the laboratory of deviations from the analytical methods. If undocumented method deviations are discovered during data validation, NDEP chemists will evaluate potential effects on data usability and comparability and will contact the laboratory for corrective action.

Completeness

Completeness is defined as the percentage of usable data out of the total amount of data generated. Analytical completeness is a measure of the number of overall accepted analytical results (valid results), including estimated values, compared to the total number of analytical results requested on samples submitted for analysis after review of the analytical data. Less than 100 percent completeness can occur if high concentrations necessitate dilutions, such that PRQLs are exceeded for some parameters. Highly contaminated environments may also present complex matrices that produce analytical interferences and prevent the achievement of specified precision and accuracy criteria. Therefore, the target goal for completeness as a whole shall be 90 percent for both field and laboratory analytical methods. Completeness for project-specific data needs shall be 95 percent for each individual method. Project-specific data needs will be defined on an individual batch basis and will consist of data for which all QC criteria were met.

Completeness will be calculated as follows:

$$\%C = \frac{A}{I} \times 100$$

Where:

%C = Percent completeness (analytical)

A = Actual number of samples collected/valid analyses obtained

I = Intended number of samples/analyses requested

Rejection of data due to severe matrix interference is sometimes unavoidable. NDEP chemists will work with the laboratories to minimize these problems if possible and will document any steps taken to alleviate such problems.

Rejection of data due to laboratory performance issues is typically unacceptable. NDEP chemists will closely monitor laboratory performance during project execution to minimize the potential for discovery of severe data quality issues after the data are reported. Project laboratories are expected to pay careful attention to analytical procedures and method requirements, and to implement corrective actions to avoid rejection of results.

Analytical Sensitivity

Analytical sensitivity is the lowest concentration of a variable that can be reliably measured in a given sample. To ensure that analytical data are useful, the lowest reporting limit (LRL) for a given analyte should be either well below the lowest expected ambient environmental concentrations or below any applicable regulatory action levels. Although the LRL can vary from sample to sample due to matrix interferences and other analytical issues, under most conditions the LRL is fixed for a given analytical method. The routine LRLs for water quality variables analyzed for this program are listed in Appendix D.

INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

All field and laboratory analytical instruments and equipment will be tested, inspected, and maintained according to the manufacturer's guidelines and recommendations. Data collected from improperly functioning equipment will not be used.

Records for equipment testing, inspection, and maintenance will be maintained in a bound logbook for each piece of equipment. The date, time, name of inspector, what was inspected, and the results of testing and inspection will be recorded in the logbook. All equipment or systems requiring periodic maintenance will be inspected.

Preventive maintenance for most field equipment is carried out in accordance with procedures and schedules recommended in (1) the equipment manufacturer's literature or operating manual, or (2) SOPs that describe equipment operation associated with particular applications of the instrument. However, more stringent testing, inspection, and maintenance procedures and schedules may be required when field equipment is used to make critical measurements.

A field instrument that is out of order will be segregated, clearly marked, and not used until it is repaired. The field team leader will be notified of equipment malfunctions so that service can be completed quickly or substitute equipment can be obtained. When the condition of equipment is suspect, unscheduled testing, inspection, and maintenance should be conducted. Any significant problems with field equipment will be reported in the daily field QC report.

Testing, inspection, maintenance of analytical equipment used by the contract laboratory, and corrective actions shall be documented in the QA manuals for each analyzing laboratory. The laboratory QA manual must be submitted to the NBP Quality Coordinator for review and approval prior to start of sampling and analyses.

Subcontractor laboratories will prepare and follow a maintenance schedule for each instrument used to analyze samples collected for this project. All instruments will be serviced at scheduled intervals necessary to optimize factory specifications. Routine preventive maintenance and major repairs will be documented in a maintenance logbook.

An inventory of items to be kept ready for use in case of instrument failure will be maintained and restocked as needed. The list will include equipment parts subject to frequent failure, parts that have a limited lifetime of optimum performance, and parts that cannot be obtained in a timely manner.

The laboratory's QA plan and written SOPs will describe specific preventive maintenance procedures for equipment maintained by the laboratory. These documents identify the personnel responsible for major, preventive, and daily maintenance procedures; the frequency and type of maintenance performed; and procedures for documenting maintenance activities.

Laboratory equipment malfunctions will require immediate corrective action. Actions should be documented in laboratory logbooks. No other formal documentation is required unless data quality is adversely affected or further corrective action is necessary. On-the-spot corrective

actions will be taken as necessary in accordance with the procedures described in the laboratory QA plan and SOPs.

The equipment testing, inspection, and maintenance logs for all contractor equipment must be made available to the Program or Quality Coordinator or the NBP Supervisor upon request.

INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

Calibration of all analytical instrumentation is required to ensure that the analytical system is operating correctly and functioning at the sensitivity that is required to meet project-specific DQOs. Each instrument will be calibrated with standard solutions appropriate to the instrument and analytical method, in accordance with the methodology specified, and at the QC frequency specified in laboratory or field sampling SOPs.

Field-Based Instruments

Field equipment, if used, will be calibrated at the beginning of the field effort and at prescribed intervals. The calibration frequency depends on the type and stability of equipment, the intended use of the equipment, and the recommendation of the manufacturer. Detailed calibration procedures for field equipment are available from the specific manufacturers' instruction manuals, and general guidelines are included in SOPs. All calibration information will be recorded in a field logbook or on field forms. A label that specifies the scheduled date of the next calibration will be attached to the field equipment. If this type of identification is not feasible, equipment calibration records will be readily available for reference. Field-based analytical instruments, such as turbidometers and pH electrodes must be calibrated following manufacturers' instructions and frequency recommendations (or following appropriate SOPs) before they may be used for collecting data.

Laboratory Instruments

Calibration and maintenance of analytical instruments will be conducted in accordance with the QC requirements identified in each laboratory SOP and in QA manuals, along with the manufacturers' instructions. General requirements are discussed below.

The history of calibration and maintenance for instruments in the subcontract laboratory is an important aspect of the project's overall QA/QC program. As such, all initial and continuing calibration procedures will be implemented by trained personnel following the manufacturer's instructions and in accordance with applicable EPA protocols to ensure the equipment is functioning within the tolerances established by the manufacturer and the method-specific analytical requirements.

The laboratory will obtain calibration standards from commercial vendors for both inorganic and organic compounds and analytes. Stock solutions for surrogate standards and other inorganic mixes will be made from reagent-grade chemicals or as specified in the analytical method. Stock standards will also be used to make intermediate standards that will be used to prepare calibration standards. Special attention will be paid to expiration dating, proper labeling, proper refrigeration, and freedom from contamination. Documentation on receipt, mixing, and use of

standards will be recorded in the appropriate laboratory logbook. Logbooks must be permanently bound. Additional specific handling and documentation requirements for the use of standards may be provided in subcontractor laboratory QA plans.

The verification standards for initial calibrations should be analyzed after the instrument calibration to verify the preparation and concentration of the calibration standards. The verification standards for continuing calibrations should be analyzed (as per method requirements) to verify the calibration of the analytical system over time.

Analytical balances will be calibrated annually according to manufacturer's instructions and have a calibration check before each use by laboratory personnel. Balance calibration shall be documented in hardbound logbooks with pre-numbered pages.

All refrigerators will be monitored for proper temperature by measuring and recording internal temperatures daily. At a minimum, thermometers used for these measurements will be calibrated annually, according to manufacturers' instructions.

The subcontract laboratories will maintain an appropriate water supply system that is capable of furnishing ASTM Type II polished water to the various analytical areas.

INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The laboratory shall inspect supplies and consumables prior to their use in analysis. The description of materials provided in the method shall be used as a guideline for establishing the acceptance criteria for these materials. Purity of reagents shall be monitored by analysis of LCSs. An inventory and storage system for these materials shall assure use before manufacturers' expiration dates and storage under safe and chemically compatible conditions.

Analytical laboratories are required to provide certified clean containers for all analyses. These containers must meet EPA standards described in "Specifications and Guidance for Obtaining Contaminant-Free Sampling Containers" (EPA 1992).

Procedures for receiving supplies and consumables in the field are similar. When supplies are received, the project manager or field team leader will inspect all items against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook, and deficient items will be returned for immediate replacement.

NON-DIRECT MEASUREMENTS

Data from non-measurement sources, such as computer databases, computer programs, or scientific publications, must be approved for use by the NDEP in this QA Plan, or in a site-specific SAP or FSP.

DATA MANAGEMENT

Field data from Brownfields site assessments, such as sample ID and latitude/longitude coordinates, should be recorded on field data sheets or hand-held computers. Field data are

reported to the Program and Quality Coordinators through submission of field notebooks or field sampling data sheets, if used, by contractor field staff.

Laboratory analytical reports will include QC results and any other necessary analytical information, enabling reviewers to determine data quality. Laboratory data should be submitted to the Program and Quality Coordinators in both printed and electronic form. Rapid turnaround data from the laboratory are reported to the Program and Quality Coordinators, if requested, but rapid turnaround is generally not required for Brownfields projects. Copies of field logs; a copy of chain-of-custody forms; original, preliminary, and final lab reports; and electronic media reports must be kept for review by the NDEP. The field crew must retain original field logs. The contract laboratory shall retain chain-of-custody forms. The contract laboratory will retain copies of the preliminary and final data reports.

The NDEP will supply instructions for the required format for EDDs produced by analytical laboratories. EDDs from the laboratory will be verified and loaded into NDEP's environmental database. This database will be the repository from which data may be retrieved for evaluation. Any errors found during the course of data evaluation will be corrected in the database, with documentation noting the error, reason, and date of correction.

In partnership with the Environmental Data Standards Council (EDSC), the EPA is developing data standards for environmental information collection and exchange. Information on data standards can be found on-line at https://www.epa.gov/data-standards. The latest overview of standards applicable to environmental sampling, analysis, and data was published January 6, 2006 and is available at http://www.exchangenetwork.net/standards/ESAR_Overview_01_06_2006_Final.pdf (Also see: http://www.epa.gov/fem/eds.htm). All results meeting MQOs, along with results having satisfactory explanations for deviations from objectives shall be reported. The final results shall include the results of all field and laboratory QC samples.

Table B1. Common Contaminants at Nevada Brownfields Sites and Recommended Methods for Analysis of Soil Samples

Product	Parameter/ Constituent	Lab Test Protocol & Number	Detection Level	Notification Level	Action Level	Cleanup Level
Gasoline	TPH	Modified EPA 8015	10 mg/kg	> 25 Gallons or 3 Cubic Yards*	100mg/kg	100mg/kg
Diesel	TPH	Modified EPA 8015	10 mg/kg	> 25 Gallons or 3 Cubic Yards*	100mg/kg	100mg/kg
Waste Oil	TPH	Modified EPA 8015, TCLP Inorganics	10 mg/kg	> 25 Gallons or 3 Cubic Yards*	100mg/kg	100mg/kg
Metals	Lead, arsenic	EPA method 6010B	0.5 mg/kg			

***** NDEP prefers use of Purge and Trap (P&T) techniques for analysis of Gasoline releases via Modified EPA Method 8015. NDEP prefers the use of Extractable Techniques for analysis of non-Gasoline (i.e., Diesel, Motor Oil and Waste Oil) via Modified EPA Method 8015.

The characterization must include all constituents of concern to be evaluated in the risk analysis and must use EPA-approved analytical methods. NDEP recommends the following analyses to comply with the requirements of both items 1 and 2.

- Volatile Organic Compounds (VOCs) by EPA method 8260D and Semi-Volatile Organic Compounds (SVOCs) by EPA method 8270E.

- Eight metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by Toxicity Characteristic Leaching Procedure (TCLP) using an extraction via EPA method 1311 and analyses via EPA method 6010B or 6020 for all except mercury, which may be analyzed via EPA method 6020 or 7470A.

- Total Petroleum Hydrocarbons (TPH) purgeable (TPHp) and extractable (TPHe) by EPA method 8015 Modified.

Depending on the results obtained from these analyses, and the risk evaluation method chosen, additional analyses for certain VOCs or SVOCs by TCLP may be required.

Table B2. Collection Frequencies for Field Quality Control Samples

Field QC Type	Frequency
Trip Blank	One per day per cooler containing VOC samples
Rinsate Blank	One per day when nondedicated sampling equipment is used
Field Duplicates	5 percent (1 in 20 samples) per matrix per analysis. Minimum of 1 per analysis. Field duplicates are collected for water and air samples but need not be collected for soil or sediment samples.
Matrix Spike/Matrix Spike Duplicate	5 percent (1 in 20 samples) per matrix per analysis. Minimum of 1 per analysis (Noted here because twice the volume must be collected for MS/MSD analysis)
Interlaboratory Split Sample	5 percent (1 in 20 samples) per matrix (optional) (Noted here because additional sample volume must be collected for interlaboratory analysis)
Field Instrument Calibration	Instrument-specific. Follow instrument specifications and sampling SOPs

Notes:
VOC = Volatile organic compound
MS/MSD = Matrix spike/matrix spike duplicate
SOPs = Standard operating procedures

GROUP C: ASSESSMENT AND OVERSIGHT

ASSESSMENTS AND RESPONSE ACTIONS

Assessment and response actions are part of the quality system for ensuring and documenting that the procedures required by this QA Plan, as well as by site-specific SAPs or FSPs, are being followed during the generation of data for Brownfields sites.

Purpose/Background

During the planning process, many options for sampling, sample handling, sample analysis, and data reduction are evaluated. Selection of specific options depends on the nature of the corrective action or monitoring activity. This section of the QA Plan describes the internal and external checks necessary to ensure that all elements are correctly implemented. In addition, checks are needed to ensure that the quality of the data is adequate and that corrective actions are implemented in a timely and effective manner. Documenting all internal assessments is a critical component of the quality system.

Assessment Activities and Program Planning

A number of assessment activities are available to managers to evaluate the effectiveness of program implementation. These include audits, peer reviews, and other activities, as discussed in the following sections.

Assessment of Subsidiary Organizations

Management assessment is generally accomplished through a management systems review (MSR), which is a qualitative assessment to evaluate whether the quality management structure, policies, practices, and procedures are adequate to ensure the type and quality of data collected under this program. EPA provides guidance (Guidance for the Management Systems Review Process, QA/G-3, 2003) for conducting MSRs. MSRs may also include providing technical assistance to improve the quality system.

MSRs are a necessary component of the overall Quality System and serve the purpose of identifying problems that need to be addressed to improve the Quality System. For the NBP, MSRs will be conducted by EPA every 4 years, as defined in EPA Order 5360.1. The MSR process will produce a draft report that details findings and recommended corrective actions for the NDEP program. MSRs are a useful means to bring attention to areas of needed improvement and a useful mechanism for communication between the NDEP and the EPA.

Assessment of Program Activities

Field Audits

The NDEP will conduct field audits of contractors shortly after they have begun project work. These field audits will be used to reveal any weaknesses in management structure, policy, practices, or procedures. Experienced NDEP staff members will perform the audits. The purpose of these audits by the NDEP is to support data quality and encourage continuous quality

improvement. During field work, the contractor should routinely observe field operations to ensure consistency and compliance with sampling specifications presented in this document and in project-specific SAPs or FSPs that will be developed later. An audit checklist will be used to document field observations and activities.

During a field audit, the NDEP assessor will use personnel interviews, direct observations, and reviews of project-specific documentation to evaluate and document whether procedures specified in this QA Plan and the project-specific SAP or FSP are being implemented. Specific items that may be observed during the audit include:

- Availability of approved project plans such as the SAP and Health and Safety Plan (HASP) to all project members
- Documentation of personnel qualifications and training
- Sample collection, identification, preservation, handling, and shipping procedures
- Decontamination procedures used to clean sampling equipment
- Equipment calibration and maintenance
- Completeness of logbooks and other field records (including nonconformance documentation)

During the field audit, the NDEP assessor will verbally communicate any significant deficiencies to the field team and project manager for immediate correction. These and all other observations and comments will also be documented in an audit summary. The audit summary will be issued to the contractor project manager and EPA program QA manager in electronic (email) format within 7 days after the audit is completed.

Surveillance

Surveillance is intended for use in identifying repeated non-compliance due to deficiencies in the QC program requiring remedy through either greater enforcement of provisions in the QA Plan or correction of the problematic elements. Surveillance is also intended to identify and investigate fraud or other efforts to deceive for convenience or personal gain. Due to the investigative nature of some surveillance activities, any action taken by the NBP Coordinator may be initiated without the knowledge or consent of the subject, though their involvement will be sought prior to any disciplinary action.

In determining whether to initiate surveillance activities, the NBP Coordinator will consult with the Superfund Branch Supervisor in presenting both the information that serves as the basis for the suspicion of non-compliance and a plan for verification. It will be the Supervisor's responsibility to authorize the time and resource commitment necessary to undertake appropriate surveillance activities and to monitor the methods and actions taken by the NBP Coordinator.

In any instance where the NBP Coordinator believes that the QC provisions of this QA Plan, or any associated FSP/SAP submitted to the program as part of a requirement of the program plan,

are not being followed appropriately, he/she may take action to verify the noncompliance, determine the circumstances, and document the findings. Actions may include, but are not limited to, conducting interviews with field personnel, reviewing field logs or other field documentation, observing sampling efforts, and holding discussions with managers or other quality control officers. These types of surveillance activities may be initiated in response to instance- or personnel-specific inconsistencies observed during routine QC checks. Surveillance may be either short or long term, depending on the nature of the presumed non-compliance.

The findings of surveillance actions will be documented by the NBP Coordinator and compiled in the YSA. The report of findings must be accompanied by a plan for either corrective or disciplinary action if the finding of non-compliance is confirmed.

Audits of Data Quality

EPA QA Project Plan guidance (2001) defines an audit of data quality (ADQ) as "a qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality." An ADQ reveals how the data were handled for the project and may identify any systematic errors in data reduction. ADQs for the NBP will be conducted internally by the laboratory and involve a detailed review of the data, including review of instrument print-outs and other raw data. ADQs are comparable to full data validation but are carried out by the laboratory QA manager and do not result in qualification or rejection of data. An ADQ should trace at least 10 percent of the data from initial acquisition, through reduction and statistical comparisons, to final reporting of the analytical results.

Peer Reviews

Peer reviews are not strictly an internal QA function; rather, they are technical scientific reviews that evaluate assumptions, calculations, methods, and conclusions. The NDEP will use internal expertise to evaluate different technical aspects of the reports produced by contractors.

Data Quality Assessment

A data quality assessment (DQA) generally applies statistical tools to evaluate whether the data achieved the DQOs specified for the project. EPA guidance for DQA (EPA 2006b, 2006c) discusses the types and uses of statistical analyses. However, use of statistical tools may be limited if few data are collected or if samples were collected using a biased (judgmental) design. In the case of nonstatistical studies, the DQA process will still be used to evaluate whether project objectives, as defined by project DQOs, have been met. The NBP Quality Coordinator has significant experience with the DQO and DQA processes and will evaluate the contractor's reports to confirm that project DQOs are clearly defined in the SAP or FSP, that DQOs were achieved and documented in the investigation report, and that the data analysis is thorough and correct.

Technical System Audits/Yearly Systems Audit

Technical system audits (TSAs) are thorough and systematic qualitative audits that examine facilities, equipment, personnel, training, SOPs, and records for conformance to the QA Plan and

site-specific SAP or FSP. The TSA will be satisfied by the YSA report, which represents a compilation of project-specific audit elements taken throughout the year. Specifically, the YSA includes the results of field audits taken by the NDEP during contractor field activities (sampling and remediation). The YSA also evaluates the performance of program QA elements and would offer the opportunity to make recommendations or changes to the QA program.

The YSA report will be assembled by the Program and Quality Coordinators and will be subject to review by NDEP management. The YSA report is transmitted to the EPA Region 9 QA Manager.

Documentation of Assessments

This section identifies the organization and the person(s) that will perform the assessments, as well as the documentation of information collected during the audit.

Number, Frequency, and Types of Assessments

MSRs of the NBP will be conducted every 4 years by the EPA QA manager. TSAs of contractors by NDEP staff complement the use of SOPs and other QA planning documents to ensure data quality. These audits will be conducted at least once for each NBP project. Standardized checklists for audits are attached as Appendix H to this QA Plan. The in-text table below summarizes the number and frequency for the various types of audits.

Assessment Personnel

Personnel conducting assessments will have special training or technical experience that gives them the specific expertise to conduct the audit. Staff from the EPA will perform the MSR of the NBP and report the results to the NBP Coordinator and Supervisor, who will discuss the results with the NBP team. The NDEP will conduct TSAs of contractors for every NBP project and provide feedback to the contractor. Laboratory QA personnel will conduct ADQs and report results to the Program and Quality Coordinators. The Quality Coordinator will evaluate DQOs and the DQA process used for each NBP project.

Schedule of Assessment Activities

Criteria to serve as a guideline for field operations and laboratories are provided in Appendices to this QA Plan. The full audit checklist for laboratory analysis is included as Appendix H-1. The audit checklist for field audits is included as Appendix H-2, and covers field SOPs, interviews with field personnel, and inspection of field records. The following in-text table outlines the type, schedule, and personnel for each type of audit.

Type of Audit	Auditor	Schedule	Reporting	Distribution
MSR	EPA	Once every 4 years	Written report	NDEP Brownfields Manager
Readiness Review	Contractor Project Manager or Field Team Leader	Before field work commences	Checklist	NDEP Brownfields Manager
Field audit	NDEP	At least once per project	Written summary	Contractors
Surveillance	NBP Coordinator	No regular schedule; as deemed necessary	Written "Report of Findings"	Contractors
ADQ	Laboratory QA Manager	At least once per project	Written summary	NDEP Brownfields Manager
Performance Evaluation	Laboratory QA Manager	As specified for NELAC-certified and Nevada-certified laboratories	As specified in certification documents	NDEP Brownfields Manager
Peer Review	NDEP experts	Draft report for each Brownfields project	Written summary	NDEP Brownfields Manager
DQA	Quality Coordinator	Draft report for each Brownfields project	Written summary	NDEP Brownfields Manager and EPA QA Manager
YSA	NBP Coordinator	Annually	Written report	EPA QA Manager and NDEP team

Reporting and Resolution of Issues

Nonconformance to practices and procedures outlined in this QA Plan or project-specific SAP will be addressed in a timely manner to ensure that nonconforming issues or deficiencies are corrected. The ultimate responsibility to ensure that all issues and deficiencies are satisfactorily resolved rests with the NBP Coordinator.

Corrective Actions

The NBP Coordinator or designee shall keep a log of any issues identified through the QA audit reports described above, as well as the corrective action taken to address these issues. Possible problems requiring corrective action include:

- Sample contamination
- Equipment malfunction/non-compliance with QC systems

Any non-conformance with the established QC procedures outlined in the QA Plan shall be identified and corrected. The Program or Quality Coordinator shall issue a corrective action memorandum for each non-conformance condition and resolution.

Field Corrective Actions

Field corrective action procedures will depend on the type and severity of the finding. The NDEP classifies assessment findings as either deficiencies or observations. Deficiencies are findings that may have a significant effect on data quality and that will require corrective action. Observations are findings that do not directly affect data quality but are suggestions for consideration and review.

As described previously, project teams are required to respond to deficiencies identified in TSA reports. The Program or Quality Coordinator will discuss the deficiencies and the appropriate steps to resolve each deficiency by taking the following steps:

- Identifying when and how the problem developed
- Assigning responsibility for problem investigation and documentation
- Selecting the corrective action to eliminate the problem
- Developing a schedule for completing the corrective action
- Assigning responsibility for implementing the corrective action
- Documenting and verifying that the corrective action has eliminated the problem
- Notifying the EPA Region 9 QA manager of the problem and the corrective action taken

In responding to the TSA report, the project team will include a brief description of each deficiency, the proposed corrective action, the individual responsible for selecting and implementing the corrective action, and the completion dates for each corrective action. The Program or Quality Coordinator will use a status report to monitor all corrective actions.

The Program or Quality Coordinator is responsible for reviewing proposed corrective actions and verifying that they have been effectively implemented. The Program or Quality Coordinator can either require data acquisition to be limited or discontinued until the corrective action is complete and a deficiency is eliminated. The Program or Quality Coordinator can also request the reanalysis of any or all samples and a review of all data acquired since the system was last in control.

Laboratory Corrective Actions

Internal laboratory procedures for corrective action and descriptions of out-of-control situations that require corrective action are contained in laboratory QA plans. At a minimum, corrective action will be implemented when any of the following three conditions occur: control limits are exceeded, method QC requirements are not met, or sample holding times are exceeded.

The laboratory will report out-of-control situations to the Program and Quality Coordinators within two working days after they are identified. In addition, the laboratory project manager will prepare and submit a corrective action report to the Program and Quality Coordinators. This report will identify the out-of-control situation and the steps that the laboratory has taken to rectify it.

REPORTS TO MANAGEMENT

Effective management of environmental data collection requires (1) timely assessment and review of all activities and (2) open communication, interaction, and feedback among all project participants. This section outlines the reporting requirements for activities conducted under the NBP.

Purpose/Background

Planned reports provide a structure for evaluating the management of program schedules, assessing the effect of deviations from approved program and project plans on data quality, and determining the potential uncertainties in decisions made based on the data. QA reports keep managers and project members informed on the performance of QA/QC activities. QA reports summarize the results of project-specific audits, list any significant problems, and discuss the solutions and corrective actions implemented to resolve QA/QC problems.

Frequency, Content, and Distribution of Reports

A QA report is generated by field, technical, laboratory, or QA personnel and sent to the NBP Quality Coordinator in the Bureau of Corrective Actions, as required throughout the duration of the project. The laboratory QA report is prepared by the laboratory manager with the help of senior laboratory staff.

The contractor field team will prepare a daily progress report to summarize activities throughout the field investigation. This report will describe sampling and field measurements, equipment used, subcontractor personnel on site, QA/QC and health and safety activities, problems encountered, corrective actions taken, deviations from the QA Plan or SAP, and explanations for the deviations. The daily progress report is prepared by the field team leader and submitted to the NBP Coordinator. The content of the daily reports will be summarized and included in the final report submitted for the field investigation. The YSA for the NBP compiles the results of project-specific audit elements taken throughout the year.

The QA reports submitted for the project should include discussion of the following:

- Sampling and support equipment that were used, other than those specified in the approved QA or Project Plan
- Preservation or holding-time requirements for any sample that were not met
- QC checks (field and laboratory) that were found to be unacceptable
- Analytical requirements for precision, accuracy, or MDL/PQL that were not met
- Sample collection protocols or analytical methods specified in the QA Plan that were not met
- Any activity or event that affected the quality of the data
- Any corrective actions that were initiated as a result of deficiencies
- Any internal or external systems or performance audits that were conducted

The project team will prepare a QC summary report (QCSR) that will be submitted to the Program and Quality Coordinators, along with the final report for the field investigation. The QCSR will include a summary and evaluation of QA/QC activities, including any field or laboratory assessments, completed during the investigation. The QCSR will also indicate the location and duration of storage for the complete data packages. Particular emphasis will be placed on evaluating whether project MQOs were met and whether data are of adequate quality to support the required decisions as stated in the DQOs for the project.

Title Page	• Time period covered by the report • QA Project Plan title • Laboratory name, address, and phone number • Preparer's name and signature
Table of Contents	Include if the report is more than ten pages
Audits	• Performance and System Audits (date, system tested, auditor, parameters analyzed, reported results and true values of samples, summary of deficiencies, and ensuing corrective actions) • Significant QA/QC Problems (identify problem and date discovered, individual who reported the problem, the source of the problem, and the corrective actions taken to eliminate the problem) • Status of Corrective Actions

Identify Responsible Organizations and Individuals

The in-text table in the Schedule of Assessment Activities Section of this QA Plan identifies the type of audit, the auditor, and the audience for the audit summary report.

GROUP D: DATA REVIEW

DATA VERIFICATION, VALIDATION, AND ASSESSMENT

This section describes the procedures that are planned to review, verify, and validate field and laboratory data. This section also discusses procedures for verifying that the data are sufficient to meet DQOs and MQOs for the project.

Purpose/Background

Data verification, validation, and assessment are done to ensure that environmental programs and decisions are supported by data of the type and quality needed and expected for the intended use.

Data Verification

Data verification is the process of evaluating the completeness, correctness, conformance, and compliance of a specific data set against the method, procedural, or contractual requirements. Data verification evaluates whether sampling protocols, SOPs, analytical methods, and project-specific planning documents (SAPs or FSPs) were followed during data generation. Verification also involves examining the data for errors or omissions. Field and laboratory staff can verify that the work is producing appropriate outputs.

Data Validation

Data validation is a systematic process for reviewing a body of data against a pre-established set of acceptance criteria defined in this QA Plan and in project-specific SAPs. Data validation is an analyte- and sample-specific process that extends the evaluation of data beyond data verification and is performed to determine the analytical quality of a specific data set. Validation involves a detailed examination of the data package to determine whether MQOs for precision, accuracy, and sensitivity have been met. Data validation begins with the outputs from data verification and is done to ensure that:

- QC data are scientifically sound, appropriate to the method, and completely documented
- QC samples yield results within established guidelines
- Data are appropriately flagged by the laboratory
- Anomalies in sample preparation and analysis are completely and accurately documented
- Corrective action forms, if required, are complete
- Holding times and preservations were documented
- Data are ready for incorporation into the final report
- The data package is complete and ready for data archive

Data Assessment

Data assessment is the process of using the results of the verification and validation steps in conjunction with any other information known about the data collection event to determine overall data usability. For data collected under a statistically based sampling design, statistical analyses are typically conducted during this phase of data review. However, if the sampling design was judgmental, application of any statistical tools must be done with caution and a clear understanding of the limitations imposed by such a sampling design. Data assessment is the last step before actual decisions are made and brings together all the information known about the data. Generally, it will be a project or program manager who will perform this function, but the program plan should describe who is responsible.

APPROACHES TO VERIFICATION, VALIDATION, AND ASSESSMENT

The integrity of the data generated over the life of the project is confirmed by data verification and validation. The process for determining if the data satisfy program-defined requirements involves evaluating and interpreting the data, in addition to verifying that QC requirements were met. Projects planned using EPA's DQO process should produce data that provide answers to critical study questions.

The process for verifying and validating data is presented in EPA's "Guidance on Environmental Data Verification and Data Validation" (EPA 2002). Section 5 of this EPA guidance provides tools and techniques for data verification and validation: https://www.epa.gov/quality/agency-wide-quality-system-documents.

Approaches to Data Verification

Project team personnel will verify field data through reviews of data sets to identify inconsistencies or anomalous values. Any inconsistencies discovered will be resolved as soon as possible by seeking clarification from field personnel responsible for data collection. All field personnel will be responsible for following the sampling and documentation procedures described in this SAP so that defensible and justifiable data are obtained.

Laboratory personnel will verify analytical data at the time of analysis and reporting and through subsequent reviews of the raw data for any nonconformances to the requirements of the analytical method. Laboratory personnel will make a systematic effort to identify any outliers or errors before they report the data. Outliers that are found to be the result of errors will be identified and corrected; outliers that cannot be attributed to errors in analysis, transcription, or calculation will be clearly identified in the case narrative section of the analytical data package. All analytical data generated for NBP projects are to be verified by the laboratory.

Verified data are checked for a variety of topics including transcription errors, correct application of dilution factors, appropriate reporting of dry weight versus wet weight, and correct usage of conversion factors, among others. Verified data may have laboratory qualifiers. Verified data are one output of this process.

A second output from the verification process is documentation, which may include a certification statement signed by the laboratory manager and included in the data package. Narratives on technical issues, non-compliance, and any corrective action taken are included in the laboratory data package. Records from field activities are likely to be logbooks or handwritten notes, all of which should be dated and signed.

The laboratory QA manual must be used to accept, reject, or qualify the data generated by the laboratory. The laboratory management is responsible for validating the data generated by the laboratory. The laboratory personnel must verify that the measurement process was "in control" (i.e., all specified MQOs for the DQIs were met, or acceptable deviations are explained) for each batch of samples before proceeding with analysis of a subsequent batch. In addition, each laboratory must establish a system for detecting and reducing transcription and/or calculation errors prior to reporting data. Only data that have met MQOs, or data that have acceptable deviations explained, shall be submitted by the laboratory. When QA requirements have not been met, the samples will be reanalyzed when possible, and only the results of the reanalysis will be submitted, provided these results are acceptable.

Approaches to Data Validation

Data validation determines the analytical quality of data within a specific data set; it is an analyte- and sample-specific process based on achieving the MQOs set forth in the planning documents for the project. Validation assesses whether data quality goals specified in the planning phase have been achieved. Unlike data verification, which may be done by the laboratory, data validation is typically performed by a qualified person who is not affiliated with the laboratory. At present, validation of analytical data for the NBP will be contracted to an independent firm or individual outside of the NDEP.

The level of data validation depends on the size and complexity of the project and the decisions to be made. Basically, data validation is the process of evaluating the available data against the project MQOs to make sure that the objectives are met. Data validation may be very rigorous, or cursory, depending on project MQOs. Criteria for data validation are summarized in Table D-1. Many NBP projects may require only cursory validation.

The personnel validating the data should be familiar with the project-specific MQOs. So, the validator should have access to the QA Plan, SAP or FSP, SOPs, and approved analytical methods (e.g., SW846 or ASTM protocols). The validator must identify these and other project records, obtain records produced during data verification, and validate the records by determining whether the data quality meets goals established in the planning documents.

<u>Validation of Field Data</u>

The five steps for validating field activities include:

1. Evaluate field records for completeness and consistency
2. Review field QC information
3. Summarize deviations and determine effects on data quality

4. Summarize number and type of samples collected
5. Prepare field data validation report

Validation of Laboratory Data

The five steps for validating laboratory data include:

1. Assemble planning documents and data to be validated
2. Review results of data verification to determine method, procedural, and contractual QC compliance or noncompliance
3. Review verified data for the data set as a whole, including laboratory qualifiers
4. Assign validated data qualifiers, which supersede laboratory qualifiers although both sets of qualifiers are retained in the database
5. Prepare data validation report

Outputs from data validation include a fully validated data set, which is ready for data analysis (including statistical analysis if warranted), and the data validation report, which is typically included as an appendix to the report presenting the results of the project investigation.

Approaches to Data Assessment

The purpose of a data assessment is to integrate all aspects of data generation to determine the usability of the data. The final step in the process is to compare the data obtained to the DQOs established by the program in its QA Plan or else in project-specific planning documents. Aspects of the sampling program evaluated during the data assessment include sampling design, sample collection procedures, and sample handling. Analytical procedures (both field and laboratory), QC procedures, and instrument calibration are also reviewed during the process. Criteria for evaluating all aspects are provided in the following paragraphs.

Sampling Design

Samples should conform to the type and location specified in the project-specific SAP or FSP. Any deviations should be noted, along the likely effect on the usability of the data for its intended purpose. An overview of sampling design is also discussed in the Sampling Design Section of this QA Plan. EPA also provides guidance in QA/G-5S ("Guidance on Choosing a Sampling Design for Environmental Data Collection") (EPA 2002) https://www.epa.gov/quality/agency-wide-quality-system-documents.

Sample Collection Procedures

The data reviewer should verify that the appropriate specified methods were used during sampling. The reviewer should:

1. Evaluate the field records for consistency

2. Review QC information
3. Summarize deviations and determine their effect on data quality
4. Summarize the samples collected
5. Prepare a field data verification report

Improper field practices can compromise the useability of a data set. Specific issues to look for include mislabeling of sample containers, problems with field instruments, improper documentation (such as failure to properly fill in the log book), improper collection of VOC samples (such as leaving a cap off a container or collecting VOC samples from a well-mixed composite sample), biasing sampling locations or forgetting to obtain location information for each sample, improper purging of monitoring wells, improper decontamination procedures, or intentionally cutting corners by collecting many samples from one location to save time.

For preparation of the field data verification report, the field team leader or data reviewer evaluates field records and notebooks for consistency with field methods and procedures described in the SAP to assure that these procedures were followed properly or that deviations from the procedures still yield data of acceptable quality. The verification report should include a summary noting (1) the consistency and completeness of field records, (2) the adequacy of field QC information, (3) any deviations from SAP procedures and the probable effect of the deviations on data quality, and (4) the number and types of samples collected and how this compares with specifications in the SAP.

SOPs for various field activities are in Appendix E of this QA Plan and additional information on SOPs is available in EPA QA/G-6 (“Guidance for Preparing Standard Operating Procedures") (EPA 2007) and EPA Region 4 guidance on “Environmental Investigations Standard Operating Procedures and Quality Assurance Manual” (EPA Region 4 2001). Additional guidance on soil sampling techniques and strategies is also available (EPA 1992).

Sample Handling

QA personnel should confirm that samples were handled in accordance with protocols required in the QA Plan and project-specific SAP or FSP. Sample containers and preservation methods should be confirmed as appropriate for the nature of the sample and type of data generated from the sample. Chain-of-custody records and storage conditions should be checked to ensure the representativeness and integrity of the samples.

Analytical Procedures

The Analytical Methods Section of this QA Plan identified the requirements of analytical methods used to generate the data. Each sample should be verified to ensure that the procedures used to generate the data were implemented as specified. Acceptance criteria for these data follow those used in data validation, with suitable codes to characterize any deviations from the procedure.

Quality Control

The Quality Control Section of this QA Plan specified the QC checks that should be performed during sample collection, handling, and analysis. Here, the QA reviewer should confirm that results for QC samples were evaluated against acceptance criteria (i.e., MQOs) specified in the Quality Control Section and Appendix D.

Calibrations

The Instrument/Equipment Testing, Inspection, and Maintenance Section of this QA Plan addressed the calibration of instruments and equipment and the information required to ensure that the calibrations (1) were performed within an acceptable timeframe prior to generation of measurement data; (2) were performed in proper sequence, included the proper number of calibration points; (3) were performed using standards that bracketed the range of reported measurements (i.e., were within the linear working range of the instrument); and (4) had acceptable linearity checks to ensure the measurement system was stable when the calibration was performed.

Data Reduction and Processing

Internal checks by laboratory staff should verify the integrity of the raw data generated by the analyses. EDDs automatically produced by the laboratory should help minimize data entry errors. Steps in data reduction should be clearly documented so that the validity of the analysis can be properly assessed.

Data should be cross-checked to confirm consistency or comparability in analytical methods and detection limits, units of measurement, compatibility of file types or software, and other critical factors that affect how the data will ultimately be interpreted to influence conclusions and recommendations.

RECONCILIATION WITH DATA QUALITY OBJECTIVES

After the data have been verified and validated, the data are evaluated against project DQOs using EPA's five-step DQA process (EPA 2006). Implementation of the DQA process completes the data life cycle by providing the assessment needed to determine if project objectives were achieved.

Two guidance documents on DQA (QA/G9-R and QA/G9-S, February 2006) are available from EPA at https://www.epa.gov/quality/agency-wide-quality-program-documents. DQA is the scientific and statistical evaluation of environmental data to determine if they meet the planning objectives of the project, and thus are of the right type, quality, and quantity to support their intended use. QA/G9-R for project managers describes broadly the statistical aspects of DQA in evaluating environmental data sets. A more detailed discussion on implementation of graphical and statistical tools is found in the companion guidance document on statistical methods for practitioners (QA/G-9S). These EPA guidance documents discuss the use of DQA to support environmental decision-making (e.g., compliance determinations).

The DQA process is built on a fundamental premise: data quality is meaningful only when it relates to the intended use of the data. Data quality does not exist in a vacuum; a reviewer needs to know in what context a data set is to be used, in order to establish a relevant yardstick for judging whether or not the data are acceptable. By applying the DQA process, a reviewer can answer four important questions:

1. Can a decision (or estimate) be made with the desired level of certainty, given the quality of the data?

2. How well did the sampling design perform?

3. If the same sampling design strategy is used again for a similar study, would the data be expected to support the same intended use with the desired level of certainty?

4. Is it likely that sufficient samples were taken to enable the reviewer to see an effect if there really were an effect? That is, is the quantity of data sufficient?

Purpose/Background

This section outlines methods for evaluating the results obtained from the sampling and analysis. Scientific and statistical evaluations of the data are used to determine if the data collected are of the right type, quantity, and quality to support their intended use and to adequately address the primary study questions.

Reconciling Results with Program Objectives or DQOs

EPA guidance documents for data evaluation (EPA 2006b and c) describe an iterative five-step process:

1. Review the DQOs and sampling design described in the project planning documents.

2. Conduct a preliminary data review or exploratory data analysis to understand the character and structure of the data set and to evaluate whether there are any anomalies in the data that may not have been noticed during data verification and validation. Are there outliers or other anomalies that should be further investigated (i.e., conduct a focused data validation) before continuing with statistical testing?

3. Select a statistical test. Choose appropriate statistical tests based on the characteristics of the data and the questions that the investigation was intended to address.

4. Verify the assumptions of the statistical tests and assess the effect that violations of test assumptions may have on the result (i.e., is the test sufficiently robust to provide a valid result at a reasonable level of confidence?) and consider other factors (i.e., Are there effects of seasonality that must be considered? Would alternative statistical tests be better suited to the data than the tests proposed in the planning documents?).

5. Draw conclusions from the data. Using multiple lines of evidence, the results of statistical tests and professional judgment, the data analyst should be able to provide conclusions and recommendations for the site. In some cases, the conclusion may be that more data are needed to answer the primary study questions.

If DQOs have not been adequately developed, the analyst may need to review the planning documents and sampling design, and then define the statistical hypotheses to be tested and establish tolerable limits on decision errors. Tables D2 and D3 to this QA Plan provide example summary tables for a statistically based and a non-statistically based set of DQOs.

When the DQOs are qualitative and statistical tools are not appropriate, the NDEP will still systematically assess data quality and data usability. This assessment will include the following:

- A review of the sampling design and sampling methods to verify that these were implemented as planned and are adequate to support project objectives.
- A review of project-specific MQOs for precision, accuracy, representativeness, completeness, comparability, and quantitation limits to evaluate whether acceptance criteria have been met.
- A review of project-specific DQOs to assess whether they have been achieved by the data collected.
- An evaluation of any limitations associated with the decisions to be made based on the data collected. For example, if data completeness is only 90 percent compared to a project-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence.

Review the DQOs and the Sampling Design

Step 1 of the DQA process should (1) document or define the project specific DQOs, (2) verify that the hypothesis is consistent with project objectives, and (3) identify any deviations from the sampling plan and assess the potential effect of the deviations.

The objectives of the study should be reviewed in order to provide a context for analyzing the data. If a systematic planning process has been implemented before the data are collected, then this step reviews the study objectives to evaluate whether project goals have been met and whether the study questions have been adequately answered. If no clear planning process was used, the reviewer should:

- Develop a concise definition of the problem (DQO Step 1) and of the methodology of how the data were collected (DQO Step 2). These two steps should provide the fundamental reason for collecting the environmental data and identify all potential actions that could result from the data analysis.
- Identify the target population and determine if any essential information is missing (DQO Step 3). If so, either collect the missing information before proceeding, or select a different approach to resolving the problem.

- Specify the scale of determination (any subpopulations of interest) and any boundaries on the study (DQO Step 4) based on the sampling design. The scale of determination is the smallest area or time period to which the conclusions of the study will apply. The apparent sampling design and implementation may restrict how small or how large the scale of determination can be.

- Evaluate whether the data support the conclusions offered (DQO Step 5).

The overall type of sampling design and the manner in which data were collected will likely place constraints on how the data can be used and interpreted. The data analyst should assess whether features of the design support or contradict the stated objectives of the study. Were there deviations from the planned design? What might be the effect of these deviations? Are data adequate to address the primary study questions? How do these objectives translate into statistical hypotheses (null and alternative hypotheses)?

The design and sampling strategy should be discussed in clear detail in the project-specific SAP or FSP. The overall type of sampling design and the manner in which samples were collected or measurements were taken will place conditions and constraints on how the data can be used and interpreted.

A key distinction in sampling design is between **judgmental sampling** (also called authoritative or biased sampling), in which sample numbers and locations are selected based on expert knowledge of the problem, and **probability-based sampling**, in which sample numbers and locations are selected based on randomization, and each member of the target population has a known probability of being included in the sample. Judgmental sampling has some advantages and is appropriate in some cases, but the reviewer should be aware of its limitations and drawbacks. This type of sampling should be considered only when the objectives of the investigation are not of a statistical nature (for example, when the objective of a study is to identify specific locations of leaks, or when the study is focused solely on the sampling locations themselves). Generally, conclusions drawn from judgmental samples apply only to those individual samples; aggregation may result in severe bias due to lack of representativeness and lead to highly erroneous conclusions if statistical tests are used on biased data.

Judgmental sampling, although often rapid to implement, generally precludes the use of the sample data for any purpose other than the original one. If the reviewer elects to proceed with judgmental data, then great care should be taken in interpreting any statistical statements concerning the conclusions to be drawn. Using a probabilistic statement with a judgmental sample should be avoided because it implies a level of statistical certainty that is incorrect. The further the judgmental sample is from a truly random sample, the more questionable the conclusions based on statistical tests.

Probabilistic sampling typically takes more effort to implement than judgmental sampling, because systematic or random locations must be selected for sampling. However, a probability-based sampling design has the advantage of allowing the use of statistical tests, which permit confidence and uncertainty of the results to be specified. Probability-based designs do not preclude the use of expert knowledge or the use of existing data to establish the sampling design. An efficient sampling design is one that uses all available prior information to stratify the site (in

order to improve the representativeness of the resulting samples) and set appropriate parameters. Common types of probabilistic sampling designs include the following:

- Simple random sampling – the method of sampling where samples are collected at random times or locations throughout the sampling period or study area.

- Stratified sampling – a sampling method where a population is divided into nonoverlapping subpopulations called "strata," and sampling locations are selected randomly within each stratum using a random or systematic sampling design.

- Systematic sampling – a randomly selected unit (in space or time) establishes the starting place of a systematic pattern that is repeated throughout the population. With some important assumptions, it can be shown to be equivalent to simple random sampling.

- Ranked set sampling – a field sampling design where expert judgment or an auxiliary measurement method is used in combination with simple random sampling to determine which locations should be sampled.

- Adaptive cluster sampling – a sampling method in which some samples are taken using simple random sampling, and additional samples are taken at locations where measurements exceed some threshold value.

- Composite sampling – a sampling method in which multiple samples are physically mixed into a larger sample and samples for analysis drawn from this larger sample. This technique can be highly cost-effective (but at the expense of variability estimation) and had the advantage it can be used in conjunction with any other sampling design. (Multi-increment sampling is a particular form of composite sampling and may be an effective design for certain types of sites to answer certain types of questions.)

Regardless of the type of sampling scheme, the reviewer should review the description of the sampling design and look for design features that support the project objectives. For example, if the goal of the study is to make a decision about the average (defined here as the arithmetic mean) concentration of a contaminant in an effluent stream over time, then composite samples may be an appropriate sampling design. On the other hand, if the goal of the study is to find hot spots of contamination at a hazardous waste site, compositing should be used with caution, to avoid "averaging away" hot spots.

The reviewer should also look for potential problems in the implementation of the sampling design. For example, if simple random sampling was used to collect the data, can the reviewer be confident that the sampling locations or data points were truly random? Small deviations from a sampling plan probably have minimal effect on the conclusions drawn from the data set, but the effects of significant or substantial deviations should be carefully assessed. Finally, the reviewer should verify that the data are consistent with the project-specific SAP or FSP and the overall objectives of the study.

Conduct a Preliminary Data Review

Step 2 of the DQA process reviews graphical representations of the data and calculates some basic statistical quantities. By reviewing the data both numerically and graphically, the reviewer can understand the structure of the data, and thereby identify appropriate use of the data.

Statistical quantities numerically describe the data. The quantities that are typically calculated include the arithmetic or geometric mean, the median and other percentiles, and the standard deviation. These quantities provide estimates of characteristics for the sample population and allow one to make inferences about the population from which the data were drawn. Graphical representations permit the reviewer to identify patterns and relationships within the data, confirm or disprove assumptions, and identify potential problems.

The preliminary data review allows the reviewer to understand the structure and characteristics of the data set and the population from which these data were drawn. Graphical depictions of the data permit the analyst to identify anomalies that may require further investigation or perhaps even reanalysis by the laboratory. Output from DQA Step 2 typically includes (1) tables of summary statistics and (2) graphs and/or statistical plots of the data.

Select a Statistical Test

Under Step 3 of the DQA process, the data analyst selects the most appropriate statistical test or method for evaluating the data. The statistical method will be selected based on the sampling plan used to collect the data, the type of data distribution, and the assumptions made in setting the DQOs, noting any deviations from these assumptions. Conclusions about other aspects of the data set or the stated null hypothesis are made based on the results of this evaluation. EPA DQA guidance provides a discussion (with mathematical formulas and examples for conducting statistical tests) of the process for statistically evaluating environmental data. Detailed technical information that reviewers can use to select appropriate procedures may be found in Chapter 3 of Data Quality Assessment: Statistical Methods for Practitioners (2006c) (EPA QA/G-9S).

If a particular statistical procedure was specified in the project work plan, the reviewer should use the results of the preliminary data review to determine if the procedure is appropriate for the data collected. If not, then the reviewer should document why the procedure is deemed inappropriate, and then select a different method. Chapter 3 of Data Quality Assessment: Statistical Methods for Practitioners (2006c) (EPA QA/G-9S) provides alternatives for several statistical procedures. If a particular procedure has not been specified, then the reviewer should select a statistical test or method based on the study objectives, results of the preliminary data review, and key assumptions necessary for the method.

All statistical tests make assumptions about the data. For instance, the t-test, which is a parametric test used to compare two data sets, assumes that each data set approximates a normal distribution and that the two data sets have approximately equal variance. In contrast to parametric tests like the t-test, nonparametric tests make much weaker assumptions about the distributional form of the data. However, both parametric and nonparametric tests assume that the data are derived from statistically independent samples.

Common assumptions of statistical tests include distributional form of the data, independence, dispersion characteristics, approximate homogeneity, and the basis for randomization in the sampling design. For example, the one-sample t-test assumes random and independent samples, an approximately normal distribution, no outliers, and no more than a small percentage of nondetections.

Statistical methods that are insensitive to small or moderate departures from the assumptions are called "robust." However, some tests rely on the data meeting certain key assumptions in order for the test results to be valid. The reviewer should note any sensitive assumptions where relatively small deviations could jeopardize the validity of the test results.

After completing Step 3 of the DQA process, the data analyst or reviewer should have selected appropriate statistical tests and noted the critical assumptions of the statistical tests.

Verify Assumptions of the Statistical Tests

The validity of a statistical test or method depends on the key assumptions underlying the test and whether the data violate these assumptions. Minor deviations from assumptions are usually not critical if the statistical technique is sufficiently robust to compensate for such deviations.

If the data do not show serious deviations from the key assumptions of the statistical method, then the DQA process continues to Step 5, "Draw Conclusions from the Data." However, it is possible that if one or more of the assumptions are called into question, this could require a re-evaluation of which test may be most appropriate for the data. It is true that some deviations do not invalidate the results of a statistical test, but this should be confirmed here in Step 4 of the DQA process. For example, deviation from normality may not be seriously important for a large sample size but could be critically important for a small sample size.

This step in the DQA process is an important check on the validity and reliability of the conclusions that are drawn. Outputs from this step include documentation of the method used to verify assumptions and verification that the test results are valid. Additionally, the reviewer should provide a description of any corrective actions that were taken.

Draw Conclusions from the Data

Step 5 of the DQA process represents the culmination of the planning, implementation, and assessment phases of the project operations. In this step, the data analyst draws conclusions that address the project objectives. All of the analysis and review conducted in Steps 1 through 4 should ensure that the conclusions drawn in Step 5 adequately address project objectives in a scientifically defensible manner.

In Step 1, the project objectives are reviewed (or developed retrospectively) and the sampling design is evaluated. In Step 2, the implementation of the sampling scheme is reviewed and a preliminary picture of the data set is developed. In Step 3, the appropriate statistical tests are selected. Finally, the underlying assumptions of the statistical test are verified in Step 4.

Conclusions drawn in the final step of the DQA process allow the reviewer or data analyst to present valid statistical results with a specified level of significance. The confidence and power of the tests are stated, along with the study conclusions in plain English. Finally, the data analyst provides an assessment of the overall performance of the sampling design and identifies additional data that may be needed (that is, data gaps are identified).

If data were collected using a judgmental sampling design or if few samples were collected, professional judgment rather than formal statistical testing may be applied to draw conclusions. Or, statistical tests may be applied, recognizing that the results may present a biased "worst-case scenario." For example, if the data from biased samples (e.g., selective sampling of visibly stained soils) are used in a one-sample statistical test to compare concentrations against a cleanup standard or action level, and test results show that concentrations do not exceed the action level, then a conclusion can be drawn. If test results show that concentrations do exceed the action level, then, in formulating conclusions, the reviewer should balance the test results against the knowledge that the data were biased toward the sampling of "hot spots."

REVISIONS TO THE QA PLAN

Throughout the life of the NBP, there may be changes to program requirements, modifications to the way environmental data are collected, or changes to how enforcement activities are defined. Therefore, this QA Plan is recognized as a dynamic document that is subject to revision, as needed. The Program and Quality Coordinators will examine and revise this QA Plan annually, although the plan will only be resubmitted to EPA Region 9 QA manager for review once every five years or as otherwise needed.

Table D1. Criteria for Cursory and Full Data Validation

Analytical Group	Criteria for Cursory Data Validation	Criteria for Full Data Validation
CLP Organic Analyses	Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Overall assessment of data for an SDG	Holding times Gas Chromatography/Mass Spectroscopy tuning Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Compound identification Target compound list identification Compound quantitation and reported detection limits Tentatively identified compounds System performance Overall assessment of data for an SDG
CLP Inorganic Analyses	Holding times Calibration Blanks Matrix spike recovery Matrix duplicate sample analysis Laboratory control sample or blank spike Field duplicate sample analysis ICP serial dilution Overall assessment of data for an SDG	Holding times Calibration Blanks ICP interference check sample Matrix spike recovery Matrix duplicate sample analysis Laboratory control sample Field duplicate sample analysis Graphite furnace atomic absorption QC Sample result verification ICP serial dilution Detection limits Overall assessment of data for an SDG

Non-CLP Organic Analyses	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Compound identification Detection limits Compound quantitation Sample results verification Other laboratory QC specified by the method Overall assessment of data for an SDG

Notes:
CLP Contract Laboratory Program
ICP Inductively coupled plasma (emission spectroscopy)
SDG Sample delivery group
QC Quality control

Table D2. Example of a Summary DQO Table for a Statistically Based Study.

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
State the Problem	**Identify the Decisions**	**Identify the Inputs to the Decisions**	**Define Study Boundaries**	**Develop Decision Rules**	**Specify Tolerable Limits on Errors**	**Optimize Sampling Design**
Areas of radioactively contaminated soils have been identified and removed from the site; however, existing data for radionuclides and radiogenic indicator parameters (gross alpha and gross beta) in samples of sitewide groundwater and soils collected at the site do not provide sufficient coverage to make defensible remedial decisions for groundwater. Data are also very limited for local background activities of specific radioisotopes. Isotope-specific data are needed to evaluate whether there is site-related radioactive contamination in groundwater at the site, and if so, to delineate the extent of the contamination.	(1) Do the levels of radionuclide species in groundwater from the site exceed regulatory limits? (2) Do the activities of radionuclide species in groundwater from background areas (including seawater) exceed regulatory limits? (3) Has groundwater in areas of radioactively contaminated soils been affected by leaching of site-related radionuclides from soils and into shallow groundwater, such that activities are significantly above background levels? (4) Are high activities of gross beta reported in the existing data set the result of naturally occurring potassium-40 derived from seawater (K-40 mean = 300 pCi/L) or are the beta activities the result of site-related radionuclides?	* New and existing analytical data (validated and defensible) for specific radionuclides in samples of shallow groundwater collected from site and background areas within and outside of the site, including seawater. * Historical documentation and personnel knowledge regarding the handling, treatment, and storage of radioactive materials at the site. * Supporting data for groundwater samples including TSS, TDS, pH, and conductivity. * Background data reported in the literature for radionuclides and radiological indicators. * Hydrogeologic information including water level, gradient, seasonal fluctuations, and flow directions. * Information on well construction, depth of screened intervals and well production volumes. * PRGs or other regulatory screening levels for radionuclides. * Knowledge of the geochemical behavior of various radioactive elements.	The lateral boundary of the study area includes wells throughout the site and off-site areas for additional background samples. The vertical boundary of the study extends from 0 feet bgs and into shallow groundwater. The temporal boundary of the study is constrained by the period of performance, which is estimated to be 12 months.	(1a) If levels of radionuclides in site samples exceed regulatory limits, then site data will be compared with background data. (1b) If levels of radionuclides do not exceed regulatory limits, then the groundwater will not be further evaluated or remediated. (2a) If background radioactivity exceeds regulatory limits, realistic cleanup goals for radioactivity at the site will be established, such that the cleanup levels are not below background. (2b) If background radioactivity does not exceed regulatory limits, then regulatory limits or a site-specific cleanup level will be used at the site. (3a) If analytical data show statistically significant differences in the activities of radionuclides in site and background waters, then site groundwater in the area will be further evaluated and remedial action may be recommended. (3b) If analytical data show statistically indistinguishable activities of radionuclides in site and background waters, then site groundwater in the area will be considered not contaminated and remediation will not be recommended. (4a) If gross beta activity correlates strongly with naturally occurring activities of K-40 in seawater, then gross beta will not be used as an indicator for site-related effects. (4b) If gross beta activity shows no correlation with naturally occurring activities of K-40, then gross beta may be used as an indicator for site-related effects.	Measurement quality objectives (MQOs) will be established for sample analyses, and the analytical data will undergo QA/QC review to ensure that MQOs are met. Appropriate parametric or nonparametric one-sample or two-samples tests will be used to compare radionuclide activities to cleanup levels or to a background population, with a 95 percent level of confidence (that is, the null hypothesis that the site data do not exceed regulatory limits [one-sample tests] or that data sets are taken from the same population [two-sample tests] will be rejected if the p-value for the statistical test is less than 0.05). MDAs reported by the laboratories will be compared with regulatory limits to make certain that analytical methods are sufficiently sensitive.	Groundwater sampling is limited to existing wells (at this point, no new wells will be installed for the data gap sampling). Two rounds of sampling will be collected from 37 existing monitoring wells. Five of the 37 are background wells and the remaining 32 wells include those near areas where radioactively contaminated soils have been identified, in areas downgradient of buildings where radioactive materials were handled or stored, and in other areas to provide adequate spatial coverage across the site. In addition, samples of seawater and potable water will be collected and analyzed.

Table D3. Example of a Summary DQO Table for a Non-Statistically Based Study.

STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6	STEP 7
State the Problem	**Identify the Decisions**	**Identify the Inputs to the Decisions**	**Define Study Boundaries**	**Develop Decision Rules**	**Specify Tolerable Limits on Errors**	**Optimize Sampling Design**
Five geophysical anomalies thought to be buried metallic objects were noted at the site during an airborne geophysical survey in 1994. These anomalies are immediately upgradient of a VOC plume in groundwater and may indicate the presence of buried drums or tanks that are the source of VOCs in downgradient groundwater. A ground-based geophysical survey and soil gas sampling are needed to evaluate the geophysical anomalies as the potential source of VOC contaminants in groundwater. Additionally, excavation and soil sampling may be needed to further characterize and delineate the extent of contamination.	1) Can the locations and signatures of the geophysical anomalies be determined with certainty, using the ground-based EM-31 and magnetometer surveys? 2) Does soil gas in the area of the anomalies contain elevated levels of VOCs? 3) Are subsurface soils around the buried objects contaminated with VOCs? That is, do these soils contain significant amounts of VOCs? 4) If contaminated soils are found, what is the lateral and vertical extent of the contamination?	Historical analytical data for contaminants at each site. Validated defensible chemical data for soil samples collected at each site. Land survey and GPS location data. Toxicological and risk management data, in the form of site-specific action levels.	The proposed lateral boundaries of each site are shown in Figures X, Y and Z. Lateral boundaries may be extended based on step-out sampling. The vertical boundaries extend from the land surface to the water table The temporal boundary of the study is anticipated to be 18 months.	1a) If the locations and signatures of the geophysical anomalies can be determined with certainty, using the ground-based EM-31 and magnetometer surveys, then plot exact locations of anomalies on contoured maps of the site and use these to direct future sampling. 1b) If the locations and signatures of the geophysical anomalies cannot be determined with certainty, using the ground-based EM-31 and magnetometer surveys, then conduct exploratory excavations to locate anomalies. 2a) If samples of soil gas contain elevated concentrations of VOCs near the anomalies, then collect subsurface soil samples for analysis and pursue investigation of anomalies as the sources of VOC contamination. 2b) If samples of soil gas do not contain elevated concentrations of VOCs near the anomalies, then pursue investigation of other possible sources. 3a) If subsurface soils around the buried objects contain significant amounts of VOCs, then these soils, along with any potential source (e.g., leaking drum), will be excavated and disposed of at an appropriate disposal facility. Additional step-out samples will be collected to delineate the lateral and vertical extent of the contamination. 3b) If subsurface soils do not contain significant amounts of VOCs, then the study will pursue investigation of other possible sources for the VOC plume in downgradient groundwater.	The number of samples to be collected is not statistically based and will depend on the number of step-out samples needed to delineate the areal extent of contamination. The location and number of samples collected will be based on professional judgment. MQOs established for analytical data are described in the SAP.	The number and type of samples to be collected at the site will be based on professional judgment using the results from the previous survey/ sampling activity conducted during this project. The number and type of samples will also consider budget and schedule constraints for this project.

REFERENCES

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EPA. 2002. Guidance on Environmental Data Verification and Data Validation. QA/G-8. EPA/240/R-02/004. November.

EPA. 2002. Guidance on Choosing a Sampling Design for Environmental Data Collection (for Use in Developing a Quality Assurance Project Plan). EPA QA/G5S. EPA/240/R-02/005. December.

EPA. 2003. Guidance on Assessing Quality Systems. EPA QA/G-3. EPA/240/R-03/002. March.

EPA. 2006a. Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA QA/G-4. EPA/240/B/05-003. February.

EPA. 2006b. Data Quality Assessment: A Reviewer's Guide. EPA QA/G-9R. EPA/240/B-06/002. February.

EPA. 2006c. Data Quality Assessment: Statistical Methods for Practitioners. EPA QA/G-9S. EPA/240/B/05-003. February.

EPA. 2021. "Region 9 Regional Screening Levels." On-line address: https://www.epa.gov/risk/regional-screening-levels-rsls. May.

EPA Quality System Documents Are Available On-Line at: https://www.epa.gov/quality

EPA QA/G-1	*Guidance for Developing Quality Systems for Environmental Programs*
EPA QA/R-2	*EPA Requirements for Quality Management Plans*
EPA QA/G-3	*Guidance on Assessing Quality Systems*
EPA QA/G-4	*Guidance for the Data Quality Objectives Process*
EPA QA/G-4D	*Decision Error Feasibility Trials (DEFT) Software*
EPA QA/R-5	*EPA Requirements for Quality Assurance Project Plans*
EPA QA/G-5	*Guidance for Quality Assurance Project Plans*
EPA QA/G-5G	*Guidance for Geospatial Data Quality Assurance Project Plans*
EPA QA/G-5M	*Guidance for Quality Assurance Project Plans for Modeling*
EPA QA/G-5S	*Guidance on Choosing a Sampling Design for Environmental Data Collection*
EPA QA/G-6	*Guidance for Preparing Standard Operating Procedures*
EPA QA/G-7	*Guidance on Technical Audits and Related Assessments for Environmental Data Operations*
EPA QA/G-8	*Guidance on Environmental Data Verification and Data Validation*
EPA QA/G-9	*Guidance for Data Quality Assessment: Practical Methods for Data Analysis*
EPA QA/G-10	*Guidance for Developing a Training Program for Quality Systems*
EPA QA/G-11	*Guidance on Quality Assurance for Environmental Technology Design, Construction and Operation*

APPENDIX A
LABORATORY CERTIFICATION PROGRAM
NEVADA BUREAU OF WATER QUALITY PLANNING

APPENDIX A: LABORATORY CERTIFICATION PROGRAM
Certification of Laboratories to Analyze Substances in Water

A1. DEFINITIONS

NAC 445A.0552 Definitions. (NRS 445A.425**,** 445A.428**)** As used in NAC 445A.0552 to 445A.067, inclusive, unless the context otherwise requires, the words and terms defined in NAC 445A.0554 to 445A.0606, inclusive, have the meanings ascribed to them in those sections. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0554 "Accuracy" defined. (NRS 445A.425**,** 445A.428**)** "Accuracy" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0556 "Analyst" defined. (NRS 445A.425**,** 445A.428**)** "Analyst" means a chemist, microbiologist, physicist or technician who:

1. Is qualified to conduct analyses of environmental samples pursuant to the provisions of the manual specified in paragraph (e) of subsection 1 of NAC 445A.0612; and
2. Performs those tests or assists in performing those tests with other qualified employees of a certified laboratory.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0558 "Analyte" defined. (NRS 445A.425**,** 445A.428**)** "Analyte" means any compound, element, radical, isotope, contaminant organism, species or other substance for which an environmental sample is tested by a laboratory. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0562 "Approved method of testing" defined. (NRS 445A.425**,** 445A.428**)** "Approved method of testing" means a laboratory procedure specified in subsection 4 of NAC 445A.0622 that is approved by the Environmental Protection Agency or the Division to test an environmental sample. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0564 "Certified laboratory" defined. (NRS 445A.425, 445A.428**)** "Certified laboratory" means a laboratory for which a certificate to conduct analyses of water is issued pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive.
(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0566 "Commission" defined. (NRS 445A.425, 445A.428**)** "Commission" means the State Environmental Commission. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0568 "Director" defined. (NRS 445A.425**,** 445A.428**)** "Director" means:

1. A person who is qualified to administer any technical or scientific operation of a certified laboratory and supervise the procedures for the testing and reporting of the results of tests pursuant to the provisions of the Standards; or
2. A chemist, microbiologist or physicist who is qualified to engage in an activity specified in subsection 1 pursuant to the provisions of the manual specified in paragraph (e) of subsection 1 of NAC 445A.0612.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0572 "Division" defined. (NRS 445A.425, 445A.428**)** "Division" means the Division of Environmental Protection of the State Department of Conservation and Natural Resources. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0574 "Environmental sample" defined. (NRS 445A.425**,** 445A.428**)** "Environmental sample" means a sample of any substance obtained from any natural source or any source that may reasonably be expected to pollute or receive pollution from the atmosphere, supplies of drinking water, groundwater, surface water, soil, sediment or ecosystem biota of this State, including, without limitation:

1. Ambient air;
2. Emissions of air from point sources;
3. Drinking water;
4. Receiving waters;
5. Soil or sediment;
6. Effluents from industrial, municipal or residential sources;
7. Samples from facilities used to store or handle chemicals;
8. Facilities used to dispose of waste;
9. Runoff of surface water; and
10. Samples obtained from facilities used to handle or apply substances for the control of weeds or insects.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0576 "Federal Act" defined. (NRS 445A.425**,** 445A.428**)** "Federal Act" means the Clean Water Act, 33 U.S.C. §§ 1251 et seq. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0578 "National Environmental Laboratory Accreditation Conference" defined. (NRS 445A.425**,** 445A.428**)** "National Environmental Laboratory Accreditation Conference" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards.
(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0582 "National Environmental Laboratory Accreditation Program" defined. (NRS 445A.425**,** 445A.428**)** "National Environmental Laboratory Accreditation Program" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards.
(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0584 "Performance-based measurement system" defined. (NRS 445A.425**,** 445A.428**)** "Performance-based measurement system" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0588 "Precision" defined. (NRS 445A.425**,** 445A.428**)** "Precision" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0592 "Proficiency test sample" defined. (NRS 445A.425**,** 445A.428**)** "Proficiency test sample" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0594 "Proficiency testing program" defined. (NRS 445A.425**,** 445A.428**)** "Proficiency testing program" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0596 "Quality control sample" defined. (NRS 445A.425**,** 445A.428**)** "Quality control sample" means an uncontaminated environmental sample that is spiked with a known analyte and provided to a laboratory for analysis to determine the performance of the laboratory in testing for the

presence of that analyte by using a specified method of testing for the analyte. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0598 "Quality manual" defined. (NRS 445A.425**,** 445A.428**)** "Quality manual" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0602 "Sensitivity" defined. (NRS 445A.425**,** 445A.428**)** "Sensitivity" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards.
(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0604 "Spike" defined. (NRS 445A.425**,** 445A.428**)** "Spike" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0606 "Standards" defined. (NRS 445A.425**,** 445A.428**)** "Standards" means the Standards of the National Environmental Laboratory Accreditation Conference adopted by reference pursuant to the provisions of NAC 445A.0608.
(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

A2. GUIDELINES AND PROCEDURES

NAC 445A.0608 Adoption by reference of *National Environmental Laboratory Accreditation Conference-Constitution, Bylaws and Standards*. (NRS 445A.425**,** 445A.428**)** The Commission hereby adopts by reference the *National Environmental Laboratory Accreditation Conference-Constitution, Bylaws and Standards*, EPA 600/R-98/151, in the form most recently published by the Environmental Protection Agency, unless the Commission gives notice pursuant to the provisions of NAC 445A.067 that the most recent publication is not suitable for this State. The publication is available, free of charge, from the Environmental Protection Agency, Office of Research and Development, 401 M Street, S.W., Washington, D.C. 20460, or from the Environmental Protection Agency at the Internet address http://www.epa.gov/ttn/nelac.
(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0612 Adoption by reference of certain publications related to sample collection procedures, analytical methodologies and requirements for certification. (NRS 445A.425**,** 445A.428**)**

1. The Commission hereby adopts by reference the following publications in the forms most recently published, unless the Commission gives notice pursuant to the provisions of NAC 445A.067 that the most recent publication is not suitable for this State. The publications are available, unless otherwise provided in this section, by mail from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, or by telephone at (800) 553-6847. The publications may also be obtained from the National Technical Information Service at the Internet address http://www.ntis.gov/ordering.htm. The publications are:

(a) *Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA)*, EPA/910/9-92/029, Order Number PB93-180818, for the price of $37.

(b) *DBP/ICR Analytical Methods Manual*, EPA/814/B-96/002, Order Number PB96-157516, for the price of $52.

(c) *ICR Microbial Laboratory Manual*, EPA/600/R-95/178, Order Number PB96-157557, for the price of $74.

(d) *ICR Sampling Manual*, April 1996, EPA/814/B-96/001, Order Number PB96-157508, for the price of $52.

(e) *Manual for the Certification of Laboratories Analyzing Drinking Water: Criteria and Procedures, Quality Assurance*, 4th edition, EPA/815/B-97/001, Order Number PB97-171490, for the price of $51.

(f) *Method 100.2: Determination of Asbestos Structures over 10 Micrometers in Length in Drinking Water*, June 1994, EPA/600/R-94/134, Order Number PB94-201902, for the price of $33.50.

(g) *Method 1613: Tetra-Through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS, Revision B*, October 1994, EPA/821/B-94/005B, Order Number PB95-104774, for the price of $39.50.

(h) *Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-Polar Material) by Extraction and Gravimetry*, February 1999, EPA/821/R-98/002, Order Number PB99-121949, for the price of $33.50. The publication is also available, free of charge, from the Environmental Protection Agency at the Internet address **http://www.epa.gov/ost/methods/1664f051.html** .

(i) *Methods for the Determination of Inorganic Substances in Environmental Samples*, August 1993, EPA/600/R-93/100, Order Number PB94-120821, for the price of $52.

(j) *Methods for the Determination of Metals in Environmental Samples*, EPA/600/4-91/010, Order Number PB91-231498, for the price of $81.

(k) *Methods for the Determination of Metals in Environmental Samples, Supplement I*, EPA/600/R-94/111, Order Number PB95-125472, for the price of $74.

(l) *Methods for the Determination of Nonconventional Pesticides in Municipal and Industrial Wastewater, Volume I, Revision 1*, August 1993, EPA/821/R-93/010A, Order Number PB94-121654, for the price of $152.50.

(m) *Methods for the Determination of Organic Compounds in Drinking Water, Supplement 1*, EPA/600/4-90/020, Order Number PB91-146027, for the price of $68.50.

(n) *Methods for the Determination of Organic Compounds in Drinking Water, Supplement 2*, EPA/600/R-92/129, Order Number PB92-207703, for the price of $74.

(o) *Methods for the Determination of Organic Compounds in Drinking Water, Supplement 3*, EPA/600/R-95/131, Order Number PB95-261616, for the price of $117.

(p) *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th edition, EPA/600/4-90/027F, Order Number PB94- 114733, for the price of $81.

(q) *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms*, 3rd edition, EPA/600/4-91/002, Order Number PB96-141452, for the price of $86.50.

(r) *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms*, 2nd edition, EPA/600/4-91/003, Order Number PB96-141445, for the price of $111.50.

(s) *Technical Notes on Drinking Water Methods*, EPA/600/R-94/173, Order Number PB95-104766, for the price of $37.

(t) *Test Methods for "Escherichia Coli" in Drinking Water: EC Medium with Mug Tube Procedure*, *Nutrient Agar with Mug Membrane Filter Procedure*, EPA/600/4-91/016, Order Number PB91-234591, for the price of $17.50.

(u) *USEPA Contract Laboratory Program: Statement of Work for Organics Analysis: Multi-Media, Multi-Concentration, OLM01.0 (Includes Revisions OLM01.1 through OLM01.8)*, EPA/540/R-94/078, May 2005: http://www.epa.gov/superfund/programs/clp/download/som/som11a-c.pdf

(v) *USEPA Contract Laboratory Program: Statement of Work for Inorganics Analysis: Multi-Media, Multi-Concentration, ILM02.1*, EPA/540/R-94/095, Order Number PB95-963514, for the price of $81. The publication is also available, free of charge, from the Environmental Protection Agency at the Internet address http://www.epa.gov/superfund/programs/clp/ilm5.htm

2. The Commission hereby adopts by reference the following publications in the forms most recently published, unless the Commission gives notice pursuant to the provisions of NAC 445A.067 that the most recent publication is not suitable for this State. The publications are available by mail

from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, or by telephone at (800) 553-6847. The publications are:

(a) *Interim Radiochemical Methodology for Drinking Water*, EPA/600/4-75-008, Order Number PB253258, for the price of $37.

(b) *Method 100.1: Analytical Method for Determination of Asbestos Fibers in Water*, September 1983, EPA/600/4-83-043, Order Number PB83-260471, for the price of $78.50.

(c) *Methods for the Chemical Analysis of Water and Wastes*, EPA/600/4-79-020, Order Number PB84-128677, for the price of $117.

(d) *Methods for the Determination of Organic Compounds in Drinking Water*, Revised July 1991, EPA/600/4-88/039, Order Number PB91-231480, for the price of $89.50.

(e) *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA/600/4-80-032, Order Number PB80-224744, for the price of $47.50.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0614 Adoption by reference of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*. (NRS 445A.425, 445A.428**)** The Commission hereby adopts by reference *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, 3rd edition, and *Updates I, II, IIA, IIB and III*, Publication Number 955-001-00000-1, in the form most recently published, unless the Commission gives notice pursuant to the provisions of NAC 445A.067 that the most recent publication is not suitable for this State. The publication is available by mail from the Superintendent of Documents, United States Government Printing Office, P.O. Box 371954, Pittsburgh, Pennsylvania 15250-7954, or by telephone at (202) 512-1800, for the price of $367. The publication is also available, free of charge, from the Environmental Protection Agency at the Internet address http://www.epa.gov/epaoswer/hazwaste/test/main.htm. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0615 Adoption by reference of *Method 1600: Membrane Filter Test Method for Enterococci in Water*. (NRS 445A.425, 445A.428**)** The Commission hereby adopts by reference *Method 1600: Membrane Filter Test Method for Enterococci in Water*, May 1997, EPA-821-R-97-004, in the form most recently published, unless the Commission gives notice pursuant to the provisions of NAC 445A.067 that the most recent publication is not suitable for this State. The publication is available, free of charge, by mail from the Environmental Protection Agency, National Center for Environmental Publications and Information, P.O. Box 42419, Cincinnati, Ohio 45242-0419, or by telephone at (800) 490-9198. (Added to NAC by Environmental Comm'n by R061-04, eff. 10-7-2004)

NAC 445A.0616 Adoption of certain ASTM standards and other publications related to calibration and testing laboratories, and examination of water and wastewater. (NRS 445A.425, 445A.428**)** The following publications are hereby adopted by the Commission in the forms most recently published, unless the Environmental Protection Agency fails to publish notice of its approval of the publication in the Federal Register or the Commission gives notice pursuant to the provisions of NAC 445A.067 that the most recent publication is not suitable for this State:

1. *Annual Book of ASTM Standards,* Section 5, "Petroleum Products, Lubricants, and Fossil Fuels," which is available by mail from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, by telephone at (610) 832-9585 or at the Internet address http://www.astm.org, for the price of $999.

2. *Annual Book of ASTM Standards,* Section 11, "Water and Environmental Technology," which is available by mail from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, by telephone at (610) 832-9585 or at the Internet address http://www.astm.org, for the price of $906.

3. *ISO/IEC Guide 25, General Requirements for the Competence of Calibration and Testing Laboratories*, 1990, which is available by mail from Global Engineering Documents, 15 Inverness

Way East, Englewood, Colorado 80112-5776, by telephone at (800) 854-7179 or at the Internet address http://www.global.ihs.com, for the price of $35.

4. *Standard Methods for the Examination of Water and Wastewater*, Order Number 10079, available by mail from the American Water Works Association, Customer Service, 6666 West Quincy Avenue, Denver, Colorado 80235, by telephone at (800) 926-7337 or at the Internet address http://www.awwa.org/bookstore/ProductList.cfm, for the price of $155 for members and $200 for nonmembers.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0618 Interpretation of provisions; resolution of conflicting requirements. (NRS 445A.425**,** 445A.428**)**

1. The provisions of NAC 445A.0552 to 445A.067, inclusive, must not be interpreted to circumvent any of those provisions to make them less effective. If more than one interpretation exists for any of those provisions, the more restrictive interpretation applies.

2. If any publication adopted by reference pursuant to the provisions of NAC 445A.0612 to 445A.0616, inclusive, conflicts with any provision of NAC 445A.0552 to 445A.067, inclusive, or with the Standards, the provision set forth in NAC 445A.0552 to 445A.067, inclusive, or the Standards applies.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0622 Scope of certification. (NRS 445A.425**,** 445A.428**)**

1. A laboratory may obtain certification pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive, to perform analyses for the purposes of NRS 445A.300 to 445A.730, inclusive, to detect the presence of hazardous waste or a regulated substance in soil or water.

2. The scientific disciplines for which a laboratory may obtain certification are:

(a) Chemistry;

(b) Whole Effluent Toxicity;

(c) Microbiology; and

(d) Radiochemistry.

3. A laboratory may obtain certification pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive, for any program relating to the analysis of water approved by the Environmental Protection Agency pursuant to the Federal Act.

4. Except as otherwise provided in subsection 5, the approved methods of testing for which a laboratory may obtain certification are set forth in:

(a) Title 40 C.F.R. § 136.3 and Appendices A, C and D to 40 C.F.R. Part 136;

(b) Appendices A and B to 40 C.F.R. Part 425;

(c) Title 40 C.F.R. § 434.64;

(d) Appendices 1 and 2 to 40 C.F.R. Part 435, Subpart A;

(e) Table 7 to 40 C.F.R. Part 455;

(f) Title 40 C.F.R. § 465.03(c);

(g) Title 40 C.F.R. § 503.8; and

(h) The publications specified in paragraphs (h) to (r), inclusive, of subsection 1 of NAC 445A.0612, NAC 445A.0615 and subsections 1, 2 and 4 of NAC 445A.0616.

5. A laboratory may obtain certification to use a performance-based measurement system or any other alternative method of testing if the laboratory:

(a) Complies with the provisions of subsection 5 of NAC 445A.0626;

(b) Obtains approval for that method of testing from the Environmental Protection Agency pursuant to the provisions of 40 C.F.R. § 403.7(b)(2)(v), 403.12(b)(5)(vi) or 403.12(g)(4);

(c) Complies with the requirements for application set forth in 40 C.F.R. § 136.4; and

(d) Provides proof and evaluates the performance-based measurement system or other alternative method of testing in accordance with the provisions of:

(1) Appendix E of chapter 5 of the Standards;

(2) "Guidelines Establishing Test Procedures for the Analysis of Pollutants: Flexibility in Existing Test Procedures and Streamlined Approach for Approving New Test Methods," set forth in Volume 62 of the Federal Register at pages 14975 et seq., March 28, 1997; and

(3) "Performance Based Measurement System," set forth in Volume 62 of the Federal Register at pages 52098 et seq., October 6, 1997.

6. To be certified to conduct an analysis of an analyte using an approved method of testing specified in subsection 4, the analyte must be listed by the Division in the approved method of testing pursuant to that subsection.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0624 Categories of analytes for which laboratory may be certified. (NRS 445A.425**,** 445A.428**)** For the purposes of charging and collecting fees and conducting performance evaluations pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive, the Division shall classify each analyte for which a laboratory may be certified into the following categories:

1. Asbestos.
2. Cyanide.
3. Demands.
4. Dioxin.
5. Herbicides.
6. Microbiology.
7. Minerals.
8. Nutrients.
9. Oil and grease.
10. Perchlorate.
11. Pesticides.
12. Phenolics.
13. Polyaromatic hydrocarbons.
14. Polychlorinated biphenyls in oil.
15. Polychlorinated biphenyls in wastewater.
16. Radiochemistry.
17. Residual chlorine.
18. Residue.
19. Semivolatile organic chemistry.
20. Synthetic Organic Compounds Group 1 (includes semivolatile organic chemistry, pesticides, herbicides and polyaromatic hydrocarbons).
21. Toxicity bioassay.
22. Trace metals.
23. Volatile organic chemistry.
24. Any other individual contaminant.
25. Any other individual multicontaminant method.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0626 Requirements for certification. (NRS 445A.425**,** 445A.428**)**

1. To be certified to conduct laboratory testing, a laboratory must comply with the requirements set forth in sections 1.8.3, 4.1.1, 5.0, 5.1, 5.4 and 5.5 of the Standards.

2. To be certified in:

(a) Chemistry, a laboratory must comply with the requirements set forth in section 1.8.5 and Appendix D.1 of chapter 5 of the Standards;

(b) Whole effluent toxicity, a laboratory must comply with the requirements set forth in section 1.8.6 of the Standards and Appendix D.2 of chapter 5 of the Standards;

(c) Microbiology, a laboratory must comply with the requirements set forth in section 1.8.7 and Appendix D.3 of chapter 5 of the Standards; or

(d) Radiochemistry, a laboratory must comply with the requirements set forth in section 1.8.8 and Appendix D.4 of chapter 5 of the Standards.

3. To be certified pursuant to the program specified in subsection 3 of NAC 445A.0622, a laboratory must comply with:

(a) The provisions concerning method detection limits, sample containers, holding times and preservation set forth in 40 C.F.R. § 136.3(e) and Appendix B to that part;

(b) The provisions of 40 C.F.R. §§ 403.7(b)(2), 403.12(b)(5) and 403.12(g)(4), if applicable;

(c) The provisions concerning the methods set forth in 40 C.F.R. § 455.50, if the laboratory conducts tests for active ingredients in pesticides; and

(d) The provisions concerning the collection of representative samples and the methods set forth in 40 C.F.R. §§ 501.15(b)(10)(iv) and 503.8, if the laboratory conducts tests of sewage sludge.

4. To be certified for an approved method of testing, a laboratory must comply with the requirements for using that approved method of testing specified in subsection 4 of NAC 445A.0622 and the Standards. If a conflict occurs between a provision specified in that subsection and the Standards concerning an approved method of testing, the Standards apply. If a manufacturer provides instructions for maintaining any equipment used for testing or for ensuring the performance of any test or demonstrating the performance of any system of measurement, the laboratory shall comply with those instructions. If a conflict occurs between a provision of those instructions and a provision specified in subsection 4 of NAC 445A.0622 or the Standards, the provisions specified in that section or the Standards apply.

5. If a laboratory intends to use a performance-based measurement system or any other alternative method of testing, the laboratory shall, before the Division conducts an inspection of the laboratory pursuant to the provisions of NAC 445A.0638, submit to the Division a written statement setting forth the performance-based measurement system or other alternative method of testing it intends to use. The Division may approve the performance-based measurement system or alternative method of testing if, as determined by the Division:

(a) The system or method is equivalent to or exceeds the approved method of testing for accuracy, precision, completeness and comparability relating to determining compliance with the regulatory concentration levels or system conditions;

(b) An approved method of testing is not available for use by the laboratory to determine the presence of an analyte for which the laboratory requests certification pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive; or

(c) The laboratory obtains approval for the system or method from the Environmental Protection Agency.

6. To be certified to test for a specific analyte using an approved method of testing, a laboratory must comply with the requirements established by the Division for the approved method of testing and the standards for initial and continuing calibrations of test equipment and demonstrations by analysts of precision, accuracy, sensitivity and low system background for each analyte. If a conflict occurs between the requirements established by the Division and the Standards, the Standards apply.

7. As used in this section:

(a) "Holding times" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards.

(b) "Limit of detection" means the smallest amount or concentration of an analyte that can be reliably detected in a given sample by a specific measurement process.

(c) "Low system background" means an analysis of a method blank that does not yield contamination at a concentration that is greater than the method detection limit or the limit of detection, whichever is applicable to the particular analyte.

(d) "Method blank" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards.

(e) "Method detection limit" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0628 Certification by Division or pursuant to National Environmental Laboratory Accreditation Program. (NRS 445A.425, 445A.428)

1. A laboratory may apply for certification by the Division or certification pursuant to the National Environmental Laboratory Accreditation Program.

2. To obtain certification by the Division, a laboratory must comply with the provisions of NAC 445A.0552 to 445A.067, inclusive.

3. A laboratory that is certified by the Division may provide analytical data for an environmental sample originating in this State for each analyte for which the laboratory is certified.

4. To obtain certification pursuant to the National Environmental Laboratory Accreditation Program, a laboratory must:

(a) Comply with the provisions of NAC 445A.0552 to 445A.067, inclusive;

(b) Before obtaining certification pursuant to the Program and every 2 years after obtaining that certification, submit to an assessment of the laboratory conducted at the laboratory under the direction of a person who is approved pursuant to the Program; and

(c) Specify in its application for certification at least one approved method of testing an analyte pursuant to the provisions of subsections 4 and 6 of NAC 445A.0622.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0632 Application for certification. (NRS 445A.425, 445A.428)

1. To apply for certification pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive, the director of the laboratory for which certification is requested must submit an application to the Division on a form approved by the Division. The application must be accompanied by the fees prescribed in NAC 445A.066 and include the information specified in sections 4.1.7 and 4.1.9 of the Standards.

2. The provisions of this section do not require an application and certificate for each building or other portion of a certified laboratory that:

(a) Is operated by the same management, quality manual and quality assurance officer as the certified laboratory;

(b) Uses only methods for which the laboratory is certified;

(c) Does not issue reports directly but forwards data to the certified laboratory for reporting purposes; and

(d) The Division determines is used to analyze the same environmental samples as the certified laboratory.

➥ As used in this subsection, "quality assurance officer" means the quality assurance officer specified in section 5.4.2 of the Standards.

3. The Division shall not consider an application for certification submitted pursuant to this section to be complete unless:

(a) The laboratory specifies in the application the approved methods of testing in accordance with the provisions of NAC 445A.0622;

(b) The laboratory satisfactorily analyzes proficiency test samples in accordance with the provisions of NAC 445A.0634;

(c) The laboratory adopts a quality manual and submits the manual to the Division pursuant to the provisions of NAC 445A.0636;

(d) Except for a laboratory that complies with the provisions of NAC 445A.0665, the Division conducts an inspection of the laboratory for the approved methods of testing analytes for which the laboratory requests certification pursuant to the provisions of NAC 445A.0638;

(e) If the report of an inspection of the laboratory conducted by the Division includes any deficiency that must be corrected, the laboratory submits to the Division a written plan to correct the deficiency in accordance with the provisions of subsection 7 of NAC 445A.0638;

(f) The director of the laboratory is qualified for that position pursuant to the provisions of subsection 4.1 of chapter 4 of the Standards; and

(g) The applicable fees prescribed in NAC 445A.066 have been paid.

4. An application for certification shall be deemed withdrawn by the applicant if it is not completed pursuant to the provisions of this section within 1 year after the Division receives the application. The Division may extend the period in which an application must be completed pursuant to this subsection if the applicant submits to the Division a written request for an extension setting forth the reasons for the request.
(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0634 Participation in proficiency testing program. (NRS 445A.425, 445A.428)

1. Each laboratory for which an application for certification is submitted and each certified laboratory must participate in a proficiency testing program. The laboratory must:

(a) Obtain single-blind proficiency test samples from a provider approved by a Proficiency Testing Oversight Body/Proficiency Testing Provider Accreditor;

(b) Analyze the proficiency test samples, if available, for each category of certification and analyte that is included in the program; and

(c) Report the results of the analysis to the provider specified in paragraph (a).

➥ If the laboratory is a certified laboratory and if a test will be conducted for each category of certification and analyte for which the laboratory is certified, the certified laboratory must analyze a proficiency test sample pursuant to the program not less than once every 6 months.

2. Each laboratory specified in subsection 1 shall pay the costs of subscribing to a program specified in that subsection.

3. Each laboratory specified in subsection 1 must satisfactorily analyze each analyte that is included in the program specified in subsection 3 of NAC 445A.0622 on two of the most recent three rounds of testing. Each laboratory shall, before obtaining a proficiency test sample pursuant to paragraph (a) of subsection 1, authorize the provider of the proficiency test sample to submit to the Division the results of any test taken pursuant to the provisions of this section. If the laboratory fails to provide that authorization, the Division may refuse to consider the results of any test taken pursuant to those provisions.

4. The Division shall consider the results of any test taken pursuant to this section to be satisfactory if the results are within the limits of acceptance established by the provider of the proficiency test samples in accordance with the provisions of Appendix C of chapter 2 of the Standards.

5. If the Division determines that the results of a test are satisfactory, the laboratory may be certified to use any approved method of testing for each analyte that is satisfactorily analyzed by the laboratory if, as determined by the Division, data sufficient to validate the use of that method of testing on an annual basis are available. If such data are not available, the Division shall deny or revoke certification for that method of testing. As used in this subsection, "data sufficient to validate" means performance of an initial demonstration of capability as defined in section 7.2.8 of the manual specified in paragraph (e) of subsection 1 of NAC 445A.0612.

6. If a certified laboratory fails:

(a) Two rounds of testing pursuant to subsection 3, the Division shall suspend the certification of that laboratory for each analyte the laboratory failed to analyze during those rounds; or

(b) Three rounds of testing pursuant to that subsection, the Division shall revoke the certification of that laboratory for each analyte the laboratory failed to analyze during those rounds.

7. If the Division suspends the certification of a certified laboratory pursuant to subsection 6 because the laboratory failed two nonconsecutive rounds of testing, the Division shall reinstate the certification of that laboratory for the method of testing an analyte for which the certification was suspended if the certified laboratory satisfactorily analyzes the analyte in a proficiency test sample that is approved by the Division.

8. If the Division suspends the certification of a certified laboratory pursuant to subsection 6 because the laboratory failed to analyze an analyte on two consecutive rounds of testing, the laboratory must satisfactorily analyze the analyte during each of two consecutive rounds of testing conducted after the Division suspends the certification.

9. If the Division revokes the certification of a certified laboratory pursuant to subsection 6, the laboratory must:

(a) Analyze satisfactorily the analyte for which the certification was revoked during each of two consecutive rounds of testing conducted after the Division revoked the certification; and

(b) Reapply for certification and pay the applicable fees pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive.

➥ If a certified laboratory complies with the provisions of this subsection and is otherwise qualified for certification pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive, the Division shall reinstate the certification of the laboratory for each method of testing and analyte for which the laboratory was certified.

10. Each certified laboratory must comply with the requirements concerning enrollment, testing, conduct and participation in the program specified in subsection 1 pursuant to the provisions of sections 2.4, 2.5 and 2.7 of the Standards.

11. As used in this section, "Proficiency Testing Oversight Body/Proficiency Testing Provider Accreditor" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0636 Adoption of quality manual by laboratory; contents. (NRS 445A.425, 445A.428**)**

1. Each laboratory that applies for certification pursuant to NAC 445A.0552 to 445A.067, inclusive, shall adopt a quality manual and comply with the provisions of that manual. The director of the laboratory shall submit the manual to the Division before the Division conducts an inspection of the laboratory.

2. Each quality manual specified in subsection 1 must be adopted in accordance with the provisions of section 5.5 of the Standards and include, without limitation:

(a) A statement setting forth the requirements of the laboratory for sensitivity, precision and accuracy for each method of testing or analyte for which the laboratory requests certification;

(b) The policy of the laboratory concerning any unauthorized use of data or fraudulent activity that occurs at the laboratory; and

(c) The policy of the laboratory concerning the collection of samples for the purpose of determining compliance with the Federal Act. The policy must provide that:

(1) A person taking a sample shall sign and date an attestation indicating the validity and authenticity of the sample; and

(2) Tampering with or intentionally mislabeling the location, date, time or collection of a sample may be considered grounds for the denial of an application for certification or the revocation, suspension or limitation of certification pursuant to the provisions of NAC 445A.0642.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0638 Inspection of laboratory by Division. (NRS 445A.425, 445A.428**)**

1. Unless a laboratory satisfies the provisions of paragraph (c) of subsection 2 of NAC 445A.0665, the Division shall conduct an inspection of the premises and operation of each certified laboratory or laboratory for which an application for certification is submitted pursuant to the provisions of NAC 445A.0632. An inspection conducted pursuant to this section must be conducted in accordance with the provisions of sections 3.4 to 3.7, inclusive, of the Standards. If a certified laboratory conducts analyses of water, the laboratory must be inspected in accordance with the manual adopted by reference pursuant to the provisions of paragraph (e) of subsection 1 of NAC 445A.0612. A certified laboratory shall analyze a quality control sample for each method of testing an analyte for which it is certified:

(a) At least once every 3 months; and

(b) Each time a new calibration curve is generated.

2. The Division shall conduct an inspection specified in subsection 1:

(a) Not less than once every 2 years, if the laboratory is a certified laboratory; or

(b) If the laboratory submits an application for certification pursuant to the provisions of NAC 445A.0632, not more than 30 days after the Division determines that the laboratory has complied with the provisions of paragraphs (a), (b) and (c) of subsection 3 of that section.

3. The Division may conduct an inspection of a laboratory more than once every 2 years pursuant to this section if:

(a) The Division receives a complaint concerning the quality of the laboratory from a member of the general public or any public agency;

(b) The Division has reasonable cause to believe the laboratory is engaging in fraudulent activity;

(c) The Division identifies deficiencies in the operation of the laboratory after conducting an inspection of the laboratory pursuant to this section;

(d) The laboratory notifies the Division pursuant to NAC 445A.0652 of any changes specified in that section; or

(e) Any circumstance specified in section 3.3 of the Standards occurs.

4. An inspection conducted pursuant to the provisions of this section may include, without limitation:

(a) Requiring the laboratory to conduct an analysis of a proficiency test sample; and

(b) Photocopying, photographing or videotaping:

(1) Any part of the laboratory that is used for analyzing samples of water pursuant to the Federal Act;

(2) Any equipment, activity, environmental sample, records or results of any test relating to the analysis of water pursuant to the Federal Act;

(3) Any data concerning the control of the quality of any analysis conducted by the laboratory pursuant to the Federal Act; or

(4) Any other information required by the Division to ensure compliance with the provisions of NAC 445A.0552 to 445A.067, inclusive.

5. Except as otherwise provided in this subsection, the Division shall announce each inspection conducted pursuant to the provisions of this section. The Division may conduct an unannounced inspection of a laboratory if the Division determines that such an inspection is required to ensure compliance by the laboratory with the provisions of NAC 445A.0552 to 445A.067, inclusive. In determining whether to conduct an unannounced inspection, the Division shall consider:

(a) The laboratory's record of compliance with the provisions of NAC 445A.0552 to 445A.067, inclusive;

(b) The results of any proficiency test taken by the laboratory;

(c) The performance of any analyst or other employee of the laboratory in conducting an analysis of an environmental sample pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive;

(d) Any complaints concerning the laboratory that the Division has received from members of the general public or any public agency; and

(e) The performance of the laboratory in conducting analyses pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive.

6. If the Division conducts an inspection of a laboratory pursuant to the provisions of this section, the laboratory shall:

(a) Ensure that any record or other information which relates to compliance by the laboratory with the Federal Act or NAC 445A.0552 to 445A.067, inclusive, and which is required by the Division to conduct the inspection is available for review, including, without limitation:

(1) The quality manual adopted pursuant to the provisions of NAC 445A.0636;

(2) Any information concerning the methods of testing used by the laboratory;

(3) Any data concerning the control of the quality of an analysis conducted by the laboratory; and

(4) Any information concerning any proficiency test taken by the laboratory; and

(b) Allow the Division to:

(1) Examine any records of the laboratory concerning the operation or certification of the laboratory that relate to compliance by the laboratory with the Federal Act or NAC 445A.0552 to 445A.067, inclusive;

(2) Observe the operation, facilities and equipment of the laboratory that relate to compliance with the Federal Act or NAC 445A.0552 to 445A.067, inclusive;

(3) Interview any employee of the laboratory who performs duties relating to compliance by the laboratory with the Federal Act or NAC 445A.0552 to 445A.067, inclusive; and

(4) Engage in any activity which is necessary and appropriate for determining compliance by the laboratory with the Federal Act or NAC 445A.0552 to 445A.067, inclusive, and which is required by the Division.

7. If the Division conducts an inspection of a laboratory, it shall, within 30 days after it conducts the inspection, provide to the laboratory a copy of the report of the inspection. The report must include any deficiency the Division discovers during its inspection of the laboratory. The laboratory shall prepare a plan to correct the deficiency specified in the report. The plan must:

(a) Be submitted to the Division not more than 30 days after the laboratory receives the report from the Division;

(b) Be submitted on a form approved by the Division; and

(c) Include, without limitation:

(1) The signature of the person who prepared the plan; and

(2) The proposed date by which the laboratory will correct the deficiency.

8. If, after reviewing the plan submitted pursuant to subsection 7, the Division determines that the plan is insufficient to correct the deficiency, the Division shall notify the laboratory of that fact in writing. Upon receipt of the written notice, the laboratory shall, not more than 30 days after receiving the notice, submit a revised plan to the Division. If, after reviewing the revised plan, the Division determines that the revised plan is insufficient to correct the deficiency, or if the Division conducts an inspection of the laboratory and determines that the deficiency has not been corrected, the Division shall deny the laboratory's application for certification or revoke its certification.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0642 Grounds for denial of application for certification, or revocation, suspension or limitation of certification. (NRS 445A.425**,** 445A.428**)**

1. The Division may deny an application for certification of a laboratory or revoke, suspend or limit the certification of a certified laboratory if the laboratory:

(a) Makes a false statement in:

(1) An application for certification;

(2) A report concerning the analysis of an environmental sample; or

(3) Any other document relating to certification in violation of the provisions of NAC 445A.0552 to 445A.067, inclusive;

(b) Falsifies any results of laboratory testing or misrepresents any information obtained from laboratory testing in violation of the provisions of NAC 445A.0626 or 445A.0654;

(c) Fails to maintain the facilities or equipment of the laboratory in accordance with the quality manual or quality system of the laboratory;

(d) Fails to participate satisfactorily in a proficiency testing program, if the program is available, in violation of the provisions of NAC 445A.0634;

(e) Falsely claims certification for a method of testing or an analyte for which the laboratory is not certified in violation of the provisions of NAC 445A.0654;

(f) Fails to prepare a plan of correction or to correct any deficiency specified by the Division within the period specified in the plan in violation of the provisions of NAC 445A.0638;

(g) Fails to pay any fees or expenses of the Division in violation of the provisions of NAC 445A.066;

(h) Fails to notify the Division of any changes specified in NAC 445A.0652;

(i) Authorizes a person who is not qualified to perform an analysis in violation of the provisions of NAC 445A.0626;

(j) Communicates with or receives a communication concerning the results of a proficiency test sample from a laboratory on or before the date established for submitting the results of that sample to the provider of the sample pursuant to the provisions of NAC 445A.0634;

(k) Knowingly receives a proficiency test sample from a laboratory or provides a proficiency test sample to a laboratory on or before the date specified in paragraph (j);

(l) Prohibits an employee of the Division from conducting an inspection of the laboratory in violation of the provisions of NAC 445A.0638;

(m) Fails to provide to the Division any information required by the Division to determine whether a laboratory is operated in compliance with the provisions of NAC 445A.0552 to 445A.067, inclusive;

(n) Misrepresents any material fact to obtain or maintain certification pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive;

(o) Engages in any activity that is a ground for the denial of an application for certification or for the suspension or revocation of the certification of a laboratory set forth in section 4.1.4(d) or 4.4 of the Standards; or

(p) Knowingly employs, directly or indirectly, a person who has violated a provision of NRS 445A.300 to 445A.730, inclusive, or NAC 445A.0552 to 445A.067, inclusive.

2. In determining whether to deny an application for certification or to revoke, suspend or limit the certification of a laboratory pursuant to this section, the Division shall consider:

(a) The gravity of the violation;

(b) The harm to the health and safety of the members of the general public;

(c) The intent of the person who committed the violation;

(d) The extent of the violation; and

(e) Any proposed correction of the violation.

3. As used in this section, "quality system" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0644 Reapplication after denial of application or revocation of certification. (NRS 445A.425**,** 445A.428**)** If the Division denies an application for certification submitted by a laboratory or revokes the certification of a certified laboratory, the laboratory may, after the period specified in section 4.4 of the Standards expires, reapply for certification in the manner prescribed in NAC 445A.0632.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0646 Renewal of certification. (NRS 445A.425**,** 445A.428**)**

1. The Division may renew the certificate of a certified laboratory if:

(a) The laboratory pays the applicable fee to renew the certificate;

(b) The laboratory submits a statement on a form approved by the Division indicating that it is in compliance with the provisions of NAC 445A.0552 to 445A.067, inclusive, concerning each category of testing, method of testing and analyte for which it is certified;

(c) The laboratory submits a report to the Division indicating that it has received satisfactory proficiency test results for each category of testing and analyte for which it is certified; and

(d) The Division determines that the laboratory is in compliance with the provisions of NAC 445A.0552 to 445A.067, inclusive.

2. A certificate issued to a laboratory pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive, expires on July 31 of each year. If the certificate of a certified laboratory expires, the laboratory may apply for certification in the manner prescribed in NAC 445A.0632.

3. The Division shall make available to each certified laboratory a notice for the renewal of the certificate and a form to provide a statement of compliance specified in paragraph (b) of subsection 1.

4. Each certified laboratory shall maintain any record specified in section 4.3.3 of the Standards in accordance with the provisions of that section.

(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0648 Display of certificate; conditions for surrender of certificate; issuance of document. (NRS 445A.425, 445A.428)

1. The director of the laboratory shall display the certificate issued by the Division in a conspicuous place in the laboratory to which the members of the general public have access.

2. The certificate is the property of the Division and must be surrendered to the Division if:

(a) The Division revokes the certificate;

(b) The laboratory for which the certificate is issued ceases to conduct analyses of water for which a certificate is required; or

(c) The Division ceases to be an accrediting authority approved by the Environmental Protection Agency. As used in this paragraph, "accrediting authority" has the meaning ascribed to it in Appendix A of chapter 1 of the Standards.

3. In addition to issuing a certificate to each certified laboratory, the Division shall provide to each certified laboratory a document which indicates each category of testing an analyte for which the laboratory is certified. If, after the Division provides the document to the laboratory, the Division certifies the laboratory for an additional analyte or the Division revokes, suspends or limits the certification of the laboratory for a category of testing or analyte, the Division shall revise the document to include the additional analyte for which the laboratory is certified or the category of testing or analyte that is revoked, suspended or limited by the Division. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

NAC 445A.0652 Notification of Division of certain changes concerning certified laboratory. (NRS 445A.425, 445A.428) If, as determined by the Division, a change concerning a certified laboratory occurs that substantially affects the ability of the laboratory to perform any analysis for which the laboratory is certified, the director of the laboratory shall, not more than 30 days after the change occurs, notify the Division of the change in writing. For the purposes of this section, a change includes, without limitation, a change in the name, ownership, location or personnel of a laboratory or any other change specified in sections 4.1.8 and 4.3.2 of the Standards. (Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000)

NAC 445A.0654 Contractual agreements, records and reports. (NRS 445A.425, 445A.428)

1. A certified laboratory shall ensure that each analysis it performs complies with the provisions of Appendix D of chapter 5 of the Standards.

2. A certified laboratory shall maintain any document or other information required by the provisions of section 4.3.3 of the Standards in accordance with the provisions of that section.

3. If a certified laboratory prepares a report of any test conducted pursuant to the provisions of this section, the report must be prepared in accordance with the provisions of section 5.13 of the Standards.

4. If a certified laboratory is not certified to conduct a test in a category of testing or to use a method of testing or test for an analyte pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive, the director of the laboratory may contract with a certified laboratory to perform that test if:

(a) Before entering into the contract, the director notifies in writing the person for whom the test will be conducted of his intent to enter into the contract; and

(b) The laboratory complies with the requirements specified in section 5.14 of the Standards.

5. If a certified laboratory contracts with another certified laboratory pursuant to the provisions of this section, the director of the certified laboratory shall ensure that the certified laboratory that will conduct the test is certified pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive. If the certified laboratory that offered the contract maintains any record of the contract or of any test conducted pursuant to the contract, it shall include in that record:

(a) Any report submitted by the certified laboratory that conducted the test concerning the results of the test; and

(b) The certification number of the certified laboratory that conducted the test.

6. If the certified laboratory that offered the contract prepares a report concerning the results of any test conducted pursuant to the contract, it shall specify in the report that the results of that test were obtained by contract pursuant to the provisions of this section.
(Added to NAC by Environmental Comm'n by R070-99, eff. 5-26-2000; A by R061-04, 10-7-2004)

A3. MISCELLANEOUS PROVISIONS

NAC 445A.066 Fees for certification. (NRS 445A.425, 445A.428)

1. Except as otherwise provided in subsection 2, a laboratory must submit an annual fee of $500 with each application for certification.

2. A laboratory which only performs analysis for microbiology is not required to pay the fee provided pursuant to subsection 1.

3. In addition to the fee required pursuant to the provisions of subsections 1 and 4, a laboratory must submit an annual certification fee for each category of contaminant for which certification is requested. The categories of contaminants and annual fees are:

CATEGORY OF CONTAMINANT	ANNUAL FEE
Asbestos	$400
Cyanide	250
Demands	350
Dioxin	545
Herbicides	545
Microbiology	400
Minerals	400
Nutrients	250
Oil and grease	250
Perchlorate	250
Pesticides	545
Phenolics	250
Polyaromatic hydrocarbons	545
Polychlorinated biphenyls in oil	545
Polychlorinated biphenyls in wastewater	545
Radiochemistry	545
Residual chlorine	125
Residue	350
Semivolatile organic chemistry	545
Synthetic Organic Compounds Group 1 (includes semivolatile organic chemistry, pesticides, herbicides and polyaromatic hydrocarbons)	1,500
Toxicity bioassay	400
Trace metals	545
Volatile organic chemistry	545
Any other individual contaminant	200
Any other individual multicontaminant method	400

4. In addition to the fees required pursuant to the provisions of subsections 1 and 3, if a laboratory applies for certification for a contaminant in more than two of the approved methods of testing for that contaminant, the laboratory must submit a fee of $200 for each additional approved method of testing.

5. If a laboratory applies for certification for additional contaminants after the laboratory has been issued a certification for an annual period of certification, the fee for certification for each additional contaminant is the fee provided for that contaminant pursuant to the provisions of subsection 3. The fee must be prorated pursuant to subsection 6 if the provisions of that subsection otherwise apply. If

the Division conducts an evaluation for certification at the laboratory, the laboratory must pay, at the rate provided for state officers and employees generally, the actual travel and per diem expenses of the Division. If the laboratory is located outside of this State, the expenses must be paid pursuant to the provisions of subsection 7.

6. The fees are effective for 12 months beginning on August 1 of each year. If an application for certification to test for an analyte is submitted during that period, the fees for that certification must be prorated using the following formula:

Fee X .083 X the number of months remaining in the period of certification.

For the purpose of prorating fees, an application for certification to test for an analyte shall be deemed to have been submitted at the beginning of a month regardless of the date of the application. The prorated fee must be rounded to the next highest dollar. The fee provided pursuant to the provisions of subsection 1 must not be prorated.

7. If an evaluation for certification of a laboratory that is located outside of this State is conducted, the laboratory must pay the actual travel and per diem expenses of the employee of the Division who conducts the evaluation.

8. The fee for certification to test for a specific analyte must be paid before a certificate for that analyte may be issued.

9. Any fee paid pursuant to the provisions of this section is nonrefundable.

(Added to NAC by Environmental Comm'n, eff. 9-13-91; A 10-3-96; R070-99, 5-26-2000; R061-04, 10-7-2004)

NAC 445A.0665 Acceptance of analyses conducted by laboratory located outside State. (NRS 445A.425**,** 445A.428**)** The Division shall accept data relating to the analysis of contaminants regulated pursuant to NRS 445A.300 to 445A.730, inclusive, that are submitted from a laboratory located outside of this State if:

1. The laboratory has otherwise complied with the requirements set forth in NAC 445A.0552 to 445A.0665, inclusive;

2. The:

(a) Laboratory is certified by the United States Environmental Protection Agency;

(b) Division determines that the state where the laboratory is located:

(1) Has adopted a program for certifying laboratories for the analysis of water that is equivalent to the program for certifying those laboratories adopted by the Division; and

(2) Accepts the results of evaluations conducted pursuant to the program adopted by the Division; or

(c) Laboratory:

(1) Is located in a state that has established an agreement with this State concerning certification of laboratories by reciprocity; or

(2) Is certified pursuant to the National Environmental Laboratory Accreditation Program; and

3. The laboratory submits to the Division a copy of an acceptable report relating to the most recent evaluation conducted at the laboratory by:

(a) The state where the laboratory is certified;

(b) An independent organization that is approved by the Division to certify laboratories for the analysis of water; or

(c) The United States Environmental Protection Agency.

➥ The evaluation to which the report relates must be conducted within the 2 years immediately preceding the date of the application of the laboratory for certification.

(Added to NAC by Environmental Comm'n, eff. 9-13-91; A 10-3-96; 10-29-97; A by R070-99, 5-26-2000; R061-04, 10-7-2004)

NAC 445A.067 Review by Commission of publications adopted by reference. (NRS 445A.425**,** 445A.428**)** If any publication adopted by reference pursuant to the provisions of NAC 445A.0552 to

445A.067, inclusive, is revised, the Commission may review the revision to determine its suitability for this State. If the Commission determines that the revision is not suitable for this State, it will hold a public hearing to review its determination and give notice of that hearing within 6 months after the date of the publication of the revision. If, after the hearing, the Commission does not revise its determination, the Commission will give notice that the revision is not suitable for this State within 30 days after the hearing. If the Commission does not give such notice, the revision becomes part of the publication adopted by reference pursuant to the provisions of NAC 445A.0552 to 445A.067, inclusive. (Added to NAC by Environmental Comm'n, eff. 10-3-96; A by R070-99, 5-26-2000; R061-04, 10-7-2004)

A4. Certification of Laboratories to Analyze Drinking Water

NAC 445A.542 Definitions. (NRS 445A.860**,** 445A.863**)** As used in NAC 445A.542 to 445A.54296, inclusive, unless the context otherwise requires, the words and terms defined in NAC 445A.5421 to 445A.5425, inclusive, have the meanings ascribed to them in those sections. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5421 "Accuracy" defined. (NRS 445A.860**,** 445A.863**)** "Accuracy" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54212 "Analyst" defined. (NRS 445A.860**,** 445A.863**)** "Analyst" means a chemist, microbiologist, physicist or technician who:

1. Is qualified to conduct analyses of environmental samples pursuant to the provisions of the Manual specified in subsection 6 of NAC 445A.54254; and
2. Performs those tests or assists in performing those tests with other qualified employees of a certified laboratory.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54214 "Analyte" defined. (NRS 445A.860**,** 445A.863**)** "Analyte" means any compound, element, radical, isotope, contaminant organism, species or other substance for which an environmental sample is tested by a laboratory. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54216 "Approved method of testing" defined. (NRS 445A.860**,** 445A.863**)** "Approved method of testing" means a laboratory procedure specified in subsection 4 of NAC 445A.54264 that is approved by the Environmental Protection Agency or the Bureau to test an environmental sample. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54218 "Board" defined. (NRS 445A.860**,** 445A.863**)** "Board" means the State Board of Health. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5422 "Bureau" defined. (NRS 445A.860**,** 445A.863**)** "Bureau" means the Bureau of Licensure and Certification of the Health Division of the Department of Health and Human Services. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54222 "Certified laboratory" defined. (NRS 445A.860**,** 445A.863**)** "Certified laboratory" means a laboratory for which a certificate to conduct analyses of drinking water is issued pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54224 "Director" defined. (NRS 445A.860**,** 445A.863**)** "Director" means:

1. A person who is qualified to administer any technical or scientific operation of a certified laboratory and supervise the procedures for the testing and reporting of the results of tests pursuant to the provisions of the standards; or

2. A chemist, microbiologist or physicist who is qualified to engage in an activity specified in subsection 1 pursuant to the provisions of the manual specified in subsection 6 of NAC 445A.54254.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54226 "Environmental sample" defined. (NRS 445A.860**,** 445A.863**)** "Environmental sample" means a sample of any substance obtained from any natural source or any source that may reasonably be expected to pollute or receive pollution from the atmosphere, supplies of drinking water, groundwater, surface water, soil, sediment or ecosystem biota of this State, including, without limitation:

1. Ambient air;
2. Emissions of air from point sources;
3. Drinking water;
4. Receiving waters;
5. Soil or sediment;
6. Effluents from industrial, municipal or residential sources;
7. Samples from facilities used to store or handle chemicals;
8. Facilities used to dispose of waste;
9. Runoff of surface water; and
10. Samples obtained from facilities used to handle or apply substances for the control of weeds or insects. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54228 "Federal Act" defined. (NRS 445A.860**,** 445A.863**)** "Federal Act" has the meaning ascribed to it in NRS 445A.815. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5423 "National Environmental Laboratory Accreditation Conference" defined. (NRS 445A.860**,** 445A.863**)** "National Environmental Laboratory Accreditation Conference" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards.
(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54232 "Performance-based measurement system" defined. (NRS 445A.860**,** 445A.863**)** "Performance-based measurement system" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54234 "Point source" defined. (NRS 445A.860**,** 445A.863**)** "Point source" has the meaning ascribed to it in NRS 445A.395. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54236 "Precision" defined. (NRS 445A.860**,** 445A.863**)** "Precision" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54238 "Proficiency test sample" defined. (NRS 445A.860**,** 445A.863**)** "Proficiency test sample" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5424 "Proficiency testing program" defined. (NRS 445A.860**,** 445A.863**)** "Proficiency testing program" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54242 "Quality control sample" defined. (NRS 445A.860**,** 445A.863**)** "Quality control sample" means an uncontaminated environmental sample that is spiked with a known analyte and provided to a laboratory for analysis to determine the performance of the laboratory in testing for the presence of that analyte by using a specified method of testing for the analyte. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54244 "Quality manual" defined. (NRS 445A.860**,** 445A.863**)** "Quality manual" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54246 "Sensitivity" defined. (NRS 445A.860**,** 445A.863**)** "Sensitivity" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54248 "Spike" defined. (NRS 445A.860**,** 445A.863**)** "Spike" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5425 "Standards" defined. (NRS 445A.860**,** 445A.863**)** "Standards" means the Standards of the National Environmental Laboratory Accreditation Conference adopted by reference pursuant to the provisions of NAC 445A.54252. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54252 Adoption by reference of *National Environmental Laboratory Accreditation Conference-Constitution, Bylaws and Standards*. (NRS 445A.860**,** 445A.863**)** The Board hereby adopts by reference the *National Environmental Laboratory Accreditation Conference-Constitution, Bylaws and Standards*, EPA 600/R-98/151, in the form most recently published by the Environmental Protection Agency, unless the Board gives notice pursuant to the provisions of NAC 445A.5426 that the most recent publication is not suitable for this State. The publication is available, free of charge, from the United States Environmental Protection Agency, Office of Research and Development, 401 M Street, S.W., Washington, D.C. 20460, or from the Environmental Protection Agency at the Internet address: http://www.epa.gov/esd/trc/publications/ntis_docs/reports/nelac/nelac.pdf . See also: http://www.nelac-institute.org/ . (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54254 Adoption by reference of certain publications related to sample collection procedures, analytical methodologies and requirements of certification. (NRS 445A.860**,** 445A.863**)** The Board hereby adopts by reference the following publications in the forms most recently published, unless the Board gives notice pursuant to the provisions of NAC 445A.5426 that the most recent publication is not suitable for this State. The publications are available, unless otherwise specified in this section, by mail from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, or by telephone at (800) 553-6847. The publications may also be obtained from the National Technical Information Service at the Internet address http://www.ntis.gov/products/publications.aspx . The publications are:

1. *Consensus Method for Determining Groundwaters under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA)*, EPA 910/9-92-029, Order Number PB93-180818, for the price of $31.50.
2. *DBP/ICR Analytical Methods Manual*, EPA 814-B-96-002, Order Number PB96-157516, for the price of $45.
3. *ICR Microbial Laboratory Manual*, April 1996, EPA 600/R-95/178, Order Number PB96-157557, for the price of $63.
4. *ICR Sampling Manual*, April 1996, EPA 814-B-96-001, Order Number PB96-157508, for the price of $45.

5. *Interim Radiochemical Methodology for Drinking Water*, EPA/600/4-75-008, Order Number PB253258, for the price of $31.50.

6. *Manual for the Certification of Laboratories Analyzing Drinking Water: Criteria and Procedures, Quality Assurance*, 3rd edition, EPA 815-B-97-001, Order Number PB90-220500, for the price of $36.50.

7. *Method 100.1 - Analytical Method for Determination of Asbestos Fibers in Water*, September 1983, EPA 600/4-83-043, Order Number PB83-260471, for the price of $67.50.

8. *Method 100.2 - Determination of Asbestos Structures over 10 Micrometers in Length in Drinking Water*, June 1994, EPA/600/R-94/134, Order Number PB94-201902, for the price of $28.50.

9. *Method 1613: Tetra-Through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS, Revision B*, October 1994, EPA 821-B-94-005, Order Number PB95-104774, for the price of $34.

10. *Methods for Chemical Analysis of Water and Wastes*, EPA 600/4-79-020, Order Number PB84-128677, for the price of $101.

11. *Methods for the Determination of Inorganic Substances in Environmental Samples*, August 1993, EPA/600/R-93-100, Order Number PB94-120821, for the price of $45.

12. *Methods for the Determination of Metals in Environmental Samples*, EPA/600-4-91/010, Order Number PB91-231498, for the price of $70.

13. *Methods for the Determination of Metals in Environmental Samples, Supplement I*, EPA/600/R-94/111, Order Number PB95-125472, for the price of $63.

14. *Methods for the Determination of Nonconventional Pesticides in Municipal and Industrial Wastewater, Volume I, Revision 1*, August 1993, EPA-821-R-93-010-A, Order Number PB94-121654, for the price of $133.

15. *Methods for the Determination of Organic Compounds in Drinking Water*, Revised July 1991, EPA/600/4-88/039, Order Number PB91-231480, for the price of $77.50.

16. *Methods for the Determination of Organic Compounds in Drinking Water, Supplement 1*, EPA/600/4-90/020, Order Number PB91-146027, for the price of $58.50.

17. *Methods for the Determination of Organic Compounds in Drinking Water, Supplement 2*, EPA/600/R-92/129, Order Number PB92-207703, for the price of $63.

18. *Methods for the Determination of Organic Compounds in Drinking Water, Supplement 3*, EPA/600/R-95/131, Order Number PB95-261616, for the price of $101.

19. *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th edition, EPA/600/4-90/027F, Order Number PB94-114733, for the price of $70.

20. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA 600/4-80-032, Order Number PB80-224744, for the price of $41.

21. *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms*, 3rd edition, EPA/600/4-91/002, Order Number PB96-141452, for the price of $60.

22. *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Marine and Estuarine Organisms*, 2nd edition, EPA/600/4-91-003, Order Number PB96-141445, for the price of $77.

23. *Technical Notes on Drinking Water Methods*, EPA 600/R-94-173, Order Number PB95-104766, for the price of $31.50.

24. *Test Methods for "Escherichia Coli" in Drinking Water: EC Medium with Mug Tube Procedure, Nutrient Agar with Mug Membrane Filter Procedure*, EPA/600/4-91/016, Order Number PB91-234591, for the price of $15.

25. *US EPA Contract Laboratory Program - Statement of Work for Organics Analysis - Multi-Media, Multi-Concentration, OLM01.0 (Includes Revisions OLM01.1 through OLM01.8)*, Order Number PB95-963508, for the price of $86.50.

26. *US EPA Contract Laboratory Program - Statement of Work for Inorganics Analysis - Multi-Media, Multi-Concentration, ILM02.1*, Order Number PB95-963514, for the price of $70.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54256 Adoption by reference of certain publications related to methods of testing for certain contaminants. (NRS 445A.860, 445A.863**)** The Board hereby adopts by reference the following publications in the forms most recently published, unless the Board gives notice pursuant to the provisions of NAC 445A.5426 that the most recent publication is not suitable for this State. The publications are available, unless otherwise specified in this section, by mail from the Superintendent of Documents, United States Government Printing Office, P.O. Box 371954, Pittsburgh, Pennsylvania 15250-7954, or by telephone at (202) 512-1800. The publications are:

1. *Method 1600-Membrane Filter Test Method for Enterococci in Water*, May 1997, EPA-821-R-97-004, which is available, free of charge, from the United States Environmental Protection Agency, National Center for Environmental Publications and Information, 11029 Kenwood Road, Building 5, Cincinnati, Ohio 45242.

2. *Method 1664, Revision A: N-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated N-Hexane Extractable Material (SGT-HEM; Non-Polar Material) by Extraction and Gravimetry*, February 1999, EPA-821-R-98-002. The publication is available, free of charge, from the Environmental Protection Agency at the Internet address http://www.epa.gov/waterscience/methods/1664f051.html.

3. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, 3rd edition, and Updates I, II, IIA, IIB, III and IIIA, Publication Number 955-001-00000-1, for the price of $367. The publication is also available, free of charge, from the United States Government Printing Office athttp://www.epa.gov/epaoswer/hazwaste/test/main.htm.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54258 Adoption of certain ASTM standards and other publications related to calibration and testing laboratories, and examination of water and wastewater. (NRS 445A.860, 445A.863**)** The Board hereby adopts by reference the following publications in the forms most recently published unless the Environmental Protection Agency fails to publish notice of its approval of the publication in the Federal Register or the Board gives notice pursuant to the provisions of NAC 445A.5426 that the most recent publication is not suitable for this State:

1. *Annual Book of ASTM Standards, Section 5, Petroleum Products, Lubricants, and Fossil Fuels*, which is available from the American Society For Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, for the price of $657.

2. *Annual Book of ASTM Standards, Section 11, Water and Environmental Technology*, which is available from the American Society For Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959, for the price of $686.

3. *ISO/IEC Guide 25, General Requirements for the Competence of Calibration and Testing Laboratories*, 1990, which is available from Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112, for the price of $76.

4. *Standard Methods for the Examination of Water and Wastewater*, Order Number 10079, which is available from the American Water Works Association, Customer Service, 6666 West Quincy Avenue, Denver, Colorado 80235, for the price of $155 for members and $200 for nonmembers.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5426 Review by Board of publications adopted by reference. (NRS 445A.860, 445A.863**)** If any publication adopted by reference pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive, is revised, the Board may review the revision to determine its suitability for this State. If the Board determines that the revision is not suitable for this State, it will hold a public hearing to review its determination and give notice of that hearing within 6 months after the date of the publication of the revision. If, after the hearing, the Board does not revise its determination, the Board will give notice that the revision is not suitable for this State within 30 days after the hearing. If the Board does not give the notice, the revision becomes part of the publication adopted by reference

pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54262 Interpretation of provisions; resolution of conflicting requirements. (NRS 445A.860**,** 445A.863**)**

1. The provisions of NAC 445A.542 to 445A.54296, inclusive, must not be interpreted to circumvent any of those provisions to make them less effective. If more than one interpretation exists for any of those provisions, the more restrictive interpretation applies.

2. If any provision of a publication adopted by reference pursuant to the provisions of NAC 445A.54254, 445A.54256 or 445A.54258 conflicts with any provision of NAC 445A.542 to 445A.54296, inclusive, or with the standards, the provision set forth in NAC 445A.542 to 445A.54296, inclusive, or the standards applies.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54264 Scope of certification. (NRS 445A.860**,** 445A.863**)**

1. Laboratory testing is the category of testing specified in Figure 1-3 of the standards for which a laboratory may obtain certification pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive.

2. The scientific disciplines within the category of testing specified in subsection 1 for which a laboratory may obtain certification are:

(a) Chemistry;

(b) Microbiology; and

(c) Radiochemistry.

3. A laboratory may obtain certification pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive, for any program relating to the analysis of drinking water approved by the Environmental Protection Agency pursuant to the Federal Act.

4. Except as otherwise provided in subsection 5, the approved methods of testing for which a laboratory may obtain certification are set forth in:

(a) 40 C.F.R. §§ 141.21(f), 141.23(k)(1), 141.24(e), 141.25(a) and (b), 141.40(n)(11), 141.74(a), 141.142(b), 141.143(b) and 143.4(b); and

(b) The publications adopted by reference pursuant to the provisions of subsections 1 to 13, inclusive, 15 to 18, inclusive, 20, 23 and 24 of NAC 445A.54254 and subsections 1, 2 and 4 of NAC 445A.54258.

5. A laboratory may obtain certification to use a performance-based measurement system or any other alternative method of testing if the Environmental Protection Agency indicates in the Federal Register that the method of testing is equivalent to an approved method of testing and the laboratory:

(a) Complies with the provisions of subsection 5 of NAC 445A.54268; and

(b) Provides proof and evaluates the performance-based measurement system or any other alternative method of testing in accordance with the provisions of:

(1) Appendix E of chapter 5 of the Standards; and

(2) 40 C.F.R. § 141.27.

6. To be certified to conduct an analysis of an analyte using an approved method of testing specified in subsection 4, the analyte must be listed by the Bureau in the approved method of testing pursuant to that subsection.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54266 Categories of analytes for which laboratory may be certified. (NRS 445A.860**,** 445A.863**)** For the purposes of charging and collecting fees and conducting performance evaluations pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive, the Bureau shall classify each analyte for which a laboratory may be certified into the following categories:

1. Primary inorganic contaminants;

2. Secondary inorganic contaminants;

3. Regulated and unregulated volatile organic contaminants, including, without limitation, vinyl chloride and trihalomethanes;
4. Regulated and unregulated synthetic organic contaminants;
5. Radiochemical contaminants;
6. Individual primary or secondary inorganic contaminants; or
7. Microbiological contaminants.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54268 Requirements for certification in certain areas. (NRS 445A.860, 445A.863)

1. To be certified to conduct laboratory testing, a laboratory must comply with the requirements set forth in sections 1.8.3, 4.1.1, 5.0, 5.1 and 5.4 to 5.16, inclusive, of the Standards.
2. To be certified in:

(a) Chemistry, a laboratory must comply with the requirements set forth in section 1.8.5 and Appendix D.1 of chapter 5 of the Standards;

(b) Microbiology, a laboratory must comply with the requirements set forth in section 1.8.7 and Appendix D.3 of chapter 5 of the Standards; or

(c) Radiochemistry, a laboratory must comply with the requirements set forth in section 1.8.8 and Appendix D.4 of chapter 5 of the Standards.

3. To be certified pursuant to the program specified in subsection 3 of NAC 445A.54264, a laboratory must comply with the provisions concerning method detection limits, sample containers, holding times, proficiency testing and quality assurance set forth in 40 C.F.R. §§ 141.21(c), 141.21(f), 141.23(k), 141.24(e), 141.24(f)(17), 141.24(f)(20), 141.24(h)(13), 141.24(h)(19), 141.25, 141.30(e), 141.40(g), 141.40(n)(11), 141.40(n)(12), 141.74(a) and 141.89.
4. To be certified for an approved method of testing, a laboratory must comply with the requirements for using that approved method of testing specified in subsection 4 of NAC 445A.54264 and the Standards. If a conflict occurs between a provision specified in that subsection and the Standards concerning an approved method of testing, the Standards apply. If a manufacturer provides instructions for maintaining any equipment used for testing or for ensuring the performance of any test or demonstrating the performance of any system of measurement, the laboratory shall comply with those instructions. If a conflict occurs between a provision of those instructions and a provision specified in subsection 4 of NAC 445A.54264 or the Standards, the provisions specified in that subsection or the Standards apply.
5. If a laboratory intends to use a performance-based measurement system or any other alternative method of testing, the laboratory shall, before the Bureau conducts an inspection of the laboratory pursuant to the provisions of NAC 445A.5428, submit to the Bureau a written statement setting forth the performance-based measurement system or other alternative method of testing it intends to use. The Bureau may approve the performance-based measurement system or alternative method of testing if, as determined by the Bureau:

(a) The system or method is equivalent to or exceeds the approved method of testing for accuracy, precision, completeness and comparability relating to determining compliance with the regulatory concentration levels or system conditions;

(b) An approved method of testing is not available for use by the laboratory to determine the presence of an analyte for which the laboratory requests certification pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive; or

(c) The laboratory obtains approval for the system or method from the Environmental Protection Agency.

6. To be certified to test for a specific analyte using an approved method of testing, a laboratory must comply with the requirements established by the Bureau for the approved method of testing and the Standards for initial and continuing calibrations of test equipment and demonstrations by analysts of precision, accuracy, sensitivity and low system background for each analyte. If a conflict occurs between the requirements established by the Bureau and the Standards, the Standards apply.
7. As used in this section:

(a) "Holding times" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards.

(b) "Low system background" means an analysis of a method blank that does not yield contamination at a concentration that is greater than the method detection limit.

(c) "Method blank" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards.

(d) "Method detection limit" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards.

(e) "Quality assurance" has the meaning ascribed to it in Appendix B of the Standards.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5427 Certification by Bureau or pursuant to National Environmental Laboratory Accreditation Program. (NRS 445A.860**,** 445A.863**)**

1. A laboratory may apply for certification by the Bureau or certification pursuant to the National Environmental Laboratory Accreditation Program.

2. To obtain certification by the Bureau, a laboratory must comply with the provisions of NAC 445A.542 to 445A.54296, inclusive.

3. A laboratory that is certified by the Bureau may provide analytical data for an environmental sample originating in this State for each analyte for which the laboratory is certified.

4. To obtain certification pursuant to the National Environmental Laboratory Accreditation Program, a laboratory must:

(a) Comply with the provisions of NAC 445A.542 to 445A.54296, inclusive;

(b) Before obtaining certification pursuant to the program and every 2 years after obtaining the certification, submit to an assessment of the laboratory conducted at the laboratory under the direction of a person who is approved pursuant to the National Environmental Laboratory Accreditation Program; and

(c) Specify in its application for certification at least one approved method of testing and analyte pursuant to the provisions of subsections 4 and 6 of NAC 445A.54264.

5. As used in this section, "National Environmental Laboratory Accreditation Program" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54272 Application for certification. (NRS 445A.860**,** 445A.863**)**

1. To apply for certification pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive, the director of the laboratory for which certification is requested must submit an application to the Bureau on a form approved by the Bureau. The application must be accompanied by the fees prescribed in NAC 445A.54296 and include the information specified in sections 4.1.7 and 4.1.9 of the Standards.

2. The provisions of this section do not require an application and certificate for each building or other portion of a certified laboratory that:

(a) Is operated by the same management, quality manual and quality assurance officer as the certified laboratory;

(b) Uses only methods for which the laboratory is certified;

(c) Does not issue reports directly but forwards data to the certified laboratory for reporting purposes; and

(d) The Bureau determines is used to analyze the same environmental samples as the certified laboratory.

➥ As used in this subsection, "quality assurance officer" means the quality assurance officer specified in section 5.4.2 of the Standards.

3. The Bureau shall not consider an application for certification submitted pursuant to this section to be complete unless:

(a) The laboratory specifies in the application the approved methods of testing in accordance with the provisions of NAC 445A.54264;

(b) The laboratory satisfactorily analyzes proficiency test samples in accordance with the provisions of NAC 445A.54276;

(c) The laboratory adopts a quality manual and submits the manual to the Bureau pursuant to the provisions of NAC 445A.54278;

(d) The Bureau conducts an inspection of the laboratory for the approved methods of testing and analytes for which the laboratory requests certification pursuant to the provisions of NAC 445A.5428, except that an inspection is not required pursuant to this paragraph if the laboratory has complied with the provisions of NAC 445A.54274;

(e) If the report of an inspection of the laboratory conducted by the Bureau includes any deficiency that must be corrected, the laboratory submits to the Bureau a written plan to correct the deficiency in accordance with the provisions of subsection 7 of NAC 445A.5428;

(f) The director of the laboratory is qualified for that position pursuant to the provisions of the manual specified in subsection 6 of NAC 445A.54254; and

(g) The applicable fees prescribed in NAC 445A.54296 have been paid.

4. An application for certification shall be deemed withdrawn by the applicant if it is not completed pursuant to the provisions of this section within 1 year after the Bureau receives the application. The Bureau may extend the period in which an application must be completed pursuant to this subsection if the applicant submits to the Bureau a written request for an extension setting forth the reasons for the request.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54274 Acceptance of analysis conducted by laboratory located outside State. (NRS 445A.860**,** 445A.863**)** The Bureau shall accept data relating to the analysis of contaminants regulated pursuant to the provisions of the Federal Act that are submitted from a laboratory located outside this State if:

1. The laboratory has otherwise complied with the requirements set forth in NAC 445A.542 to 445A.54296, inclusive;

2. The laboratory is certified by:

(a) The state where it is located or, if the state where the laboratory is located does not have a program for certifying laboratories for the analysis of drinking water, by any other state that provides those certifications; or

(b) The Environmental Protection Agency;

3. The Bureau determines that the state where the laboratory is located:

(a) Has adopted a program for certifying laboratories for the analysis of drinking water that is equivalent to the program for certifying those laboratories adopted by this State; and

(b) Accepts the results of laboratories certified in this State; and

4. The laboratory submits to the Bureau a copy of an acceptable report relating to the most recent evaluation conducted at the laboratory by:

(a) The state where the laboratory is certified;

(b) An independent organization that is approved by the Bureau to certify laboratories for the analysis of drinking water; or

(c) The Environmental Protection Agency.

➥ The evaluation to which the report relates must be conducted within the 2 years immediately preceding the date of the application for certification of the laboratory.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54276 Participation in proficiency testing program. (NRS 445A.860**,** 445A.863**)**

1. Each laboratory for which an application for certification is submitted and each certified laboratory must participate in a proficiency testing program. The laboratory must:

(a) Obtain single-blind proficiency test samples from a provider approved by the National Institute of Standards and Technology;

(b) Analyze the proficiency test samples, if available, for each category of certification and analyte that is included in the program; and

(c) Report the results of the analysis to the provider specified in paragraph (a).

➥ If the laboratory is a certified laboratory and if a test will be conducted for each category of certification and analyte for which the laboratory is certified, the certified laboratory must analyze a proficiency test sample pursuant to the program not less than once every 6 months.

2. Each laboratory specified in subsection 1 shall pay the costs of subscribing to a program specified in that subsection.

3. Each laboratory specified in subsection 1 must satisfactorily analyze each analyte that is included in the program specified in subsection 3 of NAC 445A.54264 on two of the most recent three rounds of testing. Each laboratory shall, before obtaining a proficiency test sample pursuant to paragraph (a) of subsection 1, authorize the provider of the proficiency test sample to submit to the Bureau the results of any test taken pursuant to the provisions of this section. If the laboratory fails to provide that authorization, the Bureau may refuse to consider the results of any test taken pursuant to those provisions.

4. The Bureau shall consider the results of any test taken pursuant to this section to be satisfactory if the results are within the limits of acceptance established by the provider of the proficiency test samples in accordance with the provisions of Appendix C of chapter 2 of the Standards.

5. If the Bureau determines that the results of a test are satisfactory, the laboratory may be certified to use any approved method of testing for each analyte that is satisfactorily analyzed by the laboratory if, as determined by the Bureau, data sufficient to validate the use of that method of testing on an annual basis are available. If such data are not available, the Bureau shall deny or revoke the certification for that method of testing. As used in this paragraph, "data sufficient to validate" means performance of an initial demonstration of capability as defined in section 7.2.8 of the manual specified in subsection 6 of NAC 445A.54254.

6. If a certified laboratory fails:

(a) Two rounds of testing pursuant to subsection 3, the Bureau shall suspend the certification of that laboratory for each analyte the laboratory failed to analyze during those rounds; or

(b) Three rounds of testing pursuant to subsection 3, the Bureau shall revoke the certification of that laboratory for each analyte the laboratory failed to analyze during those rounds.

7. If the Bureau suspends the certification of a certified laboratory pursuant to subsection 6 because the laboratory failed two nonconsecutive rounds of testing, the Bureau shall reinstate the certification of that laboratory for the method of testing and analyte for which the certification was suspended if the certified laboratory satisfactorily analyzes the analyte in a proficiency test sample that is approved by the Bureau.

8. If the Bureau suspends the certification of a certified laboratory pursuant to subsection 6 because the laboratory failed to analyze an analyte on two consecutive rounds of testing, the laboratory must satisfactorily analyze the analyte during each of two consecutive rounds of testing conducted after the Bureau suspends the certification.

9. If the Bureau revokes the certification of a certified laboratory pursuant to subsection 6, the laboratory must:

(a) Analyze satisfactorily the analyte for which the certification was revoked during each of two consecutive rounds of testing conducted after the Bureau revoked the certification; and

(b) Reapply for certification and pay the applicable fees pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive.

➥ If a certified laboratory complies with the provisions of this subsection and is otherwise qualified for certification pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive, the Bureau shall reinstate the certification of the laboratory for each method of testing and analyte for which the laboratory was certified.

10. Each certified laboratory must comply with the requirements concerning enrollment, testing, conduct and participation in the program specified in subsection 1 pursuant to the provisions of sections 2.4, 2.5 and 2.7 of the Standards.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54278 Adoption of quality manual by laboratory; contents. (NRS 445A.860, 445A.863)

1. Each laboratory that applies for certification pursuant to NAC 445A.542 to 445A.54296, inclusive, shall adopt a quality manual and comply with the provisions of that manual. The director of the laboratory shall submit the manual to the Bureau before the Bureau conducts an inspection of the laboratory.

2. Each quality manual specified in subsection 1 must be adopted in accordance with the provisions of section 5.5 of the standards and include, without limitation:

(a) A statement setting forth the requirements of the laboratory for sensitivity, precision and accuracy for each method of testing or analyte for which the laboratory requests certification; and

(b) The policy of the laboratory concerning any unauthorized use of data or fraudulent activity that occurs at the laboratory.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5428 Inspection of laboratory by Bureau. (NRS 445A.860, 445A.863)

1. The Bureau shall conduct an inspection of the premises and operation of each certified laboratory or laboratory for which an application for certification is submitted pursuant to the provisions of NAC 445A.54272. An inspection conducted pursuant to this section must be conducted in accordance with the provisions of sections 3.4 to 3.7, inclusive, of the Standards. If a certified laboratory conducts analyses of drinking water, the laboratory must be inspected in accordance with the manual specified in subsection 6 of NAC 445A.54254. A certified laboratory shall analyze a control sample for each method of testing and analyte for which it is certified:

(a) At least once every 12 months; and

(b) Each time a new calibration curve is generated.

2. The Bureau shall conduct an inspection specified in subsection 1:

(a) Not less than once every 2 years, if the laboratory is a certified laboratory; or

(b) If the laboratory submits an application for certification pursuant to the provisions of NAC 445A.54272, not more than 30 days after the Bureau determines that the laboratory has complied with the provisions of paragraphs (a), (b) and (c) of subsection 3 of that section.

3. The Bureau may conduct an inspection of a laboratory more than once every 2 years pursuant to this section if:

(a) The Bureau receives a complaint concerning the quality of the laboratory from a member of the general public or any public agency;

(b) The Bureau has reasonable cause to believe the laboratory is engaging in fraudulent activity;

(c) The Bureau identifies deficiencies in the operation of the laboratory after conducting an inspection of the laboratory pursuant to this section;

(d) The laboratory notifies the Bureau pursuant to NAC 445A.5429 of any changes specified in that section; or

(e) Any circumstance specified in section 3.3 of the Standards occurs.

4. An inspection conducted pursuant to the provisions of this section may include, without limitation:

(a) Requiring the laboratory to conduct an analysis of a proficiency test sample; and

(b) Photocopying, photographing or videotaping:

(1) Any part of the laboratory that is used for analyzing samples of drinking water;

(2) Any equipment, activity, environmental sample, records or results of any test relating to the analysis of regulated samples of drinking water;

(3) Any data concerning the control of the quality of any analysis relating to samples of drinking water conducted by the laboratory; and

(4) Any other information required by the Bureau to ensure compliance with the provisions of NAC 445A.542 to 445A.54296, inclusive.

5. Except as otherwise provided in this subsection, the Bureau shall announce each inspection conducted pursuant to the provisions of this section. The Bureau may conduct an unannounced inspection of a laboratory if the Bureau determines that such an inspection is required to ensure compliance by the laboratory with the provisions of NAC 445A.542 to 445A.54296, inclusive. In determining whether to conduct an unannounced inspection, the Bureau shall consider:

(a) The laboratory's record of compliance with the provisions of NAC 445A.542 to 445A.54296, inclusive;

(b) The results of any proficiency test taken by the laboratory;

(c) The performance of any analyst or other employee of the laboratory in conducting an analysis of an environmental sample pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive;

(d) Any complaints concerning the laboratory that the Bureau has received from members of the general public or any public agency; and

(e) The performance of the laboratory in conducting analyses pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive.

6. If the Bureau conducts an inspection of a laboratory pursuant to the provisions of this section, the laboratory shall:

(a) Ensure that any record or other information which relates to compliance by the laboratory with the Federal Act or NAC 445A.542 to 445A.54296, inclusive, and which is required by the Bureau to conduct the inspection is available for review, including, without limitation:

(1) The quality manual adopted pursuant to the provisions of NAC 445A.54278;

(2) Any information concerning the methods of testing used by the laboratory;

(3) Any data concerning the control of the quality of a regulated analysis conducted by the laboratory; and

(4) Any information concerning any proficiency test taken by the laboratory; and

(b) Allow the Bureau to:

(1) Examine any records of the laboratory concerning the operation or certification of the laboratory that relate to compliance by the laboratory with the Federal Act or NAC 445A.542 to 445A.54296, inclusive;

(2) Observe the operation, facilities and equipment of the laboratory that relate to compliance with the Federal Act or NAC 445A.542 to 445A.54296, inclusive;

(3) Interview any employee of the laboratory who performs duties relating to compliance by the laboratory with the Federal Act or NAC 445A.542 to 445A.54296, inclusive; and

(4) Engage in any activity which is necessary and appropriate for determining compliance by the laboratory with the Federal Act or NAC 445A.542 to 445A.54296, inclusive, and which is required by the Bureau.

7. If the Bureau conducts an inspection of a laboratory, it shall, within 30 days after it conducts the inspection, provide to the laboratory a copy of the report of the inspection. The report must include any deficiency the Bureau discovers during its inspection of the laboratory. The laboratory shall prepare a plan to correct the deficiency specified in the report. The plan must:

(a) Be submitted to the Bureau not more than 30 days after the laboratory receives the report from the Bureau;

(b) Be submitted on a form approved by the Bureau; and

(c) Include, without limitation:

(1) The signature of the person who prepared the plan; and

(2) The proposed date by which the laboratory will correct the deficiency.

8. If, after reviewing the plan submitted pursuant to subsection 7, the Bureau determines that the plan is insufficient to correct the deficiency, the Bureau shall notify the laboratory of that fact in writing. Upon receipt of the written notice, the laboratory shall, not more than 30 days after receiving the notice, submit a revised plan to the Bureau. If, after reviewing the revised plan, the Bureau determines that the revised plan is insufficient to correct the deficiency, or if the Bureau conducts an inspection of the laboratory and determines that the deficiency has not been corrected, the Bureau shall deny the laboratory's application for certification or revoke its certification.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54282 Grounds for denial of application for certification, or revocation, suspension or limitation of certification. (NRS 445A.860, 445A.863)

1. The Bureau may deny an application for certification of a laboratory or revoke, suspend or limit the certification of a certified laboratory if the laboratory:

(a) Makes a false statement in:

(1) An application for certification;

(2) A report concerning the analysis of an environmental sample; or

(3) Any other document relating to certification in violation of the provisions of NAC 445A.542 to 445A.54296, inclusive;

(b) Falsifies the results of any laboratory testing or misrepresents any information obtained from laboratory testing in violation of the provisions of NAC 445A.54268 or 445A.54292;

(c) Fails to maintain the facilities or equipment of the laboratory in accordance with the quality manual or quality system of the laboratory;

(d) Fails to participate satisfactorily in a proficiency testing program, if the program is available, in violation of the provisions of NAC 445A.54276;

(e) Falsely claims certification for a method of testing or an analyte for which the laboratory is not certified in violation of the provisions of NAC 445A.54292;

(f) Fails to prepare a plan of correction or to correct any deficiency specified by the Bureau within the period specified in the plan in violation of the provisions of NAC 445A.5428;

(g) Fails to pay any fees or expenses of the Bureau in violation of the provisions of NAC 445A.54296;

(h) Fails to notify the Bureau of any changes specified in NAC 445A.5429;

(i) Authorizes a person who is not qualified to perform an analysis in violation of the provisions of NAC 445A.54268;

(j) Communicates with or receives a communication concerning the results of a proficiency test sample from a laboratory on or before the date established for submitting the results of that sample to the provider of the sample pursuant to the provisions of NAC 445A.54276;

(k) Knowingly receives a proficiency test sample from a laboratory or provides a proficiency test sample to a laboratory on or before the date specified in paragraph (j);

(l) Prohibits an employee of the Bureau from conducting an inspection of the laboratory in violation of the provisions of NAC 445A.5428;

(m) Fails to provide to the Bureau any information required by the Bureau to determine whether the laboratory is operated in compliance with the provisions of NAC 445A.542 to 445A.54296, inclusive;

(n) Misrepresents any material fact to obtain or maintain certification pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive; or

(o) Engages in any activity that is a ground for the denial of an application for certification or for the suspension or revocation of the certification of a laboratory set forth in section 4.4 of the Standards.

2. In determining whether to deny an application for certification or to revoke, suspend or limit the certification of a laboratory pursuant to this section, the Bureau shall consider:

(a) The gravity of the violation;

(b) The harm to the health and safety of the members of the general public;

(c) The intent of the person who committed the violation;

(d) The extent of the violation; and

(e) Any proposed correction of the violation.

3. As used in this section:

(a) "Protocol" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards.

(b) "Quality system" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54284 Reapplication after denial of application or revocation of certification. (NRS 445A.860**,** 445A.863**)** If the Bureau denies an application for certification of a laboratory or revokes the certification of a certified laboratory, the laboratory may, after the period specified in section 4.4 of the Standards has expired, reapply for certification in the manner prescribed in NAC 445A.54272.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54286 Renewal of certification. (NRS 445A.860, 445A.863)

1. The Bureau may renew the certificate of a certified laboratory if:

(a) The laboratory pays the applicable fee to renew the certificate;

(b) The laboratory submits a statement on a form approved by the Bureau indicating that it is in compliance with the provisions of NAC 445A.542 to 445A.54296, inclusive, concerning each category of testing, method of testing and analyte for which it is certified;

(c) The laboratory submits a report to the Bureau indicating that it has received satisfactory proficiency test results for each category of testing and analyte for which it is certified; and

(d) The Bureau determines that the laboratory is in compliance with the provisions of NAC 445A.542 to 445A.54296, inclusive.

2. A certificate issued to a laboratory pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive, expires on July 31 of each year. If the certificate of a certified laboratory expires, the laboratory may reapply for certification in the manner prescribed in NAC 445A.54272.

3. Not later than July 1 of each year, the Bureau shall mail to each certified laboratory a notice for the renewal of the certificate and a form to provide a statement of compliance specified in paragraph (b) of subsection 1.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54288 Display and contents of certificate. (NRS 445A.860, 445A.863)

1. The director of the laboratory shall display the certificate issued by the Bureau in a conspicuous place in the laboratory to which the members of the general public have access.

2. A certificate:

(a) Must include a statement indicating each category of testing and analyte for which the laboratory is certified; and

(b) Is the property of the Bureau and must be surrendered to the Bureau if:

(1) The Bureau revokes the certificate;

(2) The laboratory for which the certificate is issued ceases to conduct analyses of drinking water for which a certificate is required; or

(3) The Bureau ceases to be an accrediting authority approved by the Environmental Protection Agency. As used in this subparagraph, "accrediting authority" has the meaning ascribed to it in Appendix B of chapter 5 of the Standards.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.5429 Notification of Bureau of certain changes concerning certified laboratory. (NRS 445A.860, 445A.863) If, as determined by the Bureau, a change concerning a certified laboratory occurs which substantially affects the ability of the laboratory to perform any analysis for which the laboratory is certified, the director of the laboratory shall, not more than 30 days after the change occurs, notify the Bureau of that change in writing. For the purposes of this section, a change includes, without limitation, a change in the name, ownership, location or personnel of a laboratory or any other change specified in sections 4.1.8 and 4.3.2 of the Standards. (Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54292 Contractual agreements, records and reports. (NRS 445A.860, 445A.863)

1. A certified laboratory shall ensure that each analysis it performs complies with the provisions of Appendix D of chapter 5 of the Standards.

2. A certified laboratory shall maintain any document or other information required by the provisions of section 4.3.3 of the Standards in accordance with the provisions of that section.

3. If a certified laboratory prepares a report of any test conducted pursuant to the provisions of this section, the report must be prepared in accordance with the provisions of section 5.13 of the Standards.

4. If a certified laboratory is not certified to conduct a test in a category of testing or to use a method of testing or test for an analyte pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive, the director of the laboratory may contract with a certified laboratory to perform that test if:

(a) Before entering into the contract, the director notifies in writing the person for whom the test will be conducted of his intent to enter into the contract; and

(b) The laboratory complies with NAC 445A.542 to 445A.54296, inclusive, or the requirements specified in section 5.14 of the Standards.

5. If a certified laboratory contracts with another certified laboratory pursuant to the provisions of this section, the director of the certified laboratory shall ensure that the certified laboratory that will conduct the test is certified pursuant to the provisions of NAC 445A.542 to 445A.54296, inclusive. If the certified laboratory that offered the contract maintains any record of the contract or of any test conducted pursuant to the contract, it shall include in that record:

(a) Any report submitted by the certified laboratory that conducted the test concerning the results of the test conducted pursuant to the contract; and

(b) The certification number of the certified laboratory that conducted the test.

6. If the certified laboratory that offered the contract prepares a report concerning the results of any test conducted pursuant to the contract, it shall specify in the report that the results of the test were obtained by contract pursuant to the provisions of this section.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54294 Issuance of emergency order. (NRS 445A.860, 445A.863)

1. If the Bureau determines that any facility, equipment, operation or other condition of a certified laboratory requires immediate action to protect the health and safety of the members of the general public and the Bureau receives the approval of the Administrator of the Health Division of the Department of Health and Human Services, the Bureau may, without notice or hearing, issue an emergency order:

(a) Suspending the certification of the laboratory; and

(b) Requiring the person to whom the Bureau issues the order to correct the condition for which the emergency order is issued.

2. An emergency order is effective upon issuance and is not subject to review unless, within 30 days after the date the order is served, the person to whom the Bureau issues the order petitions for a hearing before the Board.

3. The Board shall continue, modify or revoke the emergency order within 30 days after it conducts the hearing required by the provisions of subsection 2.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

NAC 445A.54296 Fees. (NRS 445A.860, 445A.863)

1. Each application for:

(a) Chemistry certification must include a fee of $500.

(b) Microbiology certification must include a fee of $600.

2. In addition to the fees specified in subsection 1, the Bureau shall charge and collect the following fees:

For an application to renew certification	$500
Initial fee or annual renewal fee for certification to analyze primary inorganic contaminants	545
Initial fee or annual renewal fee for certification to analyze secondary inorganic contaminants	545
Initial fee or annual renewal fee for certification to analyze regulated and unregulated volatile organic contaminants, including trihalomethanes and vinyl chloride	545
Initial fee or annual renewal fee for certification to analyze regulated and unregulated synthetic organic contaminants	1,090
Initial fee or annual renewal fee for certification to analyze radiochemical contaminants	545
Annual renewal fee for certification to analyze specific primary or secondary inorganic contaminants, or both	200
Annual renewal fee for microbiology certification	600

3. The initial or annual renewal fee for certification to analyze any chemical contaminant not set forth in subsection 2 is $400, plus the per diem allowance and travel expenses provided for state officers and employees generally for each person who conducts an inspection that is required for certification of the laboratory.

4. If an application for certification to test for an analyte is received during the fiscal year, the fees for that certification must be prorated by using the following formula:

Fee x .083 x the number of months remaining in the fiscal year.

The month in which the application is submitted must not be counted as a month remaining in the fiscal year. The prorated fee must be rounded to the next highest dollar. The fee for submitting an application for certification to test for an analyte must not be prorated.

5. In addition to any fees paid by a laboratory located outside this State, each such laboratory shall pay to the Bureau the costs incurred by the Bureau to conduct an inspection of the laboratory.

6. A fee for certification to analyze a specific contaminant must be paid before a certificate may be issued.

7. Any fee paid pursuant to the provisions of this section is nonrefundable.

(Added to NAC by Bd. of Health by R203-99, eff. 8-1-2001)

Table 1. Guidelines for Submitting an Application

For Initial Application Please Submit:

1. Completed application
2. Fees
3. Proficiency test (PT) data for each method & matrix if available
    - If 2 sets of PT data are submitted they should have been acquired within the last 12 months,
    - If 3 sets of PT data are submitted, it should be less than 18 months old. PT studies should be performed at approximately 6 months intervals.
4. Latest onsite report and responding corrective action report
5. Quality Assurance Manual
6. Standard Operation Procedures
7. Demonstration of Capability Packet for each method.
8. Out of State Labs need to submit proof of certification by their home state or a NELAC Accrediting Authority.

For Renewing Labs Please Submit:

1. Completed application
2. Fees Proficiency test (PT) data for each method & matrix if available
    - Submission of data with the application is not necessary if PT data is being submitted by third party vendor to the state.
    - PT data must be less than 18 months old.
3. Latest onsite report and responding corrective action report
4. Quality Assurance Manual
5. Standard Operation Procedures updated procedures only or for any new methods requested

Out of state labs need to submit proof of continued certification by their home state or a NELAC Accrediting Authority. Please have your home state or NELAC AA submit certificates and scope to our program as they expire. They need not be submitted with the application package if the documentation on file is current.

Table 2. Applicable Nevada Statutes and Administrative Codes

NRS Nevada Revised Statutes *HTML/LCB*	NAC Nevada Administrative Code *HTML/LCB*	Topical Areas
40.501 - 40.512	No NAC Exists	Environmental Impairment of Real Collateral of Secured Lender(1)
41.540 - 41.570	No NAC Exists	Private Actions to Enforce Statutory or Regulatory Controls for Environmental Protection (1)
233B. - ALL	233B	Administrative Procedures Act - (1)
278.335 - 278.377	278.010 - 278.530	Subdivision of Land (DWR, HEALTH)
*444.440 - 444.645	444.570 - 444.7499	Disposal of Solid Waste
*459.400 - 459.600	444.842 - 444.8482	Facilities for Management of Hazardous Waste
*459.400 - 459.600	444.850 - 444.8746	Disposal of Hazardous Waste
*459.400 - 459.600	444.8752- 444.8788	Program for Reduction of Hazardous or Industrial Waste
*459.400 - 459.600	444.940 - 444.9555	Polychlorinated Biphenyl
459.400 - 459.600	444.960	Limits on Hazardous Waste Facility Permits
*459.400 - 459.600	444.965 - 444.976	Disposal of Asbestos
444A.010 - 444A.110	444A.005 - 444A.470	Recycling
444A.420	445A.118 - 445A.225	Water Quality Standards
445A.425, 445A.430, 445A.660	445A.0552 - 445A.067	Water Quality Laboratory Certification
*445A.300-445A.730	445A.070 - 445A.117 445a.226 - 445A.348	Definitions Water Pollution Control Program
445A.300 - 445A.730	445A.350 - 445A.447	Mining Facilities
445A.060 - 445A.190	445A.685 - 445A.805	Sewer Loan Program
445A.265 - 445A.470	445A.810 - 445A.925	Underground Injection Control
*445B.100 - 445B.640	445B.001 - 445B.395	Air Pollution Control

445B.700 - 445B.845	445B.400 - 445B.775	Engine Emission Control (DMV & PS - SEC)
445B.200 - 445B.245	445B.875 - 445B.899	Practice Before the Commission
*445C.010 - 445C.140	445C.010 - 445C.140	Environmental Audit
459.380 - 459.3874	459.952 - 459.9542	Highly Hazardous Substances
*459.500, 459.535	459.970 - 459.9729	Consultant Certification
*459.610, 459.658	459.973 - 459.9743	Voluntary Cleanup
*459.800 - 459.856	459.9921 - 445.9995	Storage Tanks
486A.010 - 486A.180	486A.101 - 486A.250	Use of Alternative Fuels
519A.010 - 519A.240 519A.260 - 519A.280	519A.010 - 519A.415	Mining Regulation & Reclamation
590.700 - 590.920	590.700 - 590.790	Cleanup of Petroleum Discharges (PETROLEUM BD)
618.775	444.965 - 444.976	Disposal of Asbestos
704.820 - 704.900	704.9063 704.9359 - 704-9361 704.9361	Utility Environmental Protection Act (PSC)[2]

(1) No direct statutory or regulatory impact; provided only for information purposes.

(2)The Regulations are defined only with the context of electrical energy demand and supply.

***** A requirement contained in NRS 444.440 to 444.645 inclusive; 445A.300 to 445A.730 inclusive, 445B.100 to 445B.640 inclusive, 459.400 to 459.856 inclusive; and 519A.010 to 519A.280 inclusive. These are the statutory areas applicable to NRS 445C -"Environmental Audits"

² The Nevada Administrative Code (NAC) contain the State of Nevada's code of regulations. State regulations are defined under State law (NRS 233B.038) as an agency rule, standard, directive or statement of general applicability which effectuates or interprets (state) law or policy, or describes the organization, procedure or practice requirements of any agency. Of note, the NAC's have the same force of law as the NRS's

NOTE: Nevada Administrative Code (NAC) Chapter 445 was revised into two chapters by the Legislative Counsel Bureau in November, 1994, Chapter 445A (Water Regulations) and Chapter 445B (Air Regulations); the NRS was revised into NRS 445A and NRS 445B in March, 1995.

Table 3. Certification of Laboratories to Analyze Substances in Water

General Provisions

445A.0552	Definitions.
445A.0554	"Accuracy" defined.
445A.0556	"Analyst" defined.
445A.0558	"Analyte" defined.
445A.0562	"Approved method of testing" defined.
445A.0564	"Certified laboratory" defined.
445A.0566	"Commission" defined.
445A.0568	"Director" defined.
445A.0572	"Division" defined.
445A.0574	"Environmental sample" defined.
445A.0576	"Federal Act" defined.
445A.0578	"National Environmental Laboratory Accreditation Conference" defined.
445A.0582	"National Environmental Laboratory Accreditation Program" defined.
445A.0584	"Performance-based measurement system" defined.
445A.0588	"Precision" defined.
445A.0592	"Proficiency test sample" defined.
445A.0594	"Proficiency testing program" defined.
445A.0596	"Quality control sample" defined.
445A.0598	"Quality manual" defined.
445A.0602	"Sensitivity" defined.
445A.0604	"Spike" defined.
445A.0606	"Standards" defined.

Guidelines and Procedures

445A.0608	Adoption by reference of *National Environmental Laboratory Accreditation Conference-Constitution, Bylaws and Standards*.
445A.0612	Adoption by reference of certain publications related to sample collection procedures, analytical methodologies and requirements for certification.
445A.0614	Adoption by reference of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*.
445A.0615	Adoption by reference of *Method 1600: Membrane Filter Test Method for Enterococci in Water*.
445A.0616	Adoption of certain ASTM standards and other publications related to calibration and testing laboratories, and examination of water and wastewater.
445A.0618	Interpretation of provisions; resolution of conflicting requirements.
445A.0622	Scope of certification.
445A.0624	Categories of analytes for which laboratory may be certified.
445A.0626	Requirements for certification.
445A.0628	Certification by Division or pursuant to National Environmental Laboratory Accreditation Program.
445A.0632	Application for certification.
445A.0634	Participation in proficiency testing program.
445A.0636	Adoption of quality manual by laboratory; contents.
445A.0638	Inspection of laboratory by Division.
445A.0642	Grounds for denial of application for certification, or revocation, suspension or limitation of certification.
445A.0644	Reapplication after denial of application or revocation of certification.
445A.0646	Renewal of certification.
445A.0648	Display of certificate; conditions for surrender of certificate; issuance of document.
445A.0652	Notification of Division of certain changes concerning certified laboratory.

APPENDIX B
APPLICATION FORM FOR
NEVADA BROWNFIELDS PROGRAM

State of Nevada
Division of Environmental Protection
Brownfields Funding Application

Please complete the following form with the most accurate information available to you. Along with this form you should attach the following information: a map showing the project location, any completed assessment work previously undertaken at the site (for cleanup applications, a copy of the assessment work does not need to be attached if the assessment was conducted under a previous State or Federal brownfields funding award), individual parcel information for multi-parcel projects, and any information about the project which would help the applicant reviewer understand the redevelopment project being proposed.

When completed, mail the application and attached information to
Nevada Division of Environmental Protection, Brownfields Program
901 South Stewart Street, Room 4001
Carson City, NV 89701

For any help in preparing this application or any general Brownfields questions, please feel free to call (775) 687-9368 and ask for the Brownfields Program.

A. Applicant Information

1) Project Title: _____

2) Are you seeking assistance with assessment or cleanup work for your project?

Assessment: ☐ Cleanup: ☐

3) Does your project involve potential petroleum contamination or hazardous substances?

Petroleum Contamination: ☐ Hazardous Substances: ☐

4) Agency Applying for Brownfields Funding: _____

5) Project Contact Name and Title: _____

6) Project Contact's Address: _____

_____

_____

7) Project Contact's Phone: _____

B. Site Information (for multi-parcel properties, attach a separate sheet detailing the parcel name, assessor's parcel number, address, acreage, current use, and owner for each individual parcel; indicate for questions 8-15 below that a separate sheet has been attached.)

8) Current Site Name: _____

9) Site Street Address: _____

_____

10) Current Zoning: _____ 11) Site Acreage: _____

12) Assessor's Parcel Number: _____

13) Latitude: (If readily available) _____ Longitude: _____

14) Please attach a map showing the location of the subject site. For multiple-parcel sites, make sure that the map clearly shows the boundaries of each separate parcel.

B. Site Information (con't)

15) Please briefly discuss the current ownership of the site, specifically detailing who the current owner of the site is, when they acquired the site, and how the site was acquired (i.e. tax foreclosure, eminent domain, purchase, etc.). If you as the applying agency are not the current owner of the property, discuss how the current owner is involved in the project.

16) Using the space provided below, provide a brief description of the current site usage, making particular note of any site uses which may either have caused or contributed to site contamination issues.

17) With the information available to you, what were the past property uses which may have caused or contributed to current site contamination issues.

18) Please disclose and discuss any environmental regulatory involvement or enforcement actions which have occurred at the site.

19) Please attach any documents for any environmental assessments which may have been conducted previously for the site. If you are applying for cleanup funds, and the assessment work was conducted through a previous Federal or State Brownfields grant, you do not need to attach a copy of that assessment.

C. Project Information (The information provided in the following fields will be used by the NDEP Brownfields Program to prioritize project funding and rank competing projects. The Brownfields Program currently makes every effort to fund each eligible project; however, where several projects are competing for limited funding, we will use information regarding the planned redevelopment project, the benefits to the community, and the amount of community involvement to prioritize our funding.)

20) In the space provided below, please provide information regarding the anticipated future re-use of the property, specifically highlighting how this redevelopment project will benefit the affected community (i.e. job creation, park and greenspace creation, improved access to services, etc.)

21) Describe how this project fits in with community-wide revitalization or master plans previously developed by the community. Feel free to attach to your application any planning documents which can help demonstrate the redevelopment vision and strategic planning being undertaken by the community.

22) How has the community been involved, or planned to be involved, in the potential cleanup/redevelopment activities at this site?

D. Applicant's Signature (A representative of the applying agency should sign the application; it does not need to be the project contact as listed in the first section, but it should be someone with the authority to sign on the agency's behalf.)

Signature: _____ Date: _____

Name: _____ Title: _____

E. List of Attachments (Please provide a list of attachments which are being submitted with the application. This will ensure that all relevant information is reviewed by the NDEP Brownfields Program staff.

APPENDIX C

EPA REGION 9 TEMPLATE FOR SAMPLING AND ANALYSIS PLAN

APPENDIX C – SAMPLING AND ANALYSIS PLAN

GUIDANCE AND TEMPLATE

VERSION 4, Brownfields Assessment Projects

August 2018

This Sampling and Analysis Plan (SAP) guidance and template is intended to assist organizations in documenting the procedural and analytical requirements for Brownfields Assessment projects involving the collection of water, soil, sediment, or other samples taken to characterize areas of potential environmental contamination. It combines, in a short form, the basic elements of a Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP). Once prepared and approved it will meet the requirements for any U.S. Environmental Protection Agency (EPA) Region 9 Brownfields project in which environmental measurements are to be taken.

The format is designed to accommodate projects of limited scope and presumes that the work will be going to a laboratory whose analytical services are not funded directly by EPA. This might include, but not be limited to, a private or commercial laboratory, a state laboratory, an in-house laboratory or any other laboratory under contract to the organization writing the SAP. It is intended to be used for projects generating a limited number of samples to be collected over a relatively short time. This template is not intended to be used for on-going monitoring events, or for remediation or removal activities. Exceptions to these requirements will be considered on a case-by-case basis, but they should be discussed with Region 9 QA Section staff before the template is used and before the SAP is submitted for approval. This template may be used by state, municipal and local agencies, contractor, non-profit organizations, and by EPA staff.

This guidance - template provides item-by-item instructions for each section of a SAP. If the sections are appropriate for the project, they may be used verbatim, or modified as needed to reflect project- and sampling-specific requirements. Not all sections will apply to every organization or to every project.

Some sections, such as those describing sampling procedures, contain example language which may be used with or without modification. If these procedures do not meet project needs, the organization may substitute a specific description of sampling procedures or provide copies of the sampling standard operation procedures (SOPs). Other alternatives should be discussed with QA Section staff.

An electronic version of the template is available and may be used to prepare the SAP. The format of the template is as follows:

The two types of shaded text are to be deleted from the final SAP:

1. Tutorial information presented in *italic* type. This information includes definitions and background information pertaining to a given section of the SAP.
2. Specific instructions given inside brackets [in normal type].

Suggested text which may be included in the SAP is presented in normal type. This text can be used, modified, or deleted depending on the nature of the project. For example, if only groundwater will be sampled, delete the discussion of sampling other matrices. If more than one option is presented, pick the appropriate one and delete the others.

If the use of a Standard Operating Procedure (SOP) is appropriate, the SOP should be included as an appendix to the final SAP and referenced in the appropriate section.

An underlined blank area [_____] indicates that text should be added. Examples or choices may be provided in [brackets] following the blank. If appropriate, select one and delete the others. The underlining should be deleted.

If a given section does not apply, it is recommended that the section state “Not applicable” or “Does not apply” under the section heading. By including the section, the writer avoids having to renumber sections. However, sections can be removed altogether and the remaining sections renumbered.

Example forms are located in Attachment 1. They should be deleted and organization appropriate ones included in the final SAP.

The U.S. EPA Region 9 Quality Assurance Section is available to provide assistance in completing the SAP. Contact Audrey L. Johnson at 415-972-3431, or Mr. Derrick Williamson at 415-972-3698.

Sampling and Analysis Plan [Title of Project] SITE [Address]

Prepared for:

[Name of Organization]

[Date]

Prepared by:

[Name of Organization] [Address]

APPROVAL PAGE

Approved by: _____ _____
[Grantee Name] Project Manager **Date**

Approved by: _____ _____
[Contractor Name] Project Manager **Date**

Approved by: _____ _____
[Contractor Name] Quality Assurance Officer **Date**

Approved by: _____ _____
Project Officer, USEPA Region IX **Date**

Approved by: _____ _____
Quality Assurance Manager, USEPA Region IX **Date**

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

LIST OF FIGURES

Include a list of figures referred to in the report. The following list can be used as a starting point. Add or delete figures as appropriate.

LIST OF TABLES

Include a list of tables referred to in the report. The following list can be used as a starting point. Add or delete tables as appropriate.

LIST OF APPENDICES

Include a list of appendices referred to in the report. The following list can be used as a starting point. Add or delete appendices as appropriate.

DISTRIBUTION LIST

Add additional names as appropriate.

[Grantee Name, Title]
[Grantee Address]

[Contractor Name, Title]
[Contractor Address]

[Name, USEPA Project Officer]
[Division or Section]
US EPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

[Name, USEPA QA Manager]
Quality Assurance Section
US EPA Region 9
75 Hawthorne Street
San Francisco, CA 94105

ABBREVIATIONS AND ACRONYMS

Include and define all acronyms and abbreviations used throughout the plan. The following list can be used as a starting point. Add or delete acronyms and abbreviations as appropriate.

ASTM	American Society for Testing and Materials
CERCLA	Comprehensive Environmental Response, Cleanup, and Liability Act
CFR	Code of Federal Regulations
CHHSL	California Human Health Screening Levels
CLP	Contract laboratory program
CWA	Clean Water Act
DQA	Data quality assessment
DQI	Data quality indicators
DQO	Data quality objectives
EPA	U.S. Environmental Protection Agency
ESA	Environmental site assessment
ESL	Environmental Screening Levels
FSP	Field sampling plan
GC/MS	Gas chromatography and mass spectrometry
IDW	Investigation-derived waste
LCS	Laboratory control sample
MDL	Method detection limit
MQO	Measurement quality objective
MS/MSD	Matrix spike and matrix spike duplicate
mg/L	Milligrams per liter
µg/L	Micrograms per liter
PARCCS	Precision, accuracy, representativeness, completeness, comparability, and sensitivity
PE	Performance evaluation
PRQL	Project-required quantitation limit
QA	Quality assurance
QA/QC	Quality assurance/quality control

QAPP	Quality assurance project plan
QC	Quality control
QL	Quantitation limit
RCRA	Resource Conservation and Recovery Act
RPD	Relative percent difference
RSL	Regional Screening Level
%R	Percent recovery
SAP	Sampling and analysis plan (an integrated FSP and QAPP)
SOP	Standard operating procedures
SOW	Statement of work
SVOC	Semi-volatile organic compound
TNI	The NELAC Institute
VOC	Volatile organic compound

1. INTRODUCTION

1.1 SITE HISTORY

This section should include a brief description of the project, including the history, problem to be investigated, scope of sampling effort, and types of analyses required. These topics will be covered in depth later so do not include a detailed discussion here. Include tentative sampling dates.

For Brownfields projects, the type of grant (Assessment, Cleanup, Revolving Loan Fund or 128(a)) should be specified and whether it is for hazardous substances or petroleum products. Assessment grants should also state whether it is an area-wide or site-specific grant.

1.2 SITE NAME OR SAMPLING AREA

Provide the most commonly used name of the site or sampling area. Also include the name or abbreviation ("the Site"), if any, that will be used throughout the plan.

1.3 SITE OR SAMPLING AREA LOCATION

Provide a general description of the region (residential, commercial, light industrial, mixed, etc.), state or tribal area in which the site or sampling area is located. Include street address, city, state, and postal code, if appropriate. Detailed information should be provided later in Section 2.

1.4 RESPONSIBLE ORGANIZATION

Provide a description of the organization conducting the sampling.

1.5 PROJECT ORGANIZATION

Table 1-1 should be completed. Provide the name, phone number and email address of the person(s) and/or contractor working on the sampling project as listed in the table. The table can be modified to include titles or positions appropriate to the specific project. Delete personnel or titles not appropriate to the project. A brief description of the roles and responsibilities for each key position should be included either in the table (as shown) or within the text of this section.

An Organization Chart should be included showing the lines of communication. The above information may also be included on the Organization Chart, if appropriate.

It is the responsibility of the Quality Assurance (QA) Officer to oversee the implementation of the Sampling and Analysis Plan, including whether specified quality control (QC) procedures are being followed a described. Ideally, this individual should discuss QA issues with the Project Manager, but should not be involved in the data collection/analysis/interpretation/reporting process except in a review or oversight capacity. If the project is small, another technical person may fulfill this role.

Table 1-1
Key Project Personnel Contact Information and Responsibilities

Title	Name	Phone Number Email Address	Responsibilities
EPA Project Manager			
EPA Quality Assurance Officer (QAO)			
Grantee Project Manager			
Contractor Project Manager (include Company Name)			
Contractor QAO			
Contractor Field Team Leader			
Laboratory Quality Assurance Officer (include Laboratory Name)			

2. BACKGROUND

This section provides an overview of the location, previous investigations, and the apparent problem(s) associated with the site or sampling area.

2.1 SITE OR SAMPLING AREA DESCRIPTION

Two maps of the area should be provided: the first, on a larger scale, should place the area within its geographic region; the second, on a smaller scale, should mark the sampling site or sampling areas within the local area. Additional maps may be provided, as necessary, for clarity. Maps should include a North arrow, a surface and/or ground water directional flow arrow (if appropriate), buildings or former buildings, spill areas, etc. If longitude or latitude information is available, such as from a Global Positioning System (GPS), provide it.

Fill in the blanks.

The site or sampling area occupies_____*[acres or square feet*] in a/an _____ [*urban, commercial, industrial, residential, agricultural, or undeveloped*] area. The site or sampling area is bordered on the north by_____, on the west by_____, on the south by_____, and on the east by _____. The specific location of the site or sampling area is shown in Figure 2.2.

The next paragraph(s) should describe historic and current on-site structures. These should be shown on one of the figures.

Depending on the nature of the project, some of the following sections may not be applicable. If this is the case, do not delete the section. Instead enter "Not Applicable" or other text to indicate that the section does not apply or that the information is not available.

2.2 OPERATIONAL HISTORY

As applicable, describe in as much detail as possible (i.e., use several paragraphs) the past and present activities at the site or sampling area. The discussion might include the following information:

- *a description of the owner(s) and/or operator(s) of the site or areas near the site or sampling area (present this information chronologically);*
- *a description of past and current operations or activities that may have contributed to suspected contamination;*
- *a description of the processes involved in the operation(s) and the environmentally detrimental substances, if any, used in the processes;*
- *a description of any past and present waste management practices.*

2.3 PREVIOUS INVESTIGATIONS/REGULATORY INVOLVEMENT

Summarize all previous sampling efforts at the site or sampling area, including:

- *the sampling date(s);*
- *name of the party(ies) that conducted the sampling;*
- *local, tribal, state or federal government agency for which the sampling was conducted;*
- *a rationale for the sampling;*
- *the type of media sampled (e.g., soil, sediment, water, soil vapor);*
- *laboratory methods that were used;*
- *a discussion of what is known about data quality and usability.*

The summaries should be presented in subsections chronologically. Attach reports or summary tables of results, or include in appendices, if necessary. See Table 2-1 for an example. Previous sampling locations can be shown on one of the figures, or additional figures can be included.

If results from previous sampling events are being used in a general nature, the results can be summarized (e.g., report the highest hits or the range of the results). If specific results are being used to direct the current sampling effort, those specific results must be reported on an analyte- by-analyte basis.

2.4 SCOPING MEETING

Summarize the scoping meeting and/or site visit, including:

- *the date the meeting was held*
- *who attended*
- *what was discussed*

- *what decisions were made*

If more than one scoping meeting/site visit was conducted, include the above information for each.

2.5 GEOLOGICAL/METEOROLOGICAL INFORMATION

For surface and/or ground water sampling: Provide a description of the hydrogeology of the area. Indicate the direction of flow and include a directional flow arrow on the appropriate figure.
For soil sampling: Provide a description of the geology of the area.
For air sampling: Provide prevailing wind direction, temperature, etc.

2.6 IMPACT ON HUMAN HEALTH AND/OR THE ENVIRONMENT

Discuss what is known about the possible and actual impacts of the potential environmental problem at the site on human health and/or the environment.

Table 2-1
Contaminants of Concern, Previous Investigations
Matrix = xx

Analytical Parameter (Contaminants of Concern)	Date of sampling	Sampling contractor	Laboratory Analytical Results (units)	Regulatory Limit (specify)[1]

Specify the source of the regulatory limit(s). For example:

DTSC = Calif. Department of Toxic Substances Control
RWQCB = Regional Water Quality Control Board
RSLs = EPA Region IX Regional Screening Levels
CHHSLs = California Human Health Screening Levels
ESLs = Environmental Screening Levels

3. PROJECT AND DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements for establishing criteria for data quality and for developing data collection designs. This section is crucial to SAP approval, since it defines what the data will be used for and what quality of data are needed to make decisions. EPA's Guidance for Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4, February 2006) should be consulted for more information. The DQO section should cover the following items:

- Concisely describe the problem to be investigated.
- Identify what questions the investigation will attempt to resolve, what actions (decisions) may result, and who the primary decision maker is.
- Identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement(s).
- Define study boundaries and when and where data should be collected.

Most projects utilizing this template are small. Therefore, defining action levels and measurement quality objectives (MQOs) for field and laboratory measurements used on the project are usually sufficient. MQOs define criteria for calibration and quality control (QC) for field and laboratory methods. MQOs are discussed more thoroughly below.

3.1 PROJECT TASK AND PROBLEM DEFINITION

Describe the purpose of the environmental investigation in qualitative terms and how the data will be used. Discuss how the site history relates to the problem to be investigated, scope of sampling effort, and types of analyses that will be required. Include all measurements to be made on an analyte specific basis in whatever media (soil, sediment, water, etc.) is to be sampled. This discussion should relate to how this sampling effort will support the specific decisions described in Section 3.2, DQOs, below.

Redevelopment plans, if known, should be included. If the future use of the site is not known, this should be stated.

3.2 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are quantitative and qualitative criteria that establish the level of uncertainty associated with a set of data. They answer the question: How sure are you that the values of the data are what the analyses have determined them to be? All the elements of the sampling event, from the sampling design through laboratory analysis and reporting, affect the quality of the data. The project manager, or other decision maker identified earlier in the project organization section, must make the decision as to what level of uncertainty is acceptable or appropriate. Depending on what the contaminants of concern are, what effect they may have on human and environmental health, and at what level, data quality may need to be legally defensible or capable of answering only a simple "presence-absence" question. More sophisticated DQO discussions involve defining null testing hypotheses and confidence intervals. These should be considered depending on project decision making needs, but such discussions are generally not expected in one-time event SAPs. (A description of the "Seven Step DQO Process" is included in Attachment A).

This section should describe decisions to be made based on the data and provide criteria on which these decisions will be made. Inclusion of one or more tables is recommended. Tables should contain, at a minimum, the main contaminants of concern, their associated action levels and detection limits, and the source of the action level (regulation, health based criteria, water quality standards, etc.) If a contaminant does not have an action level, or will not be used in decision making, the text should discuss how the data for that contaminant will be used. (See Attachment B for a discussion of the relationship between project action limits (PALs), detection limits (DLs) and quantitation limits (QLs).)

The use of "If...then" statements are recommended. Decisions do not have to involve regulatory or legal action (and for Brownfields projects, few are expected to). Some examples: "If contaminants of concern are not detected above the action limits, then no further action is required." or: "If one or more contaminants of concern are found above the action level, then recommendations for further action, such as additional assessment, remediation, or removal will be evaluated."

Discuss Data Quality Objectives, action levels, and decisions to be made based on the data. A table should be constructed which includes the analytes of concern, action limits and detection limits. See Table 3-1 for an example. A separate table should be prepared for each matrix/media to be sampled.

3.3 MEASUREMENT QUALITY OBJECTIVES

Measurement Quality Objectives are criteria established to assess the viability and usability of data. These are based on both field and laboratory protocols that examine whether the data quality indicators (DQIs), i.e.,

precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS), meet criteria established for various aspects of data gathering, sampling, or analysis activity. In defining MQOs specifically for the project, the level of uncertainty associated with each measurement is defined. Some DQIs are quantitative, others are more qualitative. (See Attachment C for a discussion of the PARCCS parameters.)

The values that are to be assigned to the quantitative data quality indicators (precision, accuracy, completeness and sensitivity) and statements concerning the qualitative indicators (representativeness and comparability) are determined by the answers to the questions in Section 3.2.

Project specific requirements for precision, accuracy, representativeness, completeness, comparability and sensitivity (PARCCS) should be discussed here. Where applicable, precision and accuracy acceptance limits, for both laboratory and field measurements, may be presented in a tabular format. A separate table should be prepared for each matrix or media to be sampled. Otherwise, MQO tables or laboratory SOPs should be included as appendices and referenced. This is discussed in greater detail in Section 5.2.

3.4 DATA REVIEW AND VALIDATION

Region 9 has adopted a tiered approach to data review. Details on validation are available from the QA Office, but a brief summary follows:

- Tier 1 involves a cursory review of the QC data for the project. This is sometimes referred to as a "Summary Forms" review. At a minimum, all data should receive a Tier 1 review.
- Tier 2 involves a selected validation based on several factors which should be defined in the DQOs for the project. Candidates might be a specific area within the sampling area, specific analytes or analyses of concern critical to decision making, or some other factor(s). The review may also focus on anomalies noted during the Tier 1 review.
- Tier 3 involves a traditional full validation. Data reviewed include the raw data, standards log books, extractions logs, instrument printouts, chromatograms (if applicable), mass spectra (if applicable), etc. Calibration data, sample analysis data, and quality control data are all evaluated. Typically, this is a "3rd party review" and isbased on strict protocols, such as the National Functional Guidelines.

There is no requirement that all data adhere to the same Tier; the project can mix and match depending on project needs and requirements. It is recommended that if validation will be a part of the data review process, that SOP(s) from the organization which will perform the validation be attached.

Discuss data review and data validation including what organizations or individuals will be responsible for what aspects of data review and what the review will include. This section should also discuss how data that do

not meet data quality objectives will be designated, flagged, or otherwise handled. Possible corrective actions associated with the rejection of data, such as reanalysis or resampling, also need to be addressed.

3.5 DATA MANAGEMENT

Provide a list of the steps that will be taken to ensure that data are transferred accurately from collection to analysis to reporting. Discuss the measures that will be taken to review the data collection processes, including field notes or field data sheets; to obtain and review complete laboratory reports; and to review the data entry system, including its use in reports. A checklist is acceptable.

3.6 ASSESSMENT OVERSIGHT

Describe the procedures which will be used to implement the QA Program. This would include oversight by the Quality Assurance Manager or the person assigned QA responsibilities. Indicate how often a QA review of the different aspects of the project, including audits of field and laboratory procedures, use of performance evaluation samples, review of laboratory and field data, etc., will take place. Describe what authority the QA Manager or designated QA person has to ensure that identified field and analytical problems will be corrected and the mechanism by which this will be accomplished.

Table 3-1
Contaminants of Concern, Laboratory, and Screening or Action Levels Matrix = xx

Analytical Parameter (Contaminants of Concern)	Laboratory Reporting or Quantitation Limits	Screening or Action Levels		

4. SAMPLING DESIGN AND RATIONALE

For each sampling event, the SAP must describe the sampling locations, the media tobe sampled, and the analytes of concern at each location. A rationale should then be provided justifying these choices. This information may be presented in a tabular format. (See Tables 4-1and 4-2 for examples.) This section is crucial to plan approval and should be closely related to previously discussed DQOs.

The following subsections are subdivided on a media specific basis among soil, sediment, and water. Other media should be added as needed. Appropriate figures should be included showing proposed sampling locations.

Information regarding the collection of field duplicates may be included in these sections. Provide a rationale for the selection of these locations. If locations will be determined in the field, the criteria that will be used to make these selections should be provided. Alternatively, field duplicates may be discussed in Section 10.1.2.

Do not include sampling procedures, preservation, etc., as these topics are covered in later sections.

4.1 SOIL SAMPLING

Provide a general overview of the soil sampling event. Present a rationale for choosing each sampling location at the site or sampling area and the depths at which the samples are to be taken, if relevant. If decisions will be made in the field, provide details concerning the criteria that will be used to make these decisions (i.e., the decision tree to be followed). List the analytes of concern at each location and provide a rationale for why the specific chemical or group of chemicals (e.g., organochlorine pesticides) was chosen. Include a figure showing sampling locations.

4.2 SEDIMENT SAMPLING

Provide a general overview of the sediment sampling event. Present a rationale for choosing each sampling location at the site or sampling area and the depths or area of the river, stream or lake at which the samples are to be taken, if relevant. If decisions will be made in the field, provide details concerning the criteria that will be used to make these decisions (i.e., the decision tree to be followed). List the analytes of concern at each location and provide a rationale for why the specific chemical or group of chemicals (e.g., organochlorine pesticides) was chosen. Include a figure showing sampling locations.

4.3 WATER SAMPLING

Provide a general overview of the water sampling event. For groundwater, describe the wells to be sampled or how the samples will be collected (e.g., hydro punch), including the depths at which the samples are to be taken. For surface water, describe the depth and nature of the samples to be collected (fast or slow-moving water, stream traverse, etc.). Present a rationale for choosing each sampling location or sampling area. If decisions will be made in the field, provide details concerning the criteria that will be used to make these decisions (i.e., the decision tree to be followed). List the analytes of concern at each location and provide a rationale for why the specific chemical or group of chemicals (e.g., organochlorine pesticides) was chosen. Include a figure showing sampling locations.

4.4 SOIL VAPOR SAMPLING

Describe soil vapor considerations and discuss whether soil vapor may be a potential concern, and if sampling may be warranted at the site. All assessments should consider the potential for vapor intrusion to ensure that any redevelopment activities protect the health of current and future site occupants. Evaluate the site conditions and determine the potential soil vapor intrusion. concerns. State if soil vapor intrusion is a concern at the site based on the flowchart provided below, and if warranted, describe any soil vapor sampling activities.

Below is some suggested language:

Vapor intrusion is defined as the migration of chemical vapors from contaminated soil and groundwater into existing or planned buildings. Vapor intrusion exposes building occupants to potentially toxic levels of vapors when volatile organic compounds (VOCs) present in contaminated soil or groundwater emit vapors that migrate into overlying buildings. VOCs in contaminated soil and groundwater emit vapors that rise through the pore space of the unsaturated zone above the water table. These vapors can move laterally as well as vertically from the source of contamination. Generally, soil or groundwater contamination within 100 feet (laterally or vertically) of any current or future on-site or off-site buildings contains the potential for releasing hazardous vapors to the indoor air. Any passageway, such as a sand or gravel layer, buried utility line, or animal burrow, may facilitate the flow of soil vapor. Properties with a higher potential for soil vapor intrusion include industrial and commercial areas, such as former manufacturing and chemical processing plants, warehouses, train yards, dry cleaners, and gas stations.

4.5 OTHER SAMPLING

Describe other media that may be sampled. Present a rationale for choosing each sampling location at the site or sampling area and the depths at which the samples are to be taken, if relevant. If decisions will be made in the field, provide details concerning the criteria that will be used to make these decisions (i.e., the decision tree to be followed). List the analytes of concern at each location and provide a rationale for why the specific chemical or group of chemicals was chosen. Include a figure showing sampling locations.

4.6 CULTURAL RESOURCE DISCOVERIES

The disturbance of site soils carries the potential of unanticipated discovery of cultural resources. Cultural resources are artifacts, relics, or other physical traces, regardless of condition, that may be associated with prehistoric or indigenous occupation and use of the site and may possess archeological significance or be of importance to existing tribes. Information describing the steps to be implemented if cultural resources are discovered should be included in this section. Different regions, municipalities, agencies, states, or other organizations, such as a local tribe, may already have an appropriate plan developed. If so, a copy should be included with this document and referenced here.

Table 4-1
Sampling Design and Rationale Matrix = Soil

Sampling Location/ID Number	Depth (feet)	Analytical Parameter	Rationale *

* Include rationale for location, depth and analysis.

Table 4-2
Sampling Design and Rationale
Matrix = Groundwater

Sampling Location/ID Number	Analytical Parameter	Rationale *

* Include rationale for location and analysis.

5. REQUEST FOR ANALYSES

This section should discuss the following analytical support for the project: the analyses requested, analytes of concern, turnaround times, available resources, available laboratories, etc. The use of tables is highly recommended. If samples will be sent to more than one organization, it should be clear which samples will be sent to each laboratory. Field analyses for pH, conductivity, turbidity, or other field tests should be discussed in the sampling section. Field measurements in a mobile laboratory should be discussed here and differentiated from samples to be sent to a fixed laboratory. Field screening tests (for example, immunoassay tests) should be discussed in the sampling section, but the confirmation tests should be discussed here and the totals included in the tables.

5.1 ANALYSES NARRATIVE

Complete this subsection concerning the analyses for each matrix. An analytical services table is recommended for each matrix to be sampled. See Tables 5-1 and 5-2 for examples. Each table must include the analytical parameters for each type of sample. Quality Control (QC) samples, such as blanks, duplicates, splits, and laboratory QC samples, should be indicated in the column titled "Special Designation." The selected analyses must be consistent with earlier discussions concerning DQOs and analytes of concern.

Information on container types, sample volumes, preservatives, special handling, and analytical holding times for each parameter may be included here or on a separate table. See Tables 5-3 and 5-4 for examples.

Include any special requests, such as fast turn-around time (2 weeks or less), specific QC requirements, or modified sample preparation techniques in this section. Provide information for each analysis requested.

Note: Rationale for the selection of duplicate and laboratory QC sample locations is to be provided in Section 10.0.

5.2 ANALYTICAL LABORATORY

When an organization contracts for analytical work it has two options. In Option 1, MQOs for laboratory work are defined in the SAP. The MQOs are provided to the laboratory which then acknowledges that it is capable of meeting these criteria, and also states it is willing to do so. In Option 2, the sampling organization reviews the information from the laboratory on its QA/QC Program and C criteria and determines whether the laboratory can meet project needs.

If the first approach is taken, the organization writing the SAP should include the appropriate QC tables in the SAP. The Region 9 QA Office has MQO tables available for most routine analyses. These tables can be

attached to the SAP and referenced in this section. Plan preparers are free to request these tables, review them for their appropriateness for the project, and incorporate all or some of them in original or modified form into their SAP.

If the second approach is taken, the sampling organization must acknowledge that it understands and agrees to the MQOs defined by the contract laboratory which will be used for the project. MQOs or QC criteria for work performed by the laboratory will be found in either the laboratory's QA Plan and/or its SOPs, which must be included with the sampling plan for review.

Field analyses for pH, conductivity, turbidity, or other field tests should be discussed in the sampling section. Field measurements in a mobile laboratory (for example, the Field Analytical Support Program (FASP) laboratory) should be discussed here and differentiated from samples to be sent to a fixed laboratory. Field screening tests (for example, immunoassay tests) should be discussed in the sampling section, but the confirmation tests should be discussed here and the totals included in the tables.

The narrative subsection concerning laboratory analytical requirements should be completed. Appropriate MQO tables, or the laboratory QA Plan and relevant SOPs for the methods to be performed, must accompany the SAP. EPA does not approve or certify laboratories; however, it will review the laboratory's QA Plan and provide comments to the SAP's originator concerning whether the laboratory's QA/QC program appears to be adequate to meet project objectives. It is recommended that any issues raised be discussed with the laboratory and resolved before work commences. Note that the more the SAP "defaults" to laboratory capabilities, the greater emphasis will be placed on the adequacy of the laboratory's QA program. If MQO tables, or the equivalent, are used, less emphasis will be placed on the laboratory's QA Program.

Table 5-1 Analytical Services Matrix = Soil

Sample Number	Sample Location	Depth (feet)	Special Designation	Analytical Methods			
Total number of Soil Samples, excluding QC:							
Total number of Soil Samples, including QC:							

Table 5-2

Analytical Services
Matrix = Groundwater

Sample Number	Sample Location	Special Designation	Analytical Methods			
Total number of samples, excluding QC						
Total number of samples, including QC						

6. FIELD METHODS AND PROCEDURES

In the general introductory paragraph to this section, there should be a description of the methods and procedures that will be used to accomplish the sampling goals, e.g., "...collect soil, sediment and water samples." It should be noted that personnel involved in sampling must wear clean, disposable gloves of the appropriate type. The sampling discussion should track the samples identified in Section 4.0 and Analytical Services table(s). A general statement should be made that refers to the sections containing information about sample tracking and shipping (Section 7). Provide a description of the sampling procedures. Example procedures are provided below, but the organization's own procedures can be used instead. In that case, attach a copy of the applicable SOP. Some sampling procedures are available from EPA. Contact the QA Office or visit the Region 9 laboratory's web page.

6.1 FIELD EQUIPMENT

6.1.1 List of Equipment Needed

List all the equipment that will be used in the field to collect samples, including decontamination equipment, if required. Discuss the availability of back-up equipment and spare parts. This information can be presented in a tabular format. See Table 6-1 for an example.

6.1.2 Calibration of Field Equipment

Describe the procedures by which field equipment is prepared for sampling, including calibration standards used, frequency of calibration and maintenance routines. Indicate where the equipment maintenance and calibration record(s) for the project will be kept. See Table 6-2 for an example.

6.2 FIELD SCREENING

In some projects a combination of field screening using a less accurate or sensitive method may be used in conjunction with confirmation samples analyzed in a fixed laboratory. This section should describe these methods or reference attached SOPs. Analyses such as XRF or immunoassay kits are two examples.
Describe any field screening methods to be used on the project, including how samples will be collected, prepared, and analyzed in the field. Include in an appendix, as appropriate, SOPs covering these methods. Confirmation of screening results should also be described. The role of field screening in decision making for the site should also be discussed here if it has not been covered previously.

6.3 SOIL SAMPLING

6.3.1 Surface Soil Sampling

Use this subsection to describe the collection of surface soil samples that are to be collected within 6-12 inches of the ground surface. Specify the method (e.g., hand trowels) that will be used to collect the samples and then transfer samples to the appropriate containers, or reference the appropriate sections of a Soil Sampling SOP. If SOPs are referenced, they should be included in an appendix.

If exact soil sampling locations will be determined in the field, this should be stated. The criteria that will be used to determine sampling locations, such as accessibility, visible signs of potential contamination (e.g., stained soils, etc.), and topographical features which may indicate the location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation) should be provided.

Include this paragraph first if exact sampling locations are to be determined in the field; otherwise delete.

Exact soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., stained soils), and topographical features which may indicate location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation). Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

If surface soil samples are to be analyzed for volatile organic compounds (VOCs), use this paragraph; otherwise delete. It is Region 9 policy that soils collected for volatile and gasoline analyses be collected in hermetically sealed sampling devices (such as EnCore samplers) and analyzed within the holding time specified in EPA Method 5035, or immediately preserved by one of the processes specified in EPA Method 5035. A rationale should be provided if more than one preservation method is specified. Collection in brass tubes, even if subsequently preserved, is not acceptable.

Samples to be analyzed for volatile organic compounds will be collected first. Surface soil samples for VOC analyses will be collected as grab samples (independent, discrete samples) from a depth of 0 to ____ inches below ground surface (bgs). Surface soil samples will be collected using [specify the type of sampling device], and will be collected in triplicate. Samples will be sealed and placed in a zip lock bag. See Section 7.1 for preservation and shipping procedures.

If surface soil samples are to be analyzed for compounds other than volatiles, use this paragraph; otherwise delete.

Surface soil samples will be collected as grab samples (independent, discrete samples) from a depth of 0 to inches below ground surface (bgs). Surface soil samples will be collected using a stainless-steel hand trowel. Samples to be analyzed for_____[list all analytical methods for soil samples except for volatile organic compounds] will be placed in a sample-dedicated disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being closed to prevent potential contaminant migration to or from the sample. [Alternatively, samples will be retained in the brass sleeves in which collected until samples preparation begins.] See Section 7.1 for preservation and shipping procedures.

6.3.2 Subsurface Soil Sampling

Use this subsection for subsurface soil samples that are to be collected 12 inches or more below the surface. Specify the method (e.g., hand augers) that will be used to access the appropriate depth and then state the depth at which samples will be collected and the method to be used to collect and then transfer samples to the appropriate containers, or reference the appropriate sections of a Soil Sampling SOP. If SOPs are referenced, they should be included in an Appendix.

If exact soil sampling locations will be determined in the field, this should be stated. The criteria that will be used to determine sampling locations, such as accessibility, visible signs of potential contamination (e.g., stained soils), and topographical features which may indicate the location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation) should be provided. There should also be a discussion concerning possible problems, such as subsurface refusal.

Include this paragraph first if exact sampling locations are to be determined in the field; otherwise delete.

Exact soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., stained soils), and topographical features which may indicate location of hazardous substance disposal (e.g., depressions that may indicate a historic excavation). Soil sample locations will be

recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

If subsurface samples are to be analyzed for volatile organic compounds, use this paragraph; otherwise delete It is Region 9 policy that soils collected for volatile and gasoline analyses be collected in hermetically sealed sampling devices (such as EnCore samplers) and analyzed within the holding time specified in EPA Method 5035, or immediately preserved by one of the processes specified in EPA Method 5035. A rationale should be provided if more than one preservation method is specified. Collection in brass tubes, even if subsequently preserved, is not acceptable.

Samples to be analyzed for volatile organic compounds will be collected first. Subsurface samples will be collected by boring to the desired sample depth using _____. Once the desired sample depth is reached, soil samples for VOC analyses will be collected as independent, discrete samples. Surface soil samples will be collected using [specify the type of sampling device], and will be collected in triplicate. Samples will be sealed using the Encore sampler and placed in a zip lock bag. See Section 7.1 for preservation and shipping procedures.

If subsurface soil samples are being collected for compounds other than volatiles, use these paragraphs; otherwise delete.

Subsurface samples will be collected by boring to the desired sample depth using _____. Once the desired sample depth is reached, the _____ [hand- or power-operated device, such as a shovel, hand auger, hollow-stem auger or split-spoon sampler] will be inserted into the hole and used to collect the sample. Samples will be transferred from the _____[sampling device] to a sample-dedicated disposable pail and homogenized with a trowel. Material in the pail will be transferred with a trowel from the pail to the appropriate sample containers. Sample containers will be filled to the top taking care to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration to or from the sample. See Section 7.1 for preservation and shipping procedures.

Include this as the final paragraph for subsurface soil samples.

Excess set-aside soil from the above the sampled interval will then be repacked into the hole.

6.4 SEDIMENT SAMPLING

Use this subsection if sediment samples are to be collected. Specify the method (e.g., dredges) that will be used to collect the samples and at what depth samples will be collected. Describe how samples will be homogenized and the method to be used to transfer samples to the appropriate containers, or reference the appropriate sections of a Soil Sampling SOP. If SOPs are referenced, they should be included in an appendix.

If exact sediment sampling locations will be determined in the field, this should be stated. Describe where sediment samples will be collected, e.g., slow moving portions of streams, lake bottoms, washes, etc.

Include this paragraph first if exact sampling locations are to be determined in the field; otherwise delete.

Exact sediment sampling locations will be determined in the field, based on _____ [describe the criteria to be used to determine sampling locations]. Care will be taken to obtain as representative a sample as possible. The sample will be taken from areas likely to collect sediment deposits, such as slow-moving portions of streams or from the bottom of the lake at a minimum depth of 2 feet.

The final paragraph describes sample homogenization, which is especially important if the sample is to be separated into solid and liquid phases, and container filling. Include this paragraph, or a modified form of it, for all sediment sampling. It is assumed that sediment samples will not be analyzed for volatile compounds. If sediment is to be analyzed for volatile organic compounds, the samples to be analyzed for volatile compounds should not be homogenized, but rather transferred directly from the sampler into the sample container. If feasible, a hermetically sealed sampling device should be used.

Material in the sampler will be transferred to a sample-dedicated disposable pail and homogenized with a trowel. Material from the pail will be transferred with a trowel from the bucket to the appropriate sample containers. Sample containers will be filled to the top taking care to prevent soil from remaining in the lid groves prior to being sealed in order to prevent potential contamination migration to or from the sample containers. See Section 7.2 for preservation and shipping procedures.

6.5 WATER SAMPLING

6.5.1 Surface Water Sampling

Use this subsection if samples are to be collected in rivers, streams, lakes and reservoirs, or from standing water in runoff collection ponds, gullies, drainage ditches, etc. Describe the sampling procedure, including the type of sample (grab or composite - see definitions below), sample bottle preparation, and project-specific directions for taking the sample. State whether samples will be collected for chemical and/or microbiological analyses. Alternatively, reference the appropriate sections of attached SOPs.

Grab: Samples will be collected at one time from one location. The sample should be taken from flowing, not stagnant water, and the sampler should be facing upstream in the middle of the stream. Samples will be collected by hand or with a sample bottle holder. For samples taken at a single depth, the bottle should be uncapped and the cap protected from contamination. The bottle should be plunged into the water mouth down and filled 6 to 12 inches below the surface of the water. If it is important to take samples at depths, special samplers (e.g., Niskin or Kemmerer Depth Samplers) may be required.

Time Composite: Samples are collected over a period of time, usually 24 hours. If a composite sample is required, a flow- and time-proportional automatic sampler should be positioned to take samples at the appropriate location in a manner such that the sample can be held at $4^{o}C$ for the duration of the sampling.

Spatial Composite: Samples are collected from different representative positions in the water body and combined in equal amounts. A Churn Splitter or equivalent device will be used to ensure that the sample is homogeneously mixed before the sample bottles are filled. Volatile organic compound samples will be collected as discrete samples and not composited.

If exact surface water sample locations will be determined in the field, this should be stated. Describe the criteria that will be used to determine where surface water samples will be collected.

Include this paragraph first if exact sampling locations are to be determined in the field; otherwise delete.

Exact surface water sampling locations will be determined in the field based on _____ [describe the criteria to be used to determine sampling locations]. Sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

Use this paragraph if samples are to be collected in rivers, streams, lakes and reservoirs, or from standing water in runoff collection ponds, gullies, drainage ditches, etc. Describe the sampling procedure, sample bottle preparation, and project-specific directions for taking the sample, or reference the appropriate sections of a Water Sampling SOP. If SOPs are referenced, they should be included in an appendix.

Samples will be collected from_____[describe the sampling location]. The sample will be taken from flowing, not stagnant water. The sampler will face upstream in the middle of the stream. Samples will be collected by hand or with a sample bottle holder. For samples taken at a single depth, the bottle should be uncapped and the cap protected from contamination. The bottle should be plunged into the water mouth down and filled 6 to 12" below the surface of the water. If it is important to take samples at depths, special samplers (e.g., Niskin or Kemmerer Depth Samplers) may be required. See Section 7.3 for preservation and shipping procedures.

6.5.2 Groundwater Sampling

This subsection contains procedures for water level measurements, well purging, and well sampling. Relevant procedures should be described under this heading with any necessary site- specific modifications, or reference sections of an appropriate SOP. If SOPs are referenced, they should be included in an appendix.

6.5.3 Water-Level Measurements

The following language may be used as is or modified to meet project needs.

All field meters will be calibrated according to manufacturer's guidelines and specifications before and after every day of field use. Field meter probes will be decontaminated before and after use at each well.

If well heads are accessible, all wells will be sounded for depth to water from top of casing and total well depth prior to purging. An electronic sounder, accurate to the nearest $\pm$0.01 feet, will be used to measure depth to water in each well. When using an electronic sounder, the probe is lowered down the casing to the top of the water column; the graduated markings on the probe wire or tape are used to measure the depth to water from the surveyed point on the rim of the well casing. Typically, the measuring device emits a constant

tone when the probe is submerged in standing water and most electronic water level sounders have a visual indicator consisting of a small light bulb or diode that turns on when the probe encounters water. Total well depth will be sounded from the surveyed top of casing by lowering the weighted probe to the bottom of the well. The weighted probe will sink into silt, if present, at the bottom of the well screen. Total well depths will be measured by lowering the weighted probe to the bottom of the well and recording the depth to the nearest 0.1 feet.

Water-level sounding equipment will be decontaminated before and after use in each well. Water levels will be measured in wells which have the least amount of known contamination first. Wells with known or suspected contamination will be measured last.

6.5.4 Purging

Describe the method that will be used for well purging (e.g., dedicated well pump, bailer, hand pump), or reference the appropriate sections in a Ground Water SOP. If SOPs are referenced, they should be included in an Appendix. Note: A combination of purging methods may be used.

Include this paragraph if dedicated well pumps will be used; otherwise delete.

All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using the dedicated well pump.

Include this paragraph if hand pumps, submersible pumps, bailers, or other sampling methods will be used; otherwise delete.

All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using [specify sampling method]. When a submersible pump is used for purging, clean flexible Teflon tubes will be used for groundwater extraction. All tubes will be decontaminated before use in each well. Pumps will be placed 2 to 3 feet from the bottom of the well to permit reasonable draw down while preventing cascading conditions.

The following paragraphs should be included in all sample plans.

Water will be collected into a measured bucket to record the purge volume. Casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as:

$$\mathbf{V = \pi d^2 h / 77.01}$$

where: **V** is the volume of one well casing of water ($1ft^3 = 7.48$ gallons);

d is the inner diameter of the well casing (in inches);

h is the total depth of water in the well (in feet).

It is most important to obtain a representative sample from the well. Stable water quality parameter (temperature, pH and specific conductance) measurements indicate representative sampling is obtainable. Water quality is considered stable if for three consecutive readings:

- temperature range is no more than $\pm$1°C;
- pH varies by no more than 0.2 pH units;
- specific conductance readings are within 10% of the average.

The water in which measurements were taken will not be used to fill sample bottles.

If the well casing volume is known, measurements will be taken before the start of purging, in the middle of purging, and at the end of purging each casing volume. If the well casing volume is NOT known, measurements will be taken every 2.5 minutes after flow starts. If water quality parameters are not stable after 5 casing volumes or 30 minutes, purging will cease, which will be noted in the logbook, and ground water samples will be taken. The depth to water, water quality measurements and purge volumes will be entered in the logbook.

If a well dewaters during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80% of the static water column and dewatered once more. After water levels have recharged to 80% of the static water column, groundwater samples will be collected.

6.5.5 Well Sampling

Describe the method that will be used to collect samples from wells. (This will probably be the same method as was used to purge the wells.) Specify the sequence for sample collection (e.g., bottles for volatile analysis will be filled first, followed by semivolatiles, etc.). State whether samples for metals analysis will be filtered or unfiltered. Include the specific conditions, such as turbidity, that will require samples to be filtered. Alternatively, reference the appropriate sections in the Ground Water SOP and state in which appendix the SOP is located.

The following paragraph should be included in all sample plans.

At each sampling location, all bottles designated for a particular analysis (e.g., volatile organic compounds) will be filled sequentially before bottles designated for the next analysis are filled (e.g., semivolatile organic compounds). If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis for both sample designations will be filled sequentially before bottles for another analysis are filled. In the filling sequence for duplicate samples, bottles with the two different sample designations will alternate (e.g., volatile organic compounds designation GW-2, volatile organic compounds designation GW-4 (duplicate of GW-2), metals designation GW-2, and metals designation GW-4 (duplicate of GW-2). Groundwater samples will be transferred directly into the appropriate sample containers with preservative, if required, chilled if appropriate, and processed for shipment to the laboratory.

If samples are to be collected for volatiles analysis, the following paragraph should be added; otherwise delete.

Samples for volatile organic compound analyses will be collected using a low flow sampling device. A [specify type] pump will be used at a flow rate of_____. Vials for volatile organic compound analysis will be filled first to minimize the effect of aeration on the water sample. See Section 7.3 for preservation and shipping procedures.

If some samples for metals (or other) analysis are to be filtered, depending upon sample turbidity, the following paragraph should be added; otherwise delete.

After well purging and prior to collecting groundwater samples for metals analyses, the turbidity of the groundwater extracted from each well will be measured using a portable turbidity meter. A small quantity of groundwater will be collected from the well, transferred to a disposable vial, and a turbidity measurement will be taken. The results of the turbidity measurement will be recorded in the field logbook. The water used to measure turbidity will be discarded after use. If the turbidity of the groundwater from a well is above 5 Nephelometric Turbidity Units (NTUs), both a filtered and unfiltered sample will be collected. A [specify

size]-micron filter will be used to remove larger particles that have been entrained in the water sample. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers with a preservative and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, an unfiltered sample will be collected. A sample number appended with an "Fl" will represent a sample filtered with a [specify size]-micron filter. See Section 7.3 for preservation and shipping procedures.

If samples are to be filtered for metals (or other) analysis regardless of sample turbidity, the following paragraph should be added; otherwise delete.

Samples designated for metals analysis will be filtered. A [specify size]-micron filter will be used to remove larger particles that have been entrained in the water sample. A clean, unused filter will be used for each filtered sample collected. Groundwater samples will be transferred from the filter directly into the appropriate sample containers to which preservative has been added and processed for shipment to the laboratory. When transferring samples, care will be taken not to touch the filter to the sample container. After the filtered sample has been collected, an unfiltered sample will be collected. A sample number appended with an "Fl" will represent a sample filtered with a [specify size]-micron filter. See Section 7.3 for preservation and shipping procedures.

6.6 OTHER SAMPLING

Describe the collection of other media, if any.

6.7 DECONTAMINATION PROCEDURES

Specify the decontamination procedures that will be followed if non-dedicated sampling equipment is used. Alternatively, reference the appropriate sections in the organization's Decontamination SOP and state in which appendix the SOP is located.

The decontamination procedures that will be followed are in accordance with approved procedures. Decontamination of sampling equipment must be conducted consistently as to assure the quality of samples collected. All equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment. All sampling devices used, including trowels and augers, will be steam-cleaned or decontaminated according to EPA Region 9 recommended procedures.

The following, to be carried out in sequence, is an EPA Region IX recommended procedure for the decontamination of sampling equipment.

Use the following decontamination procedures; edit as necessary.

- Non-phosphate detergent and tap water wash, using a brush if necessary
- Tap-water rinse
- 0.1 N nitric acid rinse [For inorganic analyses, include an acid rinse. Otherwise, delete.]
- Deionized/distilled water rinse
- Pesticide-grade solvent (reagent grade hexane) rinse in a decontamination bucket [For organic analyses, include a solvent rinse. Otherwise, delete.]
- Deionized/distilled water rinse (twice)

Equipment will be decontaminated in a pre-designated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas. Cleaned small equipment will be stored in plastic bags. Materials to be stored more than a few hours will also be covered.

NOTE: If a different decontamination procedure is used; a rationale for using the different approach should be provided.

Table 6-1
Field and Sampling Equipment

Description of Equipment	Material (if applicable)	Dedicated (Yes/No)

Table 6-2
Field Equipment/Instrument Calibration, Maintenance, Testing, and Inspection

Analytical Parameter	Field Equipment/ Instrument	Calibration Activity	Maintenance and Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action

7. SAMPLE CONTAINERS, PRESERVATION, PACKAGING AND SHIPPING

This section describes the types of containers to be used and the procedures for preserving, packaging and shipping samples. Some of this information may have been presented in tabular form previously. See Tables 5-1 and 5-2 for examples. The organization responsible for adding preservatives should be named.

The number and type of sample containers, volumes, and preservatives are listed in [specify table(s)]. The containers are pre-cleaned and will not be rinsed prior to sample collection. Preservatives, if required, will be added by_____[name of agency/organization doing the sampling] to the containers prior to shipment of the samples to the laboratory.

7.1 SOIL SAMPLES

Include this subsection if collecting soil samples; otherwise delete.

Include the following paragraphs, as appropriate; otherwise delete. Modify if necessary.

VOLATILE ORGANIC COMPOUNDS: Soil samples to be analyzed for volatile organic compounds will be stored in their sealed Encore samplers for no more than two days prior to analysis. Samples will be chilled to 4°C immediately upon collection.

Include these sentences if samples will be frozen or preserved; otherwise delete. Frozen Encore sampler samples will be stored for no more than 4 days prior to analysis. If samples are preserved by ejecting into either methanol or sodium bisulfate solution the holding time is two weeks.

OTHER ORGANIC COMPOUNDS: Soil samples for_____[include all requested analysis(ses)] will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounze wide-mouth glass jars using a trowel. A separate container will be collected for each laboratory. [Alternatively, samples will be retained in the brass sleeve in which collected until sample preparation begins.] The samples will be chilled to 4°C immediately upon collection.

METALS: Surface soil samples to be analyzed for metals will be homogenized and transferred from the sample-dedicated homogenization pail into 8-oz, wide-mouth glass jars. A separate container will be collected for each laboratory. Samples will not be chilled. Subsurface samples will be retained in their original brass sleeves or other container unless transferred to bottles.

7.2 SEDIMENT SAMPLES

Include this subsection if collecting sediment samples; otherwise delete.

Include the following paragraphs, as appropriate; otherwise delete. Modify if necessary.

VOLATILE ORGANIC COMPOUNDS: Sediment samples to be analyzed for volatile organic compounds will be stored in their sealed Encore samplers for no more than two days prior to analysis. Samples will be chilled to 4°C immediately upon collection.

Include these sentences if samples will be frozen or preserved; otherwise delete. Frozen EnCore samples will be stored for no more than 4 days prior to analysis. If samples are preserved by ejecting into either methanol or sodium bisulfate solution the holding time is two weeks.

OTHER ORGANIC COMPOUNDS: Soil samples for_____[include all requested analysis(ses)] will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounze wide-mouth glass jars using a trowel. A separate container will be collected for each laboratory. [Alternatively, samples will be retained in the brass sleeve in which collected until sample preparation begins.] The samples will be chilled to 4°C immediately upon collection.

METALS: Sediment samples, with rocks and debris removed, which are to be analyzed for metals will be homogenized and transferred from the sample-dedicated homogenization pail into 8-ounze, wide-mouth glass jars. A separate container will be collected for each laboratory. Samples will not be chilled.

7.3 WATER SAMPLES

Include this subsection if collecting water samples; otherwise delete.

Include the following paragraphs, as appropriate; otherwise delete. Modify if necessary.

VOLATILE ORGANIC COMPOUNDS: Low concentration water samples to be analyzed for volatile organic compounds will be collected in 40-ml glass vials. 1:1 hydrochloric acid (HCl) will be added to the vial prior to sample collection. During purging, a test vial will be filled with sample at each sample location and the pH will be measured using a pH meter or pH paper to ensure that sufficient acid is present to result in a pH of less than 2. If the pH is greater than 2, additional HCl will be added to the sample vials. Another vial will be pH tested to ensure the pH is less than 2. The tested vial(s) will be discarded. The sample vials will be filled so that there is no headspace. The vials will be inverted and checked for air bubbles to ensure zero headspace. If a bubble appears, the vial will be discarded and a new sample will be collected. The samples

will be chilled to 4°C immediately upon collection. Three vials of each water sample are required for each laboratory.

METALS: Water samples collected for metals analysis will be collected in 1-liter polyethylene bottles. The samples will be preserved by adding nitric acid (HNO_3) to the sample bottle. The bottle will be capped and lightly shaken to mix in the acid. A small quantity of sample will be poured into the bottle cap where the pH will be measured using pH paper. The pH must be $\leq$2. The sample in the cap will be discarded, and the pH of the sample will be adjusted further if necessary. The samples will be chilled to 4°C immediately upon collection. One bottle of each water sample is required for each laboratory.

OTHER PARAMETERS: [e.g., Anions, Pesticides, Semivolatile Organic Compounds]

If requested analyses require preservation, include this paragraph; otherwise delete. A separate paragraph should be included for each bottle type.

Water samples to be analyzed for [specify what parameters are included] will be collected in [specify size and type of container]. The [specify analysis(ses)] samples will be preserved by adding [describe preservative appropriate to each sample type] to the sample bottle. The bottle will be capped and lightly shaken to mix in the preservative. A small quantity of sample will be poured into the bottle cap where the pH will be measured using pH paper. The pH must be within the appropriate range. The sample in the cap will be discarded, and the pH of the sample will be adjusted further if necessary. Samples will be chilled to 4°C immediately upon collection.

If requested analyses do not require preservation, include this paragraph; otherwise delete. A separate paragraph should be included for each bottle type.

Water samples to be analyzed for _____ [specify analysis(ses)] will be collected in _____ [specify bottle type]. No preservative is required for these samples. The samples will be chilled to 4°C immediately upon collection. Two bottles of each water sample are required for each laboratory.

7.4 OTHER SAMPLES

If samples of other media (e.g., soil gas) are to be collected, specify the analyses that will be performed and the containers and preservatives required.

7.5 PACKAGING AND SHIPPING

The following paragraphs provide a generic explanation and description of how to pack and ship samples. They may be incorporated as is, if appropriate, or modified to meet any project-specific conditions.

All sample containers will be placed in a strong-outside shipping container .The following outlines the packaging procedures that will be followed for low concentration samples.

1. When ice is used, pack it in zip-lock, double plastic bags. Seal the drain plug of the cooler with fiberglass tape to prevent melting ice from leaking out of the cooler.

2. The bottom of the cooler should be lined with bubble wrap to prevent breakage during shipment.

3. Check screw caps for tightness and, if not full, mark the sample volume level of liquid samples on the outside of the sample bottles with indelible ink.

4. Secure bottle/container tops with clear tape and custody seal all container tops.

5. Affix sample labels onto the containers with clear tape.

6. Wrap all glass sample containers in bubble wrap to prevent breakage.

7. Seal all sample containers in heavy duty plastic zip-lock bags. Write the sample numbers on the outside of the plastic bags with indelible ink.

8. Place samples in a sturdy cooler(s) lined with a large plastic trash bag. Enclose the appropriate COC(s) in a zip-lock plastic bag affixed to the underside of the cooler lid.

9. Fill empty space in the cooler with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipment. Vermiculite should also be placed in the cooler to absorb spills if they occur.

10. Ice used to cool samples will be double sealed in two zip lock plastic bags and placed on top and around the samples to chill them to the correct temperature.

11. Each ice chest will be securely taped shut with fiberglass strapping tape, and custody seals will be affixed to the front, right and back of each cooler.

8. DISPOSAL OF RESIDUAL MATERIALS

This section should describe the type(s) of investigation-derived wastes (IDW) that will be generated during this sampling event. EPA recognizes that IDW may not be generated in all sampling events, in which case this section would not apply. Use the language below or reference the appropriate sections in a Disposal of Residual Materials SOP and state in which appendix the SOP is located. Depending upon site-specific conditions and applicable federal, state, and local regulations, other provisions for IDW disposal may be required. If any analyses of IDW are required, these should be discussed. If IDW are to be placed in drums, labeling for the drums should be discussed in this section.

In the process of collecting environmental, the sampling team will generate different types of potentially contaminated IDW that include the following:

- Used personal protective equipment (PPE)
- Disposable sampling equipment
- Decontamination fluids
- Soil cuttings from soil borings [Include this bullet when sampling soils; otherwise delete.]
- Purged groundwater and excess groundwater collected for sample container filling [Include this bullet when sampling groundwater; otherwise delete.]

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will follow the *Office of Emergency and Remedial Response (OERR) Directive 9345.3-02* (May 1991), which provides the guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

Listed below are the procedures that should be followed for handling the IDW. The procedures have enough flexibility to allow the sampling team to use its professional judgment as to the proper method for the disposal of each type of IDW generated at each sampling location. The following bullet is generally appropriate for site or sampling areas with low levels of contamination or for routine monitoring. If higher levels of contamination exist at the site or sampling area, other disposal methods (such as the drumming of wastes) should be used to dispose of used PPE and disposable sampling equipment.

- Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any

PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in the refuse dumpster.

Include this bullet if sampling for both metals and organics; otherwise delete.

- Decontamination fluids that will be generated in the sampling event will consist of dilute nitric acid, pesticide-grade solvent, deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site or sampling area. The water (and water with detergent) will be poured onto the ground or into a storm drain. Pesticide-grade solvents will be allowed to evaporate from the decontamination bucket. The nitric acid will be diluted and/or neutralized with sodium hydroxide and tested with pH paper before pouring onto the ground or into a storm drain.

Include this bullet if sampling for metals but not organics; otherwise delete.

- Decontamination fluids that will be generated in the sampling event will consist of nitric acid, deionized water, residual contaminants, and water with non-phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site or sampling area. The water (and water with detergent) will be poured onto the ground or into a storm drain. The nitric acid will be diluted and/or neutralized with sodium hydroxide and tested with pH paper before pouring onto the ground or into a storm drain.

Include this bullet if sampling for organics but not metals; otherwise delete.

- Decontamination fluids that will be generated in the sampling event will consist of pesticide-grade solvent, deionized water, residual contaminants, and water with non- phosphate detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site or sampling area. The water (and water with detergent) will be poured onto the ground or into a storm drain. Pesticide- grade solvents will be allowed to evaporate from the decontamination bucket.

Include this bullet if sampling soils; otherwise delete.

  - Soil cuttings generated during the subsurface sampling will be disposed of in an appropriate manner.

Include this bullet if sampling groundwater; otherwise delete.

- Purged groundwater will be _____

Depending upon the degree of groundwater contamination, site-specific conditions, and applicable federal, state, and local regulations, disposal methods will vary. Disposal methods can also vary for purge water from different wells sampled during the same sampling event.

9. SAMPLE DOCUMENTATION

9.1 FIELD NOTES

This section should discuss record keeping in the field. This may be through a combination of logbooks, preprinted forms, photographs, or other documentation. Information to be maintained is provided below.

9.1.1 Field Logbooks

Describe how field logbooks will be used and maintained.

Use field logbooks to document where, when, how, and from whom any vital project information was obtained. Logbook entries should be complete and accurate enough to permit reconstruction of field activities. Maintain a separate logbook for each sampling event or project. Logbooks should have consecutively numbered pages. All entries should be legible, written in black ink, and signed by the individual making the entries. Use factual, objective language.

At a minimum, the following information will be recorded during the collection of each sample:

Edit this list as necessary.

- Sample location and description
- Site or sampling area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab
- Type of sample (soil, sediment or water)
- Type of sampling equipment used
- Field instrument readings and calibration
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Preliminary sample descriptions (e.g., for soils: clay loam, very wet; for water: clear water with strong ammonia-like odor)
- Sample preservation
- Lot numbers of the sample containers, sample identification numbers and any explanatory codes, and chain-of-custody form numbers

- Shipping arrangements (overnight air bill number)
- Name(s) of recipient laboratory(ies)

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling:

Edit this list as necessary.

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Other personnel on site
- Summary of any meetings or discussions with tribal, contractor, or federal agency personnel
- Deviations from sampling plans, site safety plans, and QAPP procedures
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

A checklist of the field notes, following the suggestions above, using only those that are appropriate, should be developed and included in project field notes.

9.1.1 Photographs

If photographs will be taken, the following language may be used as is or modified as appropriate.

Photographs will be taken at the sampling locations and at other areas of interest on site or sampling area. They will serve to verify information entered in the field logbook. For each photograph taken, the following information will be written in the logbook or recorded in a separate field photography log:

- Time, date, location, and weather conditions
- Description of the subject photographed
- Name of person taking the photograph

9.2 SAMPLE LABELING

The following paragraph provides a generic explanation and description of the use of labels. It may be incorporated as is, if appropriate, or modified to meet any project-specific conditions.

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. A copy of the sample label is included in [specify appendix]. The samples will

have pre-assigned, identifiable, and unique numbers. At a minimum, the sample labels will contain the following information: station location, date of collection, analytical parameter(s), and method of preservation. Every sample, including samples collected from a single location but going to separate laboratories, will be assigned a unique sample number.

9.3 SAMPLE CHAIN-OF-CUSTODY FORMS AND CUSTODY SEALS

The following paragraphs provide a generic explanation and description of the use of chain-of- custody forms and custody seals. They may be incorporated as is, if they are appropriate, or modified to meet any project-specific conditions.

All sample shipments for analyses will be accompanied by a chain-of-custody record. A copy of the form is found in [specify appendix]. Form(s) will be completed and sent with the samples for each laboratory and each shipment (i.e., each day). If multiple coolers are sent to a single laboratory on a single day, form(s) will be completed and sent with the samples for each cooler.

The chain-of-custody form will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of_____ [name of agency/ organization conducting sampling]. The sampling team leader or designee will sign the chain-of-custody form in the "relinquished by" box and note date, time, and air bill number.

A self-adhesive custody seal will be placed across the lid of each sample. A copy of the seal is found in [specify appendix]. For VOC samples, the seal will be wrapped around the cap. The shipping containers in which samples are stored (usually a sturdy picnic cooler or ice chest) will be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated.

10. QUALITY CONTROL

This section should discuss the quality control samples that are being collected to support the sampling activity. This includes field QC samples, confirmation samples, background samples, laboratory QC samples, and split samples. Wherever possible, the locations at which the samples will be collected should be identified and a rationale provided for the choice of location. Frequency of collection should be discussed. All samples, except laboratory QC samples, should be sent to the laboratory blind, wherever possible. Laboratory QC samples should be identified and additional sample (e.g., a double volume) collected for that purpose.

10.1 FIELD QUALITY CONTROL SAMPLES

Field quality control samples are intended to help evaluate conditions resulting from field activities and are intended to accomplish two primary goals, assessment of field contamination and assessment of sampling variability. The former looks for substances introduced in the field due to environmental or sampling equipment and is assessed using blanks of different types. The latter includes variability due to sampling technique and instrument performance as well as variability possibly caused by the heterogeneity of the matrix being sampled and is assessed using replicate sample collection. The following sections cover field QC.

10.1.1 Assessment of Field Contamination (Blanks)

Field contamination is usually assessed through the collection of different types of blanks. Equipment blanks are obtained by passing distilled or deionized water, as appropriate, over or through the decontaminated equipment used for sampling. They provide the best overall means of assessing contamination arising from the equipment, ambient conditions, sample containers, transit, and the laboratory. Field blanks are sample containers filled in the field. They help assess contamination from ambient conditions, sample containers, transit, and the laboratory. Trip blanks are prepared by the laboratory and shipped to and from the field. They help assess contamination from shipping and the laboratory and are for volatile organic compounds only.

Region 9 recommends that equipment blanks be collected, where appropriate (e.g., where neither disposable nor dedicated equipment is used). Field blanks are next in priority and trip blanks next. Only one blank sample per matrix per day should be collected. If equipment blanks are collected, field blanks and trip blanks are not required under normal circumstances.

10.1.1.1 Equipment Blanks

In general, equipment (rinsate) blanks should be collected when reusable, non-disposable sampling

equipment (e.g., trowels, hand augers, and non-dedicated groundwater sampling pumps) are being used for the sampling event. Equipment blanks can be collected for soil, sediment, and ground water samples. A minimum of one equipment blank is prepared each day for each matrix when equipment is decontaminated in the field. These blanks are submitted "blind" to the laboratory, packaged like other samples and each with its own unique identification number. Note that for samples which may contain VOCs, water for blanks should be purged prior to use to ensure that it is organic free. HPLC water, which is often used for equipment and field blanks, can contain VOCs if it is not purged.

If equipment blanks are to be collected describe how they are to be collected and the analyses that will be performed. A maximum of one blank sample per matrix per day should be collected, but at a rate to not exceed one blank per 10 samples. The 1:10 ratio overrides the one per day requirement. If equipment rinsate blanks are collected, field blanks and trip blanks are not required under normal circumstances. Use the language below or reference the appropriate sections in a Quality Control SOP and state in which appendix the SOP is located.

Include this subsection if equipment blanks are to be collected, otherwise, delete.

Include this paragraph if blanks will be analyzed for both metals and organic compounds; otherwise delete.

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring High Performance Liquid Chromatography (HPLC) organic-free (for organics) or deionized water (for inorganics) over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for [include names of target analytes, e.g., metals, total petroleum hydrocarbons, volatile organic compounds, etc.].

Include this paragraph if blanks will be analyzed only for organic compounds; otherwise delete.

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring High Performance Liquid Chromatography (HPLC) organic-free water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for [include names of target analytes, e.g., volatile organic compounds, total petroleum hydrocarbons, etc.].

Include this paragraph if blanks will be analyzed only for metals; otherwise delete.

Equipment rinsate blanks will be collected to evaluate field sampling and decontamination procedures by pouring deionized water over the decontaminated sampling equipment. One equipment rinsate blank will be collected per matrix each day that sampling equipment is decontaminated in the field. Equipment rinsate blanks will be obtained by passing deionized water through or over the decontaminated sampling devices used that day. The rinsate blanks that are collected will be analyzed for metals.

Always include this paragraph.

The equipment rinsate blanks will be preserved, packaged, and sealed in the manner described for the environmental samples. A separate sample number and station number will be assigned to each sample, and it will be submitted blind to the laboratory.

10.1.1.2 Field Blanks

Field blanks are collected when sampling water or air and equipment decontamination is not necessary or sample collection equipment is not used (e.g., dedicated pumps). A methanol field blanks should also be collected when methanol is used as a preservative. A minimum of one field blank is prepared each day sampling occurs in the field, but equipment is not decontaminated. These blanks are submitted "blind" to the laboratory, packaged like other samples and each with its own unique identification number. Note that for samples which may contain VOCs, water for blanks should be purged prior to use to ensure that it is organic free. HPLC water which is often used for equipment and field blanks can contain VOCs if it is not purged.

Include this subsection if field blanks will be collected; otherwise delete. Only one blank sample per matrix per day should be collected. If field blanks are prepared, equipment rinsate blanks and trip blanks are not required under normal circumstances.

Include this paragraph if blanks will be analyzed for both metals and organic compounds; otherwise delete.

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling due to ambient conditions or from sample containers. Field blank samples will be obtained by pouring High Performance Liquid Chromatography (HPLC) organic-free water (for organics) and/or deionized water (for inorganics) into a sampling container at the sampling point. The field blanks that are collected will be analyzed for

_____ [include names of target analytes, e.g., metals, volatile organic compounds, etc.].

Include this paragraph if blanks will be analyzed only for organic compounds; otherwise delete.

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling due to ambient conditions or from sample containers. Field blank samples will be obtained by pouring High Performance Liquid Chromatography (HPLC) organic-free water into a sampling container at the sampling point. The field blanks that are collected will be analyzed for [include names of target analytes, e.g., volatile organic compounds, total petroleum hydrocarbons, etc.].

Include this paragraph if blanks will be analyzed only for metals; otherwise delete.

Field blanks will be collected to evaluate whether contaminants have been introduced into the samples during the sampling due to contamination from sample containers. Field blank samples will be obtained by pouring deionized water into a sampling container at the sampling point. The field blanks that are collected will be analyzed for metals.

Always include this paragraph.

The field blanks will be preserved, packaged, and sealed in the manner described for the environmental samples. A separate sample number and station number will be assigned to each sample, and it will be submitted blind to the laboratory.

10.1.1.3 Trip Blanks

Trip blanks are required only if no other type of blank will be collected for volatile organic compound analysis. If trip blanks are required, one is submitted to the laboratory for analysis with every shipment of samples for VOC analysis. These blanks are submitted "blind" to the laboratory, packaged like other samples and each is assigned its own unique identification number. Note that for samples which may contain VOCs, water for blanks should be purged prior to use to ensure that it is organic free. HPLC water, which is often used for trip blanks, can contain VOCs if it is not purged.

Include this subsection if trip blanks will be collected; otherwise delete. Only one blank sample per matrix per day should be collected. Trip blanks are only relevant to volatile organic compound (VOC) sampling efforts.

Trip blanks will be prepared to evaluate if the shipping and handling procedures are introducing contaminants into the samples, and if cross contamination in the form of VOC migration has occurred between the collected samples. A minimum of one trip blank will be submitted to the laboratory for analysis

with every shipment of samples for VOC analysis. Trip blanks are 40-ml vials that have been filled with HPLC-grade water that has been purged so it is VOC free and shipped with the empty sampling containers to the site or sampling area prior to sampling. The sealed trip blanks are not opened in the field and are shipped to the laboratory in the same cooler with the samples collected for volatile analyses. The trip blanks will be preserved, packaged, and sealed in the manner described for the environmental samples. A separate sample number and station number will be assigned to each trip sample and it will be submitted blind to the laboratory.

10.1.1.4 Temperature Blanks

Include this paragraph with all plans.

For each cooler that is shipped or transported to an analytical laboratory a 40-ml VOA vial will be included that is marked "temperature blank." This blank will be used by the sample custodian to check the temperature of samples upon receipt.

10.1.2 Assessment of Field Variability (Field Duplicate or Collocated Samples

Duplicate samples are collected simultaneously with a standard sample from the same source under identical conditions into separate sample containers. Field duplicates will consist of a homogenized sample divided in two or else a collocated sample. Each duplicate portion should be assigned its own sample number so that it will be blind to the laboratory. A duplicate sample is treated independently of its counterpart in order to assess laboratory performance through comparison of the results. At least 10% of samples collected per event should be field duplicates. At least one duplicate should be collected for each sample matrix, but their collection can be stretched out over more than one day (e.g., if it takes more than one day to reach 10 samples). Every group of analytes for which a standard sample is analyzed will also be tested for in one or more duplicate samples. Duplicate samples should be collected from areas of known or suspected contamination. Since the objective is to assess variability due to sampling technique and possible sample heterogeneity, source variability is a good reason to collect collocated samples, not to avoid their collection.

Duplicate soil samples will be collected at sample locations_____[identify soil sample locations from which duplicate or collocated samples will be collected]. Duplicate samples will be collected from these locations because_____. Add sentence(s) here explaining a rationale for collecting duplicate samples from these locations; e.g., samples from these locations are suspected to exhibit moderate concentrations of contaminants or previous sampling events have detected moderate levels of contamination at the site or sampling area at these locations.

Include this paragraph if collecting soil samples and analyzing for compounds other than volatiles; otherwise delete.

Soil samples to be analyzed for____[list all analytical methods for this sample event except for volatiles] will be homogenized with a with a trowel in a sample-dedicated 1-gallon disposable pail. Homogenized material from the bucket will then be transferred to the appropriate wide-mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g., semivolatile organic compounds) will be filled sequentially before jars designated for another analysis are filled (e.g., metals).

Include this paragraph if collecting soil samples and analyzing for volatiles; otherwise delete.

Soil samples for volatile organic compound analyses will not be homogenized. Equivalent Encore samples from a collocated location will be collected identically to the original samples, assigned unique sample numbers and sent blind to the laboratory.

Include these paragraphs if collecting sediment samples. If volatile organic compound analysis will be performed on sediment samples, modify the above paragraph for soil sample volatile analyses by changing "soil" to "sediment."

Duplicate sediment samples will be collected at sample locations[identify_____ sediment sample locations from which duplicate or collocated samples for duplicate analysis will be obtained]. Duplicate samples will be collected from these locations because_____. Add sentence(s) here explaining a rationale for collecting duplicate samples from these locations; e.g., samples from these locations are suspected to exhibit moderate concentrations of contaminants or previous sampling events have detected moderate levels of contamination at the site or sampling area at these locations.

Sediment samples will be homogenized with a trowel in a sample-dedicated 1-gallon disposable pail. Homogenized material from the bucket will then be transferred to the appropriate wide- mouth glass jars for both the regular and duplicate samples. All jars designated for a particular analysis (e.g., semivolatile organic compounds) will be filled sequentially before jars designated for another analysis are filled (e.g., metals).

Include this paragraph if collecting water samples.

Duplicate water samples will be collected for water sample numbers_____[water sample numbers which will be split for duplicate analysis]. Duplicate samples will be collected from these locations because___. Add sentence(s) here explaining a rationale for collecting duplicate samples from

these locations; e.g., samples from these locations are suspected to exhibit moderate concentrations of contaminants or previous sampling events have detected moderate levels of contamination at the site or sampling area at these locations.

When collecting duplicate water samples, bottles with the two different sample identification numbers will alternate in the filling sequence (e.g., a typical filling sequence might be, VOCs designation GW-2, VOCs designation GW-4 (duplicate of GW-2); metals, designation GW-2, metals, designation GW-4, (duplicate of GW-2) etc.). Note that bottles for one type of analysis will be filled before bottles for the next analysis are filled. Volatiles will always be filled first.

Always include this paragraph.

Duplicate samples will be preserved, packaged, and sealed in the same manner as other samples of the same matrix. A separate sample number and station number will be assigned to each duplicate, and it will be submitted blind to the laboratory.

10.2 BACKGROUND SAMPLES

Background samples are collected in situations where the possibility exists that there are native or ambient levels of one or more target analytes present or where one aim of the sampling event is to differentiate between on-site and off-site contributions to contamination. One or more locations are chosen which should be free of contamination from the site or sampling location itself, but have similar geology, hydrogeology, or other characteristics to the proposed sampling locations that may have been impacted by site activities. For example, an area adjacent to but removed from the site, upstream from the sampling points, or up gradient or cross gradient from the groundwater under the site. Not all sampling events require background samples.

Specify the sample locations that have been designated as background. Include a rationale for collecting background samples from these locations and describe or reference the sampling and analytical procedures which will be followed to collect these samples.

10.3 FIELD SCREENING, INCLUDING CONFIRMATION SAMPLES, AND SPLIT SAMPLES

For projects where field screening methods are used (typically defined as testing using field test kits, immunoassay kits, or soil gas measurements or equivalent, but not usually defined as the use of a mobile laboratory which generates data equivalent to a fixed laboratory), two aspects of the tests should be described.

First, the QC which will be run in conjunction with the field screening method itself, and, second, any fixed laboratory confirmation tests which will be conducted. QC acceptance criteria for these tests should be defined in these sections rather than in the DQO section.

10.3.1 Field Screening Samples

For projects where field screening methods are used, describe the QC samples which will be run in the field to ensure that the screening method is working properly. This usually consists of a combination of field duplicates and background samples. The discussion should specify acceptance criteria and corrective action to be taken if results are not within defined limits. Discuss confirmation tests below.

10.3.2 Confirmation Samples (Field Screening)

If the planned sampling event includes a combination of field screening and fixed laboratory confirmation, this section should describe the frequency with which the confirmation samples will be collected and the criteria which will be used to select confirmation locations. These will both be dependent on the use of the data in decision making. It is recommended that the selection process be at a minimum of 10% and that selection criteria include checks for both false positives (i.e., the field detections are invalid or the concentrations are not accurate) and false negatives (i.e., the analyte was not detected in the field). Because many field screening techniques are less sensitive than laboratory methods false negative screening is especially important unless the field method is below the action level for any decision making. It is recommended that some “hits” be chosen and that other locations be chosen randomly.

Describe confirmation sampling. Discuss the frequency with which samples will be confirmed and how location will be chosen. Define acceptance criteria for the confirmation results (e.g., RPD$\leq$25%) and corrective actions to be taken if samples are not confirmed.

10.4 LABORATORY QUALITY CONTROL SAMPLES

Laboratory quality control (QC) samples are analyzed as part of standard laboratory practice. The laboratory monitors the precision and accuracy of the results of its analytical procedures through analysis of QC samples. In part, laboratory QC samples consist of matrix spike/matrix spike duplicate samples for organic analyses, and matrix spike and duplicate samples for inorganic analyses. The term “matrix” refers to use of the actual

media collected in the field (e.g., routine soil and water samples).

Laboratory QC samples are an aliquot (subset) of the field sample. They are not a separate sample, but a special designation of an existing sample.

Include the following language if soil samples are to be collected for other than volatiles; otherwise delete.

A routinely collected soil sample (a full 8-oz sample jar or two 120-mL sample vials) contains sufficient volume for both routine sample analysis and additional laboratory QC analyses. Therefore, a separate soil sample for laboratory QC purposes will not be collected.

Include the following language if soil samples are to be collected for volatiles; otherwise delete.

Soil samples for volatile organic compound analyses for laboratory QC purposes will be obtained by collecting double the number of equivalent Encore samples from a collocated location in the same way as the original samples, assigned a unique sample numbers and sent blind to the laboratory.

Include the following language if water samples are to be collected. Otherwise delete.

For water samples, double volumes of samples are supplied to the laboratory for its use for QC purposes. Two sets of water sample containers are filled and all containers are labeled with a single sample number. *For volatile samples this would result in 6 vials being collected instead of 3, for pesticides and semivolatile samples this would be 4 liters instead of 2, etc.*

The laboratory should be alerted as to which sample is to be used for QC analysis by a notation on the sample container label and the chain-of-custody record or packing list.

At a minimum, one laboratory QC sample is required per 14 days or one per 20 samples (including blanks and duplicates), whichever is greater. If the sample event lasts longer than 14 days or involves collection of more than 20 samples per matrix, additional QC samples will be designated.

For this sampling event, samples collected at the following locations will be the designated laboratory QC samples:

If a matrix is not being sampled, delete the reference to that matrix.

- For soil, samples_____[List soil sample locations and numbers designated for QA/QC.]
- For sediment, samples_____[List sediment sample locations and numbers designated for QA/QC.]

- For water, samples_____[List water sample locations and numbers designated for QA/QC.]

11. FIELD VARIANCES

It is not uncommon to find that, on the actual sampling date, conditions are different from expectations such that changes must be made to the SAP once the samplers are in the field. The following paragraph provides a means for documenting those deviations, or variances. Adopt the paragraph as is, or modify it to project-specific conditions.

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, the QA Office will be notified and a verbal approval will be obtained before implementing the changes. Modifications to the approved plan will be documented in the sampling project report.

12. FIELD HEALTH AND SAFETY PROCEDURES

Describe any agency-, program- or project-specific health and safety procedures that must be followed in the field, including safety equipment and clothing that may be required, explanation of potential hazards that may be encountered, and location and route to the nearest hospital or medical treatment facility. A copy of the organization health and safety plan may be included as an Appendix and referenced in this section.

EXAMPLE FORMS

Table 1-1
Key Project Personnel Contact Information and Responsibilities

Title	Name	Phone Number Email Address	Responsibilities
EPA Quality Assurance Officer (QAO)			
EPA Project Manager			
Grantee Project Manager			
Contractor Project Manager (include Company Name)			
Contractor QAO			
Contractor Field Team Leader			
Laboratory Quality Assurance Officer (include Laboratory Name)			

Table 2-1
Contaminants of Concern, Previous Investigations Matrix = Soil

Analytical Parameter (Contaminants of Concern)	Date of sampling	Sampling contractor	Laboratory Analytical Results (units [µg/kg])	Regulatory Limit (specify)[1]
Benzene	06/24/01	ABC, Co.	200	50

µg/kg = micrograms per kilogram
[1] DTSC = Calif. Department of Toxic Substances Control

Table 3-1
Contaminants of Concern, Laboratory, and Screening or Action Levels Matrix = Soil

Analytical Parameter (Contaminants of Concern)	Laboratory Reporting or Quantitation Limits	Screening or Action Levels		
		EPA Residential RSLs	DTSC Residential RSLs	RWQCB Residential ESLs
Volatile Organic Compounds by Method 8260 (µg/kg)				
Benzene	10	640	NA	440
Tetrachloroethylene (PCE)	10	480	NA	87
Toluene	10	520000	NA	3300
Metals by Method 6010/7470 (mg/kg)				
Arsenic	1	0.07	0.07	Background
Chromium	2	210	0	1000
Lead	2	150	150	150

RL = Reporting Limit
EPA = US Environmental Protection Agency
DTSC = Calif. Department of Toxic Substances Control
RWQCB = Regional Water Quality Control Board
µg/kg = micrograms per kilogram mg/kg = milligrams per kilogram
RSLs = Regional Screening Levels
ESLs = Environmental Screening Levels
NA = Not available or Not applicable

Table 4-1
Sampling Design and Rationale Matrix = Soil

Sampling Location/ID Number	Depth (feet)	Analytical Parameter	Rationale *
SB1	0-1.5 2-4, 6-8	TPH-g/d, metals TPH-g/d, VOA & metals	Assess environmental conditions at the former UST and former fuel pump island locations. Volatiles will not be collected from the shallow soil due to probable weathering effects.
SB2	0-1.5 2-4, 6-8	TPH-g/d, metals TPH-g/d, VOA & metals	Assess the potential presence of contaminants in undocumented fill materials at the Site. Volatiles will not be collected from the shallow soil due to probable weathering effects.

* Include rationale for location, depth and analysis.

TPH –g/d = total petroleum hydrocarbons as gasoline and diesel VOA = volatile organic analyses

Table 4-2
Sampling Design and Rationale
Matrix = Groundwater

Sampling Location/ID Number	Analytical Parameter	Rationale *
SB1	TPH-g/d, VOA, metals	Assess the potential migration of contaminants to the groundwater at the former UST and former fuel pump island locations.
SB2	TPH-g/d, VOA, metals	Assess the potential migration of contaminants to the groundwater from the fill materials located on the Site.

*Include rationale for location and analysis.

TPH –g/d = total petroleum hydrocarbons as gasoline and diesel

VOA = volatile organic analyses

Table 5-1
Analytical Services
Matrix = Soil

Sample Number	Sample Location	Depth (feet)	Special Designation	Analytical Methods			
				SW846 Method 8015B (TPH as gasoline)	SW846 Method 8015B (TPH as diesel)	SW846 Method 8260B (volatiles)	SW846 Method 6010/7470 (metals)
SB-01-05	SB1	0-1.5		X	X		X
SB-01-24	SB1	2-4	MS/MSD	X	X	X	X
SB-01-68	SB1	6-8		X	X	X	X
SB-02-05	SB2	0-1.5		X	X		X
SB-02-24	SB2	2-4		X	X	X	X
SB-02-68	SB2	6-8		X	X	X	X
SB-01-10	SB2	6-8	Duplicate of SB-02-68	X	X	X	X
Total number of Soil Samples, excluding QC:				6	6	4	6
Total number of Soil Samples, including QC:				7	7	5	7

TPH = total petroleum hydrocarbons
MS/MSD = matrix spike/ matrix spike duplicate

Table 5-2
Analytical Services
Matrix = Groundwater

Sample Number	Sample Location	Special Designation	Analytical Methods			
			SW846 Method 8015B (TPH as gasoline)	SW846 Method 8015B (TPH as diesel)	SW846 Method 8260B (Volatiles)	SW846 Method 6010/7470 (Metals)
SB-01	SB1	MS/MSD	X	X	X	X
SB-02	SB2		X	X	X	X
SB-03	SB2	Duplicate of SB-02-68	X	X	X	X
Total number of Soil Samples, excluding QC:			2	2	2	2
Total number of Soil Samples, including QC:			3	3	3	3

TPH = total petroleum hydrocarbons
MS/MSD = matrix spike/ matrix spike duplicate

Table 5-3
Analytical Method, Container, Preservation, and Holding Time Requirements
Matrix = Soil

Analytical Parameter and/or Field Measurements	Analytical Method Number	Containers (number, type, size/volume)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times
Volatiles	SW-846 Method 8260B	Two EnCore Samplers	Chill with ice to 4°C	48 hours
Metals	SW-846 Method 6010/7470	4 oz glass jar	Chill with ice to 4°C	<180 days/<28 days for Hg

Table 5-4
Analytical Method, Container, Preservation, And Holding Time Requirements
Matrix = Groundwater

Analytical Parameter and/or Field Measurements	Analytical Method Number	Containers (number, type, size/volume)	Preservation Requirements (chemical, temperature, light protection)	Maximum Holding Times
Volatiles	SW-846 Method 8260B	3 x 40-ml VOA	Chill with ice to 4°CpH<2 with HCl	14 days
Metals	SW-846 Method 6010/7470	1 L HDPE	Chill with ice to 4°C pH<2 with HNO_3	6 months

VOA = volatile organic analysis
HDPE = high density polyethylene Hg = mercury
HCL = hydrochloric acid
HNO_3 = nitric acid

Table 6-1
Field and Sampling Equipment

Description of Equipment	Material (if applicable)	Dedicated (Yes/No)
Sampling sleeves	Acetate or equivalent	Yes
Hand auger	Hardened steel	No
EnCore® samplers	Plastic	Yes
Sampling trowel	Plastic or stainless steel	Yes
Bailer	Plastic or stainless steel	Yes
Conductivity meter	NA	No
Peristaltic pump with dedicated tubing	Tygon or HDPE tubing	no

NA = not applicable
HDPE = high density polyethylene

Table 6-2
Field Equipment/Instrument Calibration, Maintenance, Testing, and Inspection

Analytical Parameter	Field Equipment/ Instrument	Calibration Activity	Maintenance and Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action
Temperature (sensor)	Multimeter Manufacturer X, Model Y	Annual check of endpoints of desired temperature range (0°C to 40°C) versus NIST thermometer	See manufacturer's manual	Annually	±0.2°C of true value at both endpoints (i.e., manufacturer's listed accuracy for the sensor)	Remove from use if doesn't pass calibration criteria
pH (electrode)	Multimeter Manufacturer X, Model Y	Initial: two-point calibration bracketing expected range (using 7.0 and either 4.0 or 10.0 pH buffer, depending on field conditions); followed by one-point check with 7.0 pH buffer Post: single-point check with 7.0 pH buffer	See manufacturer's manual	Initial: beginning of each day Post: end of each day	Initial: two-point calibration done electronically; one-point check (using 7.0 pH buffer) ±0.1 pH unit of true value Post:) ±0.5 pH unit of true value with both 7.0 pH and other "bracketing" buffer (and either 4.0 or 10.0 pH)	Recalibrate Qualify data

Attachment A

Seven Step DQOs Process

The following information can be found in "Guidance on Systematic Planning Using the Data Quality Objectives Process" (EPA QA/G-4, February 2006).

"The U.S. Environmental Protection Agency (EPA) has developed the Data Quality Objectives (DQO) Process as the Agency's recommended planning process when environmental data are used to select between two alternatives or derive an estimate of contamination. The DQO Process is used to develop performance and acceptance criteria (or data quality objectives) that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions."

"Various government agencies and scientific disciplines have established and adopted different variations to systematic planning, each tailoring their specific application areas. For example, the Observational Method is a variation on systematic planning that is used by many engineering professions. The Triad Approach, developed by EPA's Technology Innovation Program, combines systematic planning with more recent technology advancements, such as techniques that allow for results of early sampling to inform the direction of future sampling. However, it is the Data Quality Objectives (DQO) Process that is the most commonly-used application of systematic planning in the general environmental community. Different types of tools exist for conducting systematic planning. The DQO Process is the Agency's recommendation when data are to be used to make some type of decision (e.g., compliance or non-compliance with a standard) or estimation (e.g., ascertain the mean concentration level of a contaminant)."

"The DQO Process is used to establish performance or acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the

goals of a study. The DQO Process consists of seven iterative steps. Each step of the DQO Process defines criteria that will be used to establish the final data collection design."

Step 1 - State the Problem

- Give a concise description of the problem
- Identify the leader and members of the planning team
- Develop a conceptual model of the environmental hazard to be investigated

Step 2 - Identify the Goal of the Study

- Identify the principal sturdy question(s)
- Consider alternative outcomes or actions that can occur upon answering the question(s)
- For decision problems, develop decision statements, organize multiple decisions
- For estimation problems, state what needs to be estimated and key assumptions

Step 3 - Identify Information Inputs

- Identify types and sources of information needed to resolve decisions or produce estimates
- Identify the basis of information that will guide or support choices to be made in later steps of the DQO Process
- Select appropriate sampling and analysis methods for generating the information

Step 4 - Define the Boundaries of the Study

- Define the target population of interest and its relevant spatial boundaries
- Define what constitutes a sampling unit

- Specify temporal boundaries and other practical constraints associated with sample/data collection
- Specify the smallest unit on which decision or estimates will be made

Step 5 - Develop the Analytical Approach

- Specify appropriate population parameters for making decisions or estimates
- For decision problems, choose a workable Action Level and generate an "If… then…else" decision rule which involves it
- For estimation problems, specify the estimator and the estimation procedure

Step 6 - Specify Performance or Acceptance Criteria

- For decision problems, specify the decision rule as a statistical hypothesis test, examine the consequences of making incorrect decisions from the test, and place acceptable limits on the likelihood of making decision errors
- For estimation problems, specify acceptable limits on estimation uncertainty

Step 7 - Develop the Detailed Plan for Obtaining Data

- Compile all information and outputs generated in Steps 1 through 6
- Use this information to identify alternative sampling and analysis designs that are appropriate for your intended use
- Select and document a design that will yield data that will best achieve your performance or acceptance criteria

Attachment B

Project Action Levels (PALs), Detection Limits (DLs), and Quantitation Limits (QLs)

The Project Action Limits (PALs), as introduced and defined in Section 1.7, will help target the selection of the most appropriate method, analysis, laboratory, etc. (the analytical operation) for your project. One important consideration in this selection is the type of decision or action you may wish to make with the data, depending on whether you generate results in concentrations below, equal to, or above the PALs. In order to ensure some level of certainty of the decisions or actions, it is recommended that you consider choosing an analytical operation capable of providing quality data at concentrations less than the PALs.

When choosing an analytical operation, you will come across terms such as Detection Limit (DL) and Quantitation Limit (QL). These terms are frequently expressed by other terminology, but the two key words to look for are "detection" and "quantitation" (sometimes referred to as "quantification"). The following describes the differences between these terms:

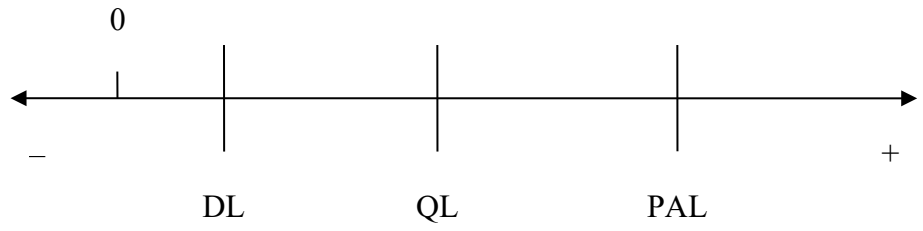
- **Detection Limit** or **DL** - This is the minimum concentration that can be detected above background or baseline/signal noise by a specific instrument and laboratory for a given analytical method. It is not recognized as an accurate value for the reporting of project data. If a parameter is detected at a concentration less than the QL (as defined below) but equal to or greater than the DL, it should be qualified as an estimated value.

- **Quantitation Limit** or **QL** - This is the minimum concentration that can be identified and quantified above the DL within some specified limits of precision and accuracy/bias during routine analytical operating conditions. It is matrix and media-specific, that is, the QL for a water sample will be different than for a

sediment sample. It is also recommended that the QL is supported by the analysis of a standard of equivalent concentration in the calibration curve (typically, the lowest calibration standard).

(Note: The actual "real time" sample Reporting Limit or RL is the QL adjusted for any necessary sample dilutions, sample volume deviations, and/or extract/digestate volume deviations from the standard procedures. It is important to anticipate potential deviations to minimize excursions of the RL above the PAL, whenever possible.)

For any analytical operation, the relationship between the PAL, QL, and DL terms can be represented as:

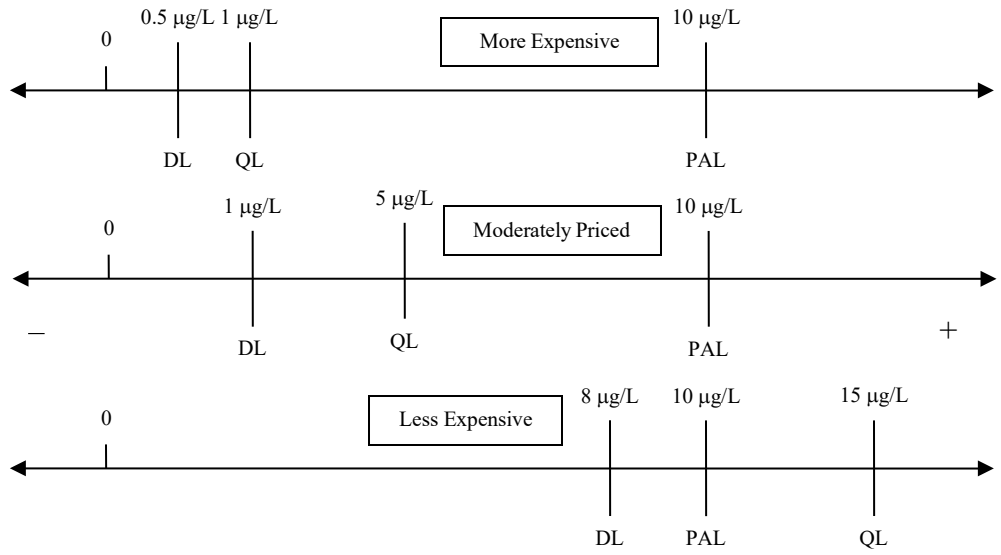


A standard general rule of thumb is to select an analytical operation capable of providing a QL in the range of 3-10 times lower than the PAL and 3-10 times higher than the DL. Some additional considerations for selecting an analytical operation with the most appropriate relationship for your data needs may include the following:

- When critical decisions will be made with project data exceeding the PALs, you may wish to have a greater level of certainty at the PAL concentration level. To accomplish this, you may want to select an analytical operation capable of providing a QL towards the lower end of the range (closer to values 5-10 times lower than the PAL). This would result in a greater distribution of concentrations that could be reported with certainty, both less than and approaching the PAL.
- When you're looking to minimize uncertainty of the project data reported at the QL, you may choose to select an analytical operation where the QL is much greater than the DL (closer to values 5-10 times higher than the DL). This would help to ensure less background noise impacts on the data.

Careful consideration of the PAL/QL/DL relationship should be given when balancing your data quality needs with project resources to get the most appropriate data quality for the least cost.

For example, the PAL for one analytical parameter may be 10 µg/l based on the Federal Water Quality Standard, and you have a choice between an expensive state-of-the-art analytical technology providing QL = 1 µg/l and DL = 0.5 µg/l, a moderately-priced standard method with QL = 5 µg/l and DL = 1 µg/l, or an inexpensive field measurement with QL = 15 µg/l and DL = 8 µg/l. These choices may be represented as follows:



If you are attempting to identify whether the analytical parameter exceeds the Federal Standard, the moderately priced method may serve your needs. However, if the parameter is known to be present and you're attempting to further identify the boundaries of those areas minimally impacted by low levels (for example, you're suspecting lower concentrations may pose a risk to some aquatic species of concern in the area), you may opt for the more expensive analysis with the lower QL and DL. In both of these examples, the inexpensive field measurement may not be appropriate to meet your project needs, as the lowest concentration that would be reported (15 µg/l) exceeds the PAL. However, if you are just trying to get a handle on whether some specific locations within your study region grossly exceed the PAL, data generated from the inexpensive field measurement may suit your project needs.

Attachment C

Data Quality Indicators (DQIs) and Measurement Performance Criteria (MPC) for Chemical Data

Identifying Data Quality Indicators (DQIs) and establishing Quality Control (QC) samples and Measurement Performance Criteria (MPC) to assess each DQI, as introduced in Section 1.7, are key components of project planning and development. These components demonstrate an understanding of how "good" the data need to be to support project decisions, and help to ensure there is a well-defined system in place to assess that data quality once data collection/generation activities are complete.

When faced with addressing data quality needs in your QA Project Plan, one of the first terms you may come across is Data Quality Indicators (DQIs). DQIs include both quantitative and qualitative terms. Each DQI is defined to help interpret and assess specific data quality needs for each sample medium/matrix and for each associated analytical operation. The principal DQIs and a brief summary of information related to assessing each DQI is as follows:

Precision

Questions answered: How reproducible do the data need to be? How good do I need to be at doing something (such as sample collection, sample prep/analysis, etc.) the same way two or more times?

Expressed in terms of "*relative percent difference*" (for the comparison of 2 data points).

Quantitative vs. Qualitative term: Quantitative.

QC samples (may include):

- Field duplicates - To duplicate all steps from sample collection through analysis;

- Laboratory duplicates - To duplicate inorganic sample preparation/analysis methodology; and/or
- Matrix spike/matrix spike duplicates - To duplicate organic sample preparation/analysis methodology; to represent the actual sample matrix itself.

Acceptance criteria or MPC: May be expressed in terms of Relative Percent Difference (RPD) between two data points representing duplicates and defined by the following equation:

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

where,

RPD = Relative Percent Difference (as %)

$|X_1 - X_2|$ = Absolute value (always positive) of $X_1 - X_2$

X_1 = Original sample concentration

X_2 = Duplicate sample concentration

For field duplicate precision, an RPD of ≤20% might serve as a standard rule of thumb for aqueous samples.

For laboratory QC sample precision, information provided in the analytical methods might be found to be adequate to meet your data quality needs.

Expressed in "*relative standard deviation*" or other statistical means for comparison of 3 or more data points - Follow a similar thought process as described above and include appropriate calculations.

Accuracy/Bias

Questions answered: How well do the measurements reflect what is actually in the sample? How far away am I from the accepted or "true" value, and am I above this value or below it?

Expressed in terms of *"Recovery"*

Quantitative vs. Qualitative term: Quantitative.

QC samples (may include)

- Matrix spikes - To monitor sample preparation/analysis methodology, as well as, to represent the actual sample matrix itself;
- Standard reference materials and/or laboratory control samples - To monitor sample preparation/analysis methodology and often of a similar media (such as water, soil, sediment) as the field samples; and/or
- Performance Evaluation (PE) samples – (may be appropriate for complex analyses) To serve as an external check on sample preparation/analysis methodology, as samples of known concentration are prepared external to the laboratory and submitted for analysis as "blind" or unknown samples.

(NOTE: The concentrations of these QC samples are typically near the middle of the calibration range.)

Acceptance criteria or MPC: MPC are typically expressed in terms of % Recovery of a known or accepted/true amount and defined by the following equation:

$$\%R = \frac{X}{K} \times 100$$

where,

$\%R$ = Recovery (as %)

X = Measured value or concentration

K = Known or accepted/true value or concentration

For matrix spikes, the % Recovery calculation typically takes into account correcting the matrix spike concentration for the naturally occurring amounts (as measured in the unspiked sample). The calculation may be represented by the following equation:

$$\%R = \frac{(A - B)}{K} \times 100$$

where,

$\%R$ = Recovery (as %)

A = Measured value or concentration in the matrix spike

B = Measured value or concentration in the unspiked sample

K = Known or accepted/true value or concentration in the matrix spike without native amounts present

For laboratory QC sample accuracy/bias, information provided in the analytical methods might be found to be adequate to meet your data quality needs.

For PE sample accuracy/bias, information is available from the PE sample vendor.

Expressed in terms of *"Contamination"*

Quantitative vs. Qualitative term: Quantitative.

QC samples (may include):

- Field blanks - To assess the effect of any potential sample collection contaminant sources on the associated sample data; and
- Laboratory blanks - To assess the effect of any potential laboratory preparation/analysis contaminant sources on the associated sample data.

Acceptance criteria or MPC: MPC are typically expressed in reference to the QL (as defined in Appendix A). MPC are often set at <QL for field blanks and <QL or some fraction of the QL (such as <1/2 QL) for laboratory blanks.

Representativeness

Questions answered: How well do the sample data reflect the environmental conditions? Is my 500mL sample representative of all the water in that lake? Is my sample still the same after that hot, bumpy truck ride to the laboratory?

Quantitative vs. Qualitative term: May include both.

If quantitative:

QC samples (may include):

- QC samples for other DQIs - To serve as overall checks of representativeness; and/or
- Temperature blanks (water samples that travel with samples from transport in the field to the laboratory) - To serve as a QC check for temperature-related sample preservation.

Acceptance criteria or MPC: For temperature blanks, MPC may be expressed in relation to an acceptable temperature range. For example, for field samples requiring preservation at 4°C, the MPC may be 4°C +/- 2°C.

If qualitative:

QC samples (may include): None.

Acceptance criteria or MPC: Assessing this DQI may include plans to verify that documented sample collection and analytical methods (including sample handling & chain-of-custody procedures, sample preservation, and sample holding times protocols) were followed to ensure the data reflects the environmental conditions. Assessing may also include a review of the sampling design to determine whether samples collected were representative of the environmental conditions and extent of physical boundaries, especially if the sampling design was based on judgmental sampling and not on statistical means.

Comparability

Questions answered: How similar do the data need to be to those from other studies or from similar locations of the same study, same sampling locations but at different times of the year, etc.? Are similar field sampling and analytical methods followed to ensure comparability? If variations are noted in field conditions (such as a stream bed being somewhat dry resulting in more turbid water samples), do these observations support poor comparability of associated data?

Quantitative vs. Qualitative: Qualitative.

QC samples (may include): None.

Acceptance criteria or MPC: Assessing this DQI may include plans to compare sample collection and handling methods, analytical procedures, and QA/QC protocols between studies, study locations, sampling time of year, etc. along with the associated data. Additionally, comparison of concentration units, types of equipment used, and weather/seasonal variations may be assessed.

Completeness

Questions answered: What amount (typically expressed in percentage) of the data you plan to collect is necessary to meet your project objectives? And, are there any data points that are absolutely critical and therefore may warrant re-sampling and/or re-analysis if not attained? After all the things that went wrong do I still have enough acceptable information and data to make a decision?

Quantitative vs. Qualitative: May include both.

If quantitative:

QC samples (may include): None.

Acceptance criteria or MPC: MPC are typically expressed in terms % Completeness between the amount of usable data collected versus the amount of data planned to be collected for the study. Completeness is defined by the following equation:

$$\%C = \frac{N}{T} \times 100$$

where,

$\%C$ = Completeness (as %)

N = Number of usable results

T = Targeted number of samples planned to be collected

Typical MPC may fall somewhere in the range of 75 - 90% completeness, depending on how critical it is to supporting project decisions.

If qualitative:

QC samples (may include): None.

Acceptance criteria or MPC: Assessing this DQI may include ensuring that any data points (locations and/or analyses) that were defined as being absolutely critical to the project have in fact produced usable data and, if not, have set plans in motion to re-sample and/or re-analyze.

Sensitivity

Questions answered: Are the field and/or laboratory methods sensitive enough to "see" or quantify your parameters of concern at or below the regulatory standards or your PALs? Are the QLs low enough to answer the question(s) you are asking? How low can I measure and still have confidence in the results?

Quantitative vs. Qualitative: Quantitative.

QC samples (may include):

- Calibration verification - To assess the ability to accurately quantify data at the low end of the calibration curve; and/or
- Laboratory QC samples (such as laboratory control samples, laboratory fortified blanks, etc.) - To ensure accurate quantifying of data at the QL.
- (NOTE: The concentrations of these samples are typically at or near the QL which is typically defined by the lowest point on a calibration range.)

Acceptance criteria or MPC: MPC may be expressed in terms of the laboratory's acceptable performance criteria for their QC checks. This is typically expressed as QL +/- some defined acceptable concentration value deviation.

Another way of approaching this material is through a systematic process broken down into several steps (for each sample medium and associated analytical operation:

Step 1 - Identify the most critical Data Quality Indicators (DQIs) for your project. (For example, sensitivity may be more critical than another DQI and would drive your selection of a sampling or analytical method.) DQIs should be associated with each sample medium/matrix and each sampling & measurement/analysis scheme planned. The principal DQIs include: precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity (as described above).

Step 2 - Determine which of the DQIs will be assessed quantitatively (typically, these may include precision, accuracy/bias, and sensitivity) and which are more qualitative in nature (typically, these may include representativeness, comparability, and completeness).

Step 3 - Describe how each DQI will be assessed. Identify pertinent quality control (QC) samples that will serve as checks on data quality, and discuss how these QC samples will be evaluated.

Step 4 - For the DQIs that can be assessed quantitatively:

- Identify the QC samples selected for assessing each DQI. The QC samples, as discussed previously, may include both field QC samples (such as field duplicates, field/equipment blanks, etc.) and measurement/analysis QC samples (such as laboratory duplicates, method blanks, matrix spikes/matrix spike duplicates, laboratory control samples, etc.).
- Provide the calculation(s) that will be used to define the acceptance criteria or Measurement Performance Criteria (MPC) for each DQI.

(NOTE: These equations are generally included in Section 1.7 of the QA Project Plan. If they are presented in another section, Section 1.7 should clearly state where they will be found.)

- Identify the Measurement Performance Criteria (MPC) for each DQI and the associated QC samples selected for assessing whether the MPC was met. The MPC for your project may be defined by several options. The two primary options include:
- Project team defines project-specific criteria; or
- Project team defaults to QC criteria already defined by a sampling, field measurement, or analytical method once reviewed and deemed acceptable to meet the data needs of the project.

Types of QC Samples and MPC to consider include:

Field QC Samples - MPC to be assessed by field QC samples are generally defined by the project team. For example: If analyzing sodium in a surface water sample, you may collect field duplicate samples at a frequency of 1 duplicate for every set of 20 samples or less. These QC samples would be used to assess the precision encompassing both sample collection and analytical methods. In this case, the analytical parameter is sodium, the sample matrix is surface water, the DQI is precision of field plus analytical methods, and the MPC set might be Relative Percent Difference (RPD) < 20% between the results of the field duplicate pair.

Field Measurement QC – MPC and associated QC samples are generally defined by the project team in conjunction with any information provided in the associated field instrument manuals.

Analytical QC - For laboratory measurements, the selected laboratory is often helpful in providing information on its internal quality control (QC) measures and criteria that may be "accepted" by (or defaulted to) the project team. It's important that the project team reviews the laboratory information and decides whether the criteria are rigorous enough for its use. To do this, you will need to identify a lab, make contact with it, and ask for its QA Manual and relevant standard operating procedures (SOPs). Within the QA Manual and SOPs, you will need to look for QC acceptance criteria usually in the form of numerical values. (NOTE: Some lab QA plans lack specific QC acceptance criteria. Instead, these plans may provide marketing information and

simply “say” the laboratory is good for the reasons they will list. In this case, the pertinent QC information is probably included in the SOPs.) Alternatively, you may choose to specify the criteria you’re expecting the laboratory to meet. If you choose to do this, you will need to have the associated laboratory contract criteria ready to insert into the QA Project Plan.

(NOTE: The MPC and associated field, measurement, and/or analytical QC samples are generally provided in Section 1.7 of the QA Project Plan. If they are presented in another section of the QA Project Plan, Section 1.7 should clearly state where they will be found. This information can very easily be combined with Section 2.5 Quality Control Requirements and summarized in a table similar to Table 2-4 of the QA Project Plan Template included in Module 2. If the project team has reviewed the QC acceptance limits summarized in Table 2-4 and has selected to accept these as the MPC meeting the data quality needs of the project, this needs to be clearly stated within Section 1.7.)

Step 5 - For the DQIs that will be assessed qualitatively, discuss the plans to assess each DQI and support the assurance that the quality of the data generated will be acceptable for making project decisions. Some examples to consider include:

Representativeness - Discuss how you will follow standardized and well-accepted sampling and analytical methods for ensuring the data collected reflects the environmental conditions. Describe the importance of any pertinent chain-of-custody procedures, sample preservation, and/or maximum sample holding times.

Comparability - Discuss if/how similar the project data need to be to those from other studies, similar locations within the same study, same sampling locations at different times of the year, etc. Compare sample collection and handling methods, analytical procedures, and QA/QC protocols as pertinent.

Completeness - Describe the amount, usually expressed in percentage, of data you plan to collect that is essential/necessary to meet your project objectives. Identify any data points (locations and/or measurements/analyses) that are absolutely critical and therefore may warrant re-sampling and/or re-analysis if not attained.

Attachment D

Selecting an Environmental Laboratory

In order for an environmental monitoring program or single sampling event project to be successful, it is usually necessary to locate and hire an environmental laboratory. The guidance in this module is designed to provide perspective on a number of the areas you may want to consider in selecting a laboratory to support the data quality needs of your project. The information is presented as a starting point. For additional assistance, feel free to consult with the Region's U.S. EPA QA staff, talk with other Grantees regarding laboratories they may be familiar with, and/or, if necessary, consider hiring a consultant.

Careful selection of laboratories and analytical methods is critical to the success of your project. Many routine laboratory procedures may not be able to support your data quality needs and/or report data to low enough limits to support decisions for your specific project. Following a review of a laboratory's qualifications and credentials, you may end up selecting a different laboratory and/or analytical method than originally considered. This decision point is critical to the success of your project. If an inappropriate laboratory and/or analytical procedure are selected, you may end up having to repeat your entire study.

There are several factors to consider when selecting a commercial laboratory including:

Technical and Logistical Qualification

- Experience with sample media/matrices and analyses
- State certification and/or TNI accreditation
- Laboratory capacity
- Laboratory location and support services
- Experience with other tribal projects

- Cost

Quality System Documentation

- Laboratory Quality Assurance Plan (or Manual)
- Standard operating procedures
- Personnel resumes
- Cost of QC
- Chain-of-custody
- Archiving data

Other Factors

- Data review procedures
- Laboratory report content
- Sample retention and disposal
- Laboratory subcontracts

Additional guidance on these factors is provided in the subsections that follow.

Technical and Logistical Qualifications:

Experience with sample media/matrices and analyses - *Does the laboratory have experience analyzing the types of samples* (e.g., water, drinking water, waste water, sediment, soil, fish tissue, plant materials, etc.) *that you want analyzed? Does the laboratory perform the specific analyses that you require?* Some laboratories may specialize in analyses based on either a particular matrix (e.g., drinking water, fish tissue, etc.) or a particular type of analysis (e.g., pesticides, dioxin, etc.). Others are full service organizations that can handle many types of matrices/media and analyses.

It is important that you determine what matrices/media and analyses you require while you are planning your project (and prior to writing your QA Project Plan). Usually laboratories have a business manager, client services manager, sales representative, etc. who will work with you to determine whether they can provide the particular analyses required for your project. Most laboratories will perform routine surface or ground water analyses. Two types of water analyses not always available at every laboratory include: organic chemistry methods for drinking water compliance analyses (as these methods require a laboratory to handle reporting at the low detection limits); and dioxin analyses (as these methods require special reagents, instruments, and expertise).

Lack of prior experience should not necessarily disqualify a laboratory, but should lead to a more thorough investigation of the laboratory's qualifications.

State certification and/or TNI accreditation - *Does the laboratory have state certification in the state in which your grantee resides? Does the certification include the types of sample media/matrices and analyses of interest for your project?* It is important to note that all states do not run their certification program the same way. Some state certifications include only drinking water, while others may include many different media (e.g., waste water, hazardous waste, tissue, etc.). Even laboratories within a given state seldom are certified for exactly the same media or analytical parameters. Laboratories are certified for specific media and analyses depending on their interest to pursue specific certification categories, as well as their ability to demonstrate compliance with the associated qualifications. State certification by itself does not guarantee that good quality work will be produced, but it may provide a good starting point to help you evaluate a laboratory's ability to support your project needs.

Does the laboratory have TNI accreditation? Does the accreditation include the types of sample media/matrices and analyses of interest for your project? Many states, independent of size, also participate in TNI (The NELAC Institute).

This program attempts to ensure a national uniformity in accreditations (similar in intent to certifications), and involves a more detailed review than that provided historically by many state certification programs.

Has the laboratory successfully analyzed all recent performance evaluation (PE) samples? Usually state certification and/or TNI accreditation requires regular participation in some kind of PE program. Although these PE programs do not cover all analyses or all possible analytes, they usually cover many of the most common analytes of interest to water monitoring programs. It is recommended that you request the laboratory's most recent (last two years is good) PE results. If there have been recent problems, you should inquire about the results of the laboratory's investigation of the problem and its corrective actions to ensure the problem was fixed.

Do you know the current status the laboratory's state certification or TNI accreditation? You may want to request the certification/accreditation audit reports, although the laboratory is not obligated to share them with you (as their availability may be dictated by company or laboratory confidentiality policy). The state certification/TNI accreditation agency will, however, tell you the media/matrices, analytes, and methods the laboratory is certified/accredited for, as well as whether the laboratory is in good standing with regards to its certification/accreditation.

Laboratory capacity - *Does the laboratory have the capacity to handle your samples (and all related sample preparation and analyses) on the schedule you need?* Do they have sufficient instruments (and back-up instruments in case of instrument failure) and personnel to handle the anticipated sample load?

If you are not generating a large number (typically, less than 40) of samples, most laboratories can handle this sample load without problem. However, if your project will generate a large number samples at one time and/or you have samples to be analyzed for a variety of analytical

parameters, you need to ensure that the laboratory can handle the work load in all of its departments. For example, a laboratory may have capacity to analyze 60 metals analyses (as these are relatively fast and involve minimal preparation), but they might not be able to analyze 60 pesticide or semivolatile organic compound analyses (as these require more time consuming sample preparation steps, as well as longer analysis time) in a specific time frame.

Make sure you discuss sample capacity loads, sampling holding times, and data deliverables with the laboratory and then make plans to schedule your sample collection accordingly; or, find a different laboratory that can handle your samples when they need to be analyzed, if you cannot be flexible in your sample collection and shipping schedule.

Laboratory location and support services - *Is the laboratory location convenient?* A local laboratory may be advantageous to your project as it may more easily facilitate transferring your samples directly to the laboratory the same day as collected, either hand-delivered by a project team member or picked up by a laboratory courier service. This may be especially critical if your project's analytical methods require that your samples be analyzed within a short time frame (after collection) to ensure sample integrity. However, with overnight courier services, shipping samples within a state or even to another state doesn't necessarily mean that processing of the samples will start any later than if they were delivered to a local laboratory.

What support services does the laboratory provide, and what is its sample receipt policy? You also need to discuss with the laboratory how it typically receives samples and what support it might provide in this regard. For example, the laboratory may provide coolers for shipping, chain-of-custody forms, free pre-cleaned/certified sample bottles and preservatives, courier service, etc. Some laboratories have staff available to receive samples after hours or on Saturdays, but not all do.

Cost - *Are the laboratory's prices reasonable?* Shop around and find the laboratory that best meets your needs and look for a competitive price. Sometimes there are economies by making a longer-term commitment (e.g., for all four quarterly monitoring events in a year) or in sending all your samples to one laboratory facility (e.g., rather than splitting up samples submitted for various analyses to two or more individual laboratories).

Quality System Documentation:

Laboratory Quality Assurance Plan (or Manual) - *Does the laboratory have a written Quality Assurance (QA) Plan, and is it adequate to meet your project's data quality needs?* Almost all laboratories will have some form of QA Plan, but these documents may vary considerably in terms of their content.

Some QA Plans are designed to provide general information as a form of marketing tool. These plans might describe the laboratory's capabilities, identify any state certifications or accreditations, discuss the QA program in place (in a general sense), list the methods it performs, describe the matrices it typically handles, list personnel and their qualifications, and provide an overview of the organization. This type of QA Plan may be supplemented with additional information available in other laboratory documentation, such as standard operating procedures (SOPs). However, acquiring this additional information may require you to "dig deeper" and ask more questions.

The other end of the spectrum might be a QA Plan containing similar types of information (as discussed above), while being much more detailed in scope. For example, this type of QA Plan might include lists of analytes associated with each method (rather than just listing the methods alone), as well as the reporting limits and/or method detection limits for each analyte for each

method. Rather than merely stating it has a QA program, this type of plan might provide specifics with respect to: the types of QC samples run; the frequency with which they are run; the sources and concentrations of specific spiking solutions that are used (in preparing surrogate spikes, matrix spikes, and/or laboratory control sample mixtures); the acceptance criteria associated with each type of QC check (on an analyte-specific basis); and the corrective actions taken when these criteria are not met. Details on calibration criteria and associated corrective action criteria may also be included in this type of plan.

Standard operating procedures - *Does the laboratory have written standard operating procedures (SOPs) for all of its operations?* Most full-service laboratories are divided up into departments or sections that include: sample receipt; organic sample preparation; inorganic sample preparation; metals analysis; general chemistry analyses; gas chromatography/mass spectrometry (GC/MS) analyses (often including separate volatile and semivolatile organic compound analysis areas); and gas chromatography (GC) analyses (often including separate pesticide, polychlorinated biphenyl (PCB), and total petroleum hydrocarbon analysis areas). Some laboratories also offer microbiological analyses or toxicity testing, while others may provide analysis of tissue or foliage samples.

Each laboratory department or section should document its procedures in written SOPs. SOPs for each analytical method should include detailed step-by-step procedures, as well as specific QC requirements, frequency, acceptance criteria, and corrective actions (to be taken if these criteria are exceeded) associated with that method. It is important to remember that a "published method" is not an SOP. In general, published methods such as EPA methods or those in Standard Methods vary considerably in their method description and may need to be supplemented with specific QC requirements, calibration criteria, reporting limits and/or method detection limits, etc. At times, the published methods may be modified to improve performance if necessary to meet a project objective.

Personnel resumes - *Are the resumes of key personnel available for review, if necessary?* Sometimes this information is found in the laboratory's QA Plan, while other times resumes are kept confidential unless requested specifically. State certification agencies typically have minimum experience and/or educational requirements for management and supervisory positions, and they may review the laboratory's general qualifications as part of

the certification process. However, you may want to review specific resumes if there are concerns related to a critical analysis area, especially for the more complex analyses.

Cost of QC - *What QC samples are analyzed and typically reported by the laboratory on a routine basis, and what QC samples may will require an additional cost to the grantee?*

Unless requested otherwise, most laboratories will perform their QC analyses on a batch basis. A batch is a set number of samples (frequently, 20) of a similar matrix/medium. The batch may be comprised of samples from a single client or include small groups of samples from multiple clients. The intent of batching samples is for the laboratory to avoid performing an overall disproportionate number of QC sample analyses. For example, a grantee may submit 5 samples and another client may submit 10 samples for the same type of analysis. But, as the laboratory typically performs analysis of the associated QC check samples (that may include a laboratory blank, a matrix spike, laboratory duplicate and possibly a laboratory control sample) at a rate of one for every 20 samples, the laboratory may combine the grantees samples and the other clients' samples into one batch and report the same batch QC results to both clients. This is logical from a laboratory perspective, as the laboratory typically absorbs the cost of these QC samples. But, this batching could result in generating results of matrix spike and lab duplicate samples that may not be representative of the grantees samples. Thus, they provide information about the laboratory's performance, but not necessarily about the grantees sample matrix/medium. In most cases, batch QC is sufficient for tribal purposes, but in some cases having one of the grantees samples designated to serve as the matrix spike, laboratory duplicate, and/or matrix spike duplicate may be desirable. Some laboratories may batch an individual client samples together (even if just a small group) and not combine samples from different clients. If that is the case, they may use the grantees samples as a basis for the QC samples without any additional charge.

It is recommended that you engage the laboratory in discussions regarding what QC samples it runs routinely for each analysis (as they may differ from method to method), the frequency of those QC sample analyses, as well as which are performed at client versus laboratory expense. Samples sent blind to the laboratory, such as field duplicates and field blanks, will always be at client expense.

Chain-of-custody - *If there are legal considerations to the data, does the laboratory have a well-documented, internal chain-of-custody system?* Oftentimes this is done electronically or with a combination of electronic and logbook documentation.

Archiving data - *Does the laboratory have a system in place to track, store, and archive raw data and old data reports?* Most laboratories have retention policies, but you should know and understand what they might be. With the increasing use of electronic data, but ever changing formats, a permanent hard copy may be the only way to ensure data is available for any future use (such as if the client loses their data, a complete data package including raw data was not requested by the client but needed later on, etc.).

Other Factors:

Data review procedures - *Does the laboratory have defined procedures in place covering administrative tasks such as sample receipt and check in, as well as for the reporting and processing of data?* It is important to understand the level of review associated with these tasks. Most laboratories will have SOPs in place covering these tasks. Some specific questions to consider include:

- Does the QA Officer (or some individual independent of performing the actual activity) review all data or a fraction of the data in real time (prior to providing the data to the client)?
- Is there an automated data review system in place? Does the data review SOP describe the review system satisfactorily?
- Are data flagged for the client to review? How are data flagged? Is the system clear?
- Will all data reports contain a narrative explaining any problems?

Laboratory report contents - *What are the contents of a typical laboratory report?* It is recommended that you request to see a typical data report (to ensure the laboratory will provide the information you will need) prior to selecting your laboratory, and that you specify the laboratory QC data you need to be reported with its data (so that you will have the information necessary to perform at least a minimum QC check on your project data). You should ensure you have a clear understanding of the criteria by which the QC data were evaluated for inclusion in

your QA Project Plan (especially if this is not to be summarized in the data report). For example, seeing a matrix spike recovery of 50% might look unacceptable, but for certain difficult compounds this may be an excellent recovery justified by the laboratory QA Plan and/or analytical SOP.

In some cases, it may be desirable or necessary to have the laboratory provide a complete data package, sometimes called a data validation package. Basically, this data package includes all the data and sample information used to generate a sample result. It may include, but not be limited to, chain-of-custody and sample receipt records, sample preparation logs, analysis logs, standards logs, raw data from the instrument for both sample and QC sample analyses, calibration information for initial and continuing calibration analyses, sample analysis results, QC sample results, and all information related to sample processing (for example, results of manual integrations of results, etc.). (Note: For an example of items to consider for inclusion in a complete data package, visit the EPA Region 9 QA website at: http://www.epa.gov/region9/qa and download the document entitled *Draft Laboratory Documentation Requirements for Data Validation, R9QA/004.2, August 2001*) "Complete" data packages are typically required for litigation. This type of data package may cost an additional $50-100 or more per sample batch, if they are even offered as an option from a given laboratory (which is information you would want to know about up front). Such packages are usually considerably cheaper if ordered when the samples are analyzed. Asking the laboratory to generate this data package after the fact may cost considerably higher.

Sample retention and disposal - *What are the laboratory's policies with respect to retention and disposal of samples?* The grantee should be reassured that there is no future liability associated with providing samples to the laboratory.

Laboratory subcontracts - *What are the laboratory's policies with respect to subcontracts, and what samples might be subcontracted for your project?* The laboratory should have a system in place to evaluate its subcontractor's quality system. It should be reviewing subcontractor data as if it was its own, since it will be reported as such. It is important to note that a subcontractor does introduce another variable into the quality system, one that you may not be able to evaluate directly. Thus, it is important that you are comfortable with whatever samples might be sent out.

If considered critical to a project's success, you may need to request documentation (such as an SOP) from the subcontract laboratory, so that it too can be evaluated.

APPENDIX D

DATA QUALITY INDICATORS AND MEASUREMENT QUALITY OBJECTIVES

APPENDIX D – DATA QUALITY INDICATORS AND MEASUREMENT QUALITY OBJECTIVES

The State of Nevada certifies laboratories for standard analyses under the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA), as well as SW-846 under RCRA. Certification of laboratories in Nevada for these standard analyses requires review of the laboratory's QA plan, an initial demonstration of capability (IDC), initial and continuing calibration studies, matrix spikes (MSs), demonstration of method detection limits (MDLs), and analysis of laboratory control samples (LCSs).

The state also approves laboratories for unusual compounds and nonstandard methods, based on reporting limit and MS demonstrations. SOPs, IDCs, CCs, RLs, MSs, and sensitivity analysis are required for approval of any performance-based measurement system (PBMS).

Measurement quality objectives (MQOs) for quantitative data quality indicators (precision and accuracy) for standard analyses are presented in Tables D-1 through D-7 of this appendix. Regulatory (or advisory) levels of chemicals and a comparison with program-required quantitation limits are provided in Tables D-8 through D-22. For more information, see also, National Functional Guidelines for Superfund Organic Methods Data Review (June 2008).

EPA's Regional Screening Levels (RSLs) replace the EPA's Preliminary Remediation Goals (PRGs) and are available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. Tables in Appendix D reflect the May 2021 RSL values.

One important note about the RSLs: The RSL values provided in EPA's RSL table include some values that exceed the physically possible limit of a "pure material" (i.e., one million parts per million, or 1.0E+06 mg/kg). Values of as much as 42 trillion parts per million are listed as the screening level for compounds in an industrial exposure scenario. EPA has intentionally done this so that if one wished to calculate a 1.0E-04 risk level instead of the 1.0E-06 risk level provided in the table, one could multiply the RSL by 100 and obtain the "correct number." For example, if the concentration at a risk level of 1.0E-04 was 5.9E+05 mg/kg, then the RSL value given in the table for a 1.0E-06 risk level would be 5.9E+07 mg/kg, which is clearly not a physically possible concentration (i.e., this represents a "concentration" of greater than one million parts per million; specifically, 59 million parts per million).

The RSL tables therefore provide "scalable" concentrations instead of physically possible concentrations in some cases. The RSLs are chemical concentrations that correspond to fixed levels of risk (i.e., either a one-in-one million [1.0E-06] cancer risk or a noncarcinogenic hazard quotient of 1 in soil, air, and water. In most cases, where a substance causes both cancer and noncancer (systemic) effects, the 1.0E-06 cancer risk will result in a more stringent criterion. If the RSLs are to be used for site screening, the EPA recommends that both cancer and noncancer-based RSLs be used. Both carcinogenic and noncarcinogenic values may be obtained in the supporting tables at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

TABLE D-1: SEMIVOLATILE ORGANIC COMPOUNDS, EPA METHOD8270E: METHOD PRECISION AND ACCURACY GOALS

Matrix Spike	Soil		Water	
Compound	% Recovery	RPD	% Recovery	RPD
Phenol	18 – 143	50	18-143	30
2-Chlorophenol	18 – 143	50	18 – 143	30
n-Nitroso-di-n-propylamine	27 – 154	50	27 – 154	30
4-Chloro-3-methylphenol	27 – 143	50	27 – 143	30
Acenaphthene	27 – 154	50	27 – 143	30
4-Nitrophenol	18 – 154	50	18 –165	30
2,4-Dinitrotoluene	27 – 165	50	27 – 165	30
Pentachlorophenol	18 – 165	50	27 – 165	30
Pyrene	27 – 154	50	27 – 154	30

Surrogate Control Limits

Surrogate Compound	Soil % Recovery	Water % Recovery
2,4,6-Tribromophenol	30-140	30-150
2-Fluorobiphenyl	30-130	40-130
2-Fluorophenol	30-130	30-130
Nitrobenzene-d5	30-130	30-130
Phenol-d5	30-130	30-130
Terphenyl-d14	30-140	40-150

Notes:

EPA U.S. Environmental Protection Agency
RPD Relative percent difference

TABLE D-2: VOLATILE ORGANIC COMPOUNDS, EPA METHOD 8260D: METHOD PRECISION AND ACCURACY GOALS

Matrix Spike	Soil		Water	
Compound	% Recovery	RPD	% Recovery	RPD
1,1-Dichloroethene	54– 143	30	63 – 143	20
Trichloroethene	60– 140	30	54 – 154	20
Benzene	63 – 143	30	63 – 143	20
Toluene	63 – 143	30	63 – 143	20
Chlorobenzene	63 – 143	30	63 – 143	20

Surrogate Control Limits

Surrogate Compound	Soil % Recovery	Water % Recovery
1,2-Dichloroethane-d4	70-130	70-130
Bromofluorobenzene	70-130	70-130
Toluene-d8	70-130	70-130

Notes:

EPA U.S. Environmental Protection Agency
RPD Relative percent difference

TABLE D-3: DIOXINS/FURANS, EPA METHOD 8290: METHOD PRECISION AND ACCURACY GOALS

Matrix Spike	Soil		Water	
Compound	% Recovery	RPD	% Recovery	RPD
2378-TCDD	40-135	50	40-135	50
12378-PeCDD	40-135	50	40-135	50
123478-HxCDD	40-135	50	40-135	50
123678-HxCDD	40-135	50	40-135	50
123789-HxCDD	40-135	50	40-135	50
1234678-HpCDD	40-135	50	40-135	50
OCDD	40-135	50	40-135	50
2378-TCDF	40-135	50	40-135	50
12378-PeCDF	40-135	50	40-135	50
23478-PeCDF	40-135	50	40-135	50
123478-HxCDF	40-135	50	40-135	50
123678-HxCDF	40-135	50	40-135	50
123789-HxCDF	40-135	50	40-135	50
234678-HxCDF	40-135	50	40-135	50
1234678-HpCDF	40-135	50	40-135	50
1234789-HpCDF	40-135	50	40-135	50
OCDF	40-135	50	40-135	50

Notes:

EPA	U.S. Environmental Protection Agency
RPD	Relative percent difference
HxCDD	Hexachlorodibenzo-p-dioxin
HxCDF	Hexachlorodibenzofuran
HpCDD	Heptachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran
OCDD	Octachlorodibenzo-p-dioxin
OCDF	Octachlorodibenzofuran
PeCDD	Pentachlorodibenzo-p-dioxin
PeCDF	Pentachlorodibenzofuran
TCDD	Tetrachlorodibenzo-p-dioxin
TCDF	Tetrachlorodibenzofuran

TABLE D-4: TOTAL PETROLEUM HYDROCARBONS, EPA METHOD 8015B: METHOD PRECISION AND ACCURACY GOALS

	Matrix Spike[a]		Surrogates[a]
Analysis	**% Recovery**	**RPD**	**% Recovery**
TPH-purgeable	70 – 130	30	-
Bromofluorobenzene	-	-	70-140
TPH-extractable	60 – 140	20	-
Bromobenzene	-	-	50-150
Hexacosane	-	-	40-160

Notes:

[a] Listed criteria will apply to all water and soil matrices.
EPA U.S. Environmental Protection Agency
RPD Relative percent difference
TPH Total petroleum hydrocarbons

TABLE D-5: EXPLOSIVES, EPA METHOD 8330: METHOD PRECISION AND ACCURACY GOALS

Matrix Spike	Soil		Water	
Compound	% Recovery	RPD	% Recovery	RPD
2-Amino-4,6-Dinitrotoluene	63-143	50	54-143	30
4-Amino-2,6-Dinitrotoluene	54-176	50	36-154	30
1,3-Dinitrobenzene	63-154	50	45-143	30
2,4-Dinitrotoluene	63-143	50	54-143	30
HMX	54-143	50	45-143	30
Nitrobenzene	63-154	50	36-143	30
RDX	54-154	50	27-143	30
2-Nitrotoluene	54-143	50	45-143	30
3-Nitrotoluene	54-154	50	45-165	30
4-Nitrotoluene	54-154	50	45-143	30
Tetryl	18-165	50	45-154	30
1,3,5-Trinitrobenzene	63-143	50	54-143	30
TNT	27-176	50	45-154	30

Surrogate Control Limits

Surrogate Compound	Soil % Recovery	Water % Recovery
3,4-Dinitrotoluene	60-140	70-130

Notes:

EPA U.S. Environmental Protection Agency
HMX octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
RDX hexahydro-1,3,5-trinitro-1,3,5-triazine
RPD Relative percent difference
TNT 2,4,6-Trinitrotoluene

TABLE D-6: RADIONUCLIDES[a]: METHOD PRECISION AND ACCURACY GOALS

Laboratory Control Sample Limits

	Water
Analysis	**% Recovery**
Americium-241	81-115
Cadmium-109	81-115
Cesium-137	81-115
Cobalt-60	81-115
Radium-226	80-120
Total alpha emitting Radium	75-125
Radium-228	70-130

Isotopic Tracer Control Limits

Surrogate Compound	Soil % Recovery
Isotropic Thorium	30-110
Isotopic Uranium	30-110
Carrier	40-110

Notes:

a Methods EPA 901.1, EPA 903.1, SW-846 9315, SW-846 9320, ASTM D3972-90M
ASTM American Society for Testing and Materials
EPA U.S. Environmental Protection Agency

TABLE D-7: MISCELLANEOUS ANALYSES: METHOD PRECISION AND ACCURACY GOALS

		Soil		Water	
Analyses	**Method**	**% Recovery**	**RPD**	**% Recovery**	**RPD**
Metals	EPA 6010B	75-125	20	75-125	20
Cyanide	EPA 9010B	75-125	20	75-125	20
Perchlorate	EPA 314.0	75-125	20	75-125	20
Alkalinity	EPA 310.1	NA	NA	75-125	20
Anions[a]	EPA 300.0	NA	NA	75-125	20
Sulfide	EPA 376.1	NA	NA	75-125	20
Total dissolved solids	EPA 160.1	NA	NA	75-125	20
Total suspended solids	EPA 160.2	NA	NA	75-125	20
Hydrazine	ASTM D1385	NA	NA	75-125	20

Notes:

[a] Anions to include bromide, chloride, fluoride, nitrate, nitrite, orthophosphate, sulfate
ASTM American Society for Testing and Materials
EPA U.S. Environmental Protection Agency
RPD Relative percent difference
NA Not applicable

TABLE D-8: VOLATILE ORGANIC COMPOUNDS IN WATER: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND DRINKING WATER CRITERIA

Volatiles	Analytical Method[a]	Water PRQL (µg/L)	Regulatory Level[b] (µg/L)
Chloromethane	EPA 8260D	2.0	NA
Bromomethane	EPA 8260D	2.0	NA
Vinyl chloride	**EPA 8260D**	**1.0**	**2**
Chloroethane	EPA 8260D	2.0	NA
Methylene chloride	EPA 8260D	2.0	5
Acetone	EPA 8260D	10.0	NA
Carbon disulfide	EPA 8260D	1.0	NA
1,1-Dichloroethene	EPA 8260D	1.0	7
1,1-Dichloroethane	EPA 8260D	1.0	NA
cis-1,2-Dichloroethene	EPA 8260D	1.0	70
trans-1,2-Dichloroethene	EPA 8260D	1.0	100
Chloroform	EPA 8260D	1.0	80
1,2-Dichloroethane	**EPA 8260D**	**1.0**	**5**
2-Butanone	EPA 8260D	10.0	NA
1,1,1-Trichloroethane	EPA 8260D	1.0	200
Carbon tetrachloride	**EPA 8260D**	**1.0**	**5**
Bromodichloromethane	EPA 8260D	1.0	80
1,2-Dichloropropane	EPA 8260D	1.0	5
cis-1,3-Dichloropropene	**EPA 8260D**	**1.0**	**NA**
Trichloroethene	EPA 8260D	1.0	5
Dibromochloromethane	EPA 8260D	1.0	80
1,1,2-Trichloroethane	EPA 8260D	1.0	5
Benzene	**EPA 8260D**	**1.0**	**5**
trans-1,3-Dichloropropene	**EPA 8260D**	**1.0**	**NA**
Bromoform	EPA 8260D	1.0	80
4-Methyl-2-pentanone	EPA 8260D	10.0	NA
2-Hexanone	EPA 8260D	10.0	NA
Tetrachloroethene	EPA 8260D	1.0	5
Toluene	EPA 8260D	1.0	1000
1,1,2,2-Tetrachloroethane	**EPA 8260D**	**1.0**	**NA**
Chlorobenzene	EPA 8260D	1.0	100
Ethylbenzene	EPA 8260D	1.0	700
Styrene	EPA 8260D	1.0	100
Total xylenes	EPA 8260D	3.0	10000

Notes:

[a] 25 milliliter (mL) purge

[b] MCLs from May 2021 RSL table and from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

[c] The listed PRQL reflects the maximum sensitivity of current, routinely used analytical methods. The listed PRQL will be used as the project screening criteria unless reasonable grounds are established for pursuing non-routine methods.

µg/L	Micrograms per liter	NA	Not available
AL	Action level	PRQL	Project-required quantitation limit
SOW	Statement of work	SOW	Statement of work
MCL	Maximum contaminant level	VOC	Volatile organic compounds

TABLE D-9: SEMIVOLATILE ORGANIC COMPOUNDS IN WATER: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND DRINKING WATER CRITERIA

Semivolatiles	Analytical Method	Water PRQL (µg/L)	Regulatory Level [a] (µg/L)
Phenol	EPA 8270E	10	NA
bis(2-Chloroethyl)ether	EPA 8270E SIM[c]	2	NA
2-Chlorophenol	EPA 8270E	10	NA
1,3-Dichlorobenzene	EPA 8270E	10	NA
1,4-Dichlorobenzene	**EPA 8270E**	**10**	**75**
1,2-Dichlorobenzene	EPA 8270E	10	600
2-Methylphenol	EPA 8270E	10	NA
2,2'-oxybis(1-Chloropropane)	EPA 8270E	10	NA
4-Methylphenol	EPA 8270E	10	NA
n-Nitroso-di-n-propylamine	EPA 8270E SIM[c]	2	NA
Hexachloroethane	EPA 8270E	10	NA
Nitrobenzene	EPA 8270E	10	NA
Isophorone	EPA 8270E	10	NA
2-Nitrophenol	EPA 8270E	10	NA
2,4-Dimethylphenol	EPA 8270E	10	NA
bis(2-Chloroethoxy)methane	EPA 8270E	10	NA
2,4-Dichlorophenol	EPA 8270E	10	NA
1,2,4-Trichlorobenzene	EPA 8270E	10	70
Naphthalene	EPA 8270E SIM[c]	1	NA
4-Chloroaniline	EPA 8270E	10	NA
Hexachlorobutadiene	EPA 8270E	10	NA
4-Chloro-3-methylphenol	EPA 8270E	10	NA
2-Methylnaphthalene	EPA 8270E SIM[c]	1	NA
Hexachlorocyclopentadiene	EPA 8270E	10	50
2,4,6-Trichlorophenol	EPA 8270E	10	NA
2,4,5-Trichlorophenol	EPA 8270E	10	NA
2-Chloronaphthalene	EPA 8270E	10	NA
2-Nitroaniline	EPA 8270E	20	NA
Dimethylphthalate	EPA 8270E	10	NA
2,6-Dinitrotoluene	EPA 8270E	20	NA
Acenaphthene	EPA 8270E SIM[c]	1	NA
2,4-Dinitrophenol	EPA 8270E	20	NA
4-Nitrophenol	EPA 8270E	20	NA
Dibenzofuran	EPA 8270E	10	NA
2,4-Dinitrotoluene	EPA 8270E	20	NA
Diethylphthalate	EPA 8270E	20	NA
4-Chlorophenyl phenyl ether	EPA 8270E	10	NA
Fluorene	EPA 8270E SIM[c]	2	NA

TABLE D-9: SEMIVOLATILE ORGANIC COMPOUNDS IN WATER: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND DRINKING WATER CRITERIA (Continued)

Semivolatiles	Analytical Method	Water PRQL (µg/L)	Regulatory Level [a] (µg/L)
3-Nitroaniline	EPA 8270E	10	NA
4-Nitroaniline	EPA 8270E	10	NA
4,6-Dinitro-2-methylphenol	EPA 8270E	20	NA
n-Nitrosodiphenylamine	EPA 8270E	10	NA
n-Nitrosodimethylamine	EPA 8270E	10	NA
4-Bromophenyl phenyl ether	EPA 8270E	20	NA
Hexachlorobenzene	**EPA 8270E SIM[c]**	**1**	**1**
Pentachlorophenol	**EPA 8270E**	**20**	**1**
Phenanthrene	EPA 8270E SIM[c]	2	NA
Anthracene	EPA 8270E SIM[c]	1	NA
Carbazole	EPA 8270E	10	NA
Di-n-butylphthalate	EPA 8270E	10	NA
Fluoranthene	EPA 8270E SIM[c]	2	NA
Pyrene	EPA 8270E SIM[c]	2	NA
Butylbenzylphthalate	EPA 8270E	10	NA
3,3'-Dichlorobenzidine	EPA 8270E	10	NA
Benzo(a)anthracene	EPA 8270E SIM[c]	2	NA
Chrysene	EPA 8270E SIM[c]	2	NA
bis(2-Ethylhexyl)phthalate	**EPA 8270E**	**20**	**6**
Di-n-octylphthalate	EPA 8270E	10	NA
Benzo(b)fluoranthene	EPA 8270E SIM[c]	1	NA
Benzo(k)fluoranthene	EPA 8270E SIM[c]	2	NA
Benzo(a)pyrene	**EPA 8270E SIM[c]**	**1**	**0.2**
Indeno(1,2,3-cd)pyrene	EPA 8270E SIM[c]	1	NA
Dibenzo(a,h)anthracene	EPA 8270E SIM[c]	1	NA
Benzo(g,h,i)perylene	EPA 8270E SIM[c]	1	NA
Acenaphthylene	EPA 8270E SIM[c]	1	NA

Notes:

[b] The listed PRQL reflects the maximum sensitivity of current, routinely used analytical methods. The listed PRQL will be used as the project screening criteria unless reasonable grounds are established for pursuing non-routine methods.

[c] SIM methodology will be used to lower the PRQL for this analyte.

µg/kg Micrograms per kilogram
µg/L Micrograms per liter
AL Action level
MCL Maximum contaminant level
NA Not available
PRQL Project-required quantitation limit
SIM Selective ion monitoring
SOW Statement of work

TABLE D-10: METALS IN WATER: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND DRINKING WATER CRITERIA

Analyte	Analytical Method	Water PRQL (mg/L)	Primary [b] (mg/L)	Secondary [a,c] (mg/L)
Aluminum	EPA 3010A/6010B	0.2	NA	0.2
Antimony	EPA 3005A/7041	0.005	0.006	NA
Arsenic	EPA 3010A/6010B-trace	0.01	0.01	0.01
Barium	EPA 3010A/6010B	0.01	2	NA
Beryllium	**EPA 3010A/6010B**	**0.01**	**0.004**	**NA**
Cadmium	**EPA 3010A/6010B**	**0.01**	**0.005**	**NA**
Calcium	EPA 3010A/6010B	1	NA	NA
Chromium	EPA 3010A/6010B	0.02	0.1	NA
Cobalt	EPA 3010A/6010B	0.02	NA	NA
Copper	EPA 3010A/6010B	0.01	1.3	1
Iron	**EPA 3010A/6010B**	**1**	**NA**	**0.3**
Lead	EPA 3010A/6010B- trace	0.01	0.015	NA
Magnesium	EPA 3010A/6010B	1	NA	NA
Manganese	**EPA 3010A/6010B**	**0.1**	**NA**	**0.05**
Mercury	EPA 7470A	0.0005	0.002	NA
Nickel	EPA 3010A/6010B	0.02	NA	NA
Potassium	EPA 3010A/6010B	5	NA	NA
Selenium	EPA 3010A/6010B-trace	0.01	0.05	NA
Silver	EPA 3010A/6010B	0.02	NA	0.1
Sodium	EPA 3010A/6010B	1	NA	NA
Thallium	**EPA 3020A/7841**	**0.005**	**0.002**	**NA**
Vanadium	EPA 3010A/6010B	0.01	NA	NA
Zinc	EPA 3010A/6010B	0.02	NA	5

Notes:

[b] Primary MCLs are mandatory, enforceable water quality standards for drinking water contaminants. The MCLs are established to protect the public against consumption of drinking water contaminants that present a risk to human health.

[c] Secondary MCLs are non-mandatory water quality standards for drinking water contaminants. They are established only as guidelines for managing aesthetic properties in drinking water, such as taste, color and odor.

[d] The listed PRQL reflects the maximum sensitivity of current, routinely used analytical methods. The listed PRQL will be used as the project screening criteria unless reasonable grounds are established for pursuing non-routine methods.

µg/L Microgram per liter
AL Action level
EPA U.S. Environmental Protection Agency
MCL Maximum contaminant level
NA Not available or not applicable
PRQL Project-required quantitation limit
SOW Statement of work

Primary Drinking Water Standards, https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations
Secondary Drinking Water Standards, https://www.epa.gov/sdwa/secondary-drinking-water-standards-guidance-nuisance-chemicals

TABLE D-11: TOTAL PETROLEUM HYDROCARBONS IN WATER: PROJECT-REQUIRED QUANTITATION LIMITS

Analyte	Analytical Method	Water PRQL (mg/L)
TPH-purgeable[a]	EPA 8015B	0.1
TPH-extractable[a]	EPA 8015B	0.5

Notes:

[a] No CA levels are available for TPH.
CA California
EPA U.S. Environmental Protection Agency
mg/L Milligrams per liter
PRQL Project-required quantitation limit
TPH Total petroleum hydrocarbons

TABLE D-12: MISCELLANEOUS ANALYSES IN WATER: PROJECT-REQUIRED QUANTITATION LIMITS

Compound	Analytical Method	Water PRQL (mg/L)	Regulatory Level (mg/L)
Alkalinity	EPA 310.1	5	NA
Anions			
Bromide	EPA 300.0	0.5	NA
Chloride	EPA 300.0	0.2	250
Fluoride	EPA 300.0	0.1	4
Nitrate (as N)	EPA 300.0	0.1	10
Nitrite (as N)	EPA 300.0	0.1	1
Orthophosphate	EPA 300.0	0.5	NA
Sulfate	EPA 300.0	0.5	250
Cyanide	EPA 9014A	0.01	0.2
Sulfide	EPA 376.1	1	NA
Perchlorate	EPA 314.0	2 µg/L	15 µg/L
Total Dissolved Solids	EPA 160.1	10	500
Total Suspended Solids	EPA 160.2	10	NA
Hydrazine	ASTM D1385	5 µg/L	NA

Notes:

µg/L Micrograms per liter
ASTM American Society for Testing and Materials
mg/L Milligrams per liter
PRQL Project-required quantitation limit
EPA U.S. Environmental Protection Agency

TABLE D-13: EXPLOSIVES IN WATER: PROJECT-REQUIRED QUANTITATION LIMITS

Compound	Analytical Method	Water PRQL (µg/L)
Explosives		
2-Amino-4,6-Dinitrotoluene	EPA 8330	1
4-Amino-2,6-Dinitrotoluene	EPA 8330	1
1,3-Dinitrobenzene	EPA 8330	1
2,4-Dinitrotoluene	EPA 8330	1
HMX	EPA 8330	1
2,6-Dinitrotoluene	EPA 8330	1
Nitroguanidine	EPA 8330	1
Nitroglycerin	EPA 8330	1
Nitrobenzene	EPA 8330	1
RDX	EPA 8330	1
2-Nitrotoluene	EPA 8330	1
3-Nitrotoluene	EPA 8330	1
4-Nitrotoluene	EPA 8330	1
Tetryl	EPA 8330	1
1,3,5-Trinitrobenzene	EPA 8330	1
TNT	EPA 8330	1
Pentaerythritol tetranitrate	EPA 8330	1

Notes:

µg/L Micrograms per liter
EPA U.S. Environmental Protection Agency
HMX octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
NA Not available
PRQL Project-required quantitation limit
RDX hexahydro-1,3,5-trinitro-1,3,5-triazine
TNT 2,4,6-Trinitrotoluene

TABLE D-14: DIOXINS AND FURANS IN WATER: COMPARISON OF METHOD DETECTION LIMITS AND DRINKING WATER CRITERIA

Compound	Analytical Method	MDL (pg/l)	Regulatory Level[a] (pg/l)
2,3,7,8-TCDD	EPA 8290	2.16	30
1,2,3,7,8-PeCDD	EPA 8290	2.75	NA
1,2,3,4,7,8-HxCDD	EPA 8290	3.56	NA
1,2,3,6,7,8-HxCDD	EPA 8290	2.70	NA
1,2,3,7,8,9-HxCDD	EPA 8290	6.66	NA
1,2,3,4,6,7,8-HpCDD	EPA 8290	5.62	NA
OCDD	EPA 8290	52.54	NA
2,3,7,8-TCDF	EPA 8290	2.36	NA
1,2,3,7,8-PeCDF	EPA 8290	2.88	NA
2,3,4,7,8-PeCDF	EPA 8290	7.41	NA
1,2,3,4,7,8-HxCDF	EPA 8290	3.52	NA
1,2,3,6,7,8-HxCDF	EPA 8290	2.58	NA
1,2,3,7,8,9-HxCDF	EPA 8290	4.30	NA
2,3,4,6,7,8-HxCDF	EPA 8290	6.97	NA
1,2,3,4,6,7,8-HpCDF	EPA 8290	2.36	NA
1,2,3,4,7,8,9-HpCDF	EPA 8290	10.10	NA
OCDF	EPA 8290	5.87	NA

Notes:

[a] These promulgated levels will be used as groundwater screening criteria for this investigation.

AL	Action level
EPA	U.S Environmental Protection Agency
HpCDD	Heptachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin
HxCDF	Hexachlorodibenzofuran
MCL	Maximum contaminant level
MDL	Method detection limit
NA	Not available
OCDD	Octachlorodibenzo-p-dioxin
OCDF	Octachlorodibenzofuran
PeCDD	Pentachlorodibenzo-p-dioxin
PeCDF	Pentachlorodibenzofuran
pg/L	Picograms per liter
SOW	Statement of Work
TCDD	Tetrachlorodibenzo-p-dioxin
TCDF	Tetrachlorodibenzofuran

TABLE D-15: RADIONUCLIDES IN WATER: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND DRINKING WATER CRITERIA

Compound	Analytical Method	(pCi/Liter)	Regulatory level
Cesium-137	Gamma spectroscopy-EPA 901.1	10	NA
Cobalt-60	Gamma spectroscopy-EPA 901.1	10	NA
Potassium-40	Gamma spectroscopy-EPA 901.1	250	NA
Radium-226	Gas Flow Proportional Counting-EPA 903.1	1	5[a]
Radium-228	Gas Flow Proportional Counting- EPA 9320	1	5[a]
Thorium-228	Alpha spectroscopy-ASTM D3972-90M	0.2	NA
Thorium-230	Alpha spectroscopy-ASTM D3972-90M	0.2	NA
Thorium-232	Alpha spectroscopy-ASTM D3972-90M	0.2	NA
Uranium-233/234	Alpha spectroscopy-ASTM D3972-90M	0.2	NA
Uranium-235	Alpha spectroscopy-ASTM D3972-90M	0.2	NA
Uranium-238	Alpha spectroscopy-ASTM D3972-90M	0.2	NA
Uranium, total			30 µg/L

Notes:

[a] The maximum contaminant level for combined Radium-226 and Radium-228 is 5pCi/L.

ASTM American Society for Testing and Materials
EPA U.S. Environmental Protection Agency
NA Not applicable
pCi/L Picocuries per liter
PRQL Project-required quantitation limit

REGIONAL SCREENING LEVELS; FORMERLY PROVIDED AS PRELIMINARY REMEDIATION GOALS

The concentrations listed in the following tables in Appendix D are the values listed in the tables of Regional Screening Levels (RSLs).

NOTE: Some of the RSL Values Provided in the EPA's RSL Table Exceed the Physically Possible Concentration Limit of "One Million Parts per Million" at the 1.0E-06 Risk Level

The RSL values provided in EPA's RSL table at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables include some values that exceed the physically possible limit of a "pure material" (i.e., one million parts per million, or 1.0E+06 mg/kg). Values of as much as 42 trillion parts per million are listed as the screening level for compounds in an industrial exposure scenario. EPA has intentionally done this so that if one wished to calculate a 1.0E-04 risk level instead of the 1.0E-06 risk level provided in the table, one could multiply the RSL by 100 and obtain the "correct number." For example, if the concentration at a risk level of 1.0E-04 was 5.9E+05 mg/kg, then the RSL value given in the table for a 1.0E-06 risk level would be 5.9E+07 mg/kg, which is clearly not a physically possible concentration (i.e., this represents a "concentration" of greater than one million parts per million; specifically, 59 million parts per million).

The RSL tables therefore provide "scalable" concentrations instead of physically possible concentrations in some cases. Rather, the RSLs are chemical concentrations that correspond to fixed levels of risk (i.e., either a one-in-one million [1.0E-06] cancer risk or a noncarcinogenic hazard quotient of 1) in soil, air, and water. In most cases where a substance causes both cancer and noncancer (systemic) effects, the 1.0E-06 cancer risk will result in a more stringent criterion. If the RSLs are to be used for site screening, EPA recommends that both cancer and noncancer-based RSLs be used. Both carcinogenic and noncarcinogenic values may be obtained in the Supporting Tables at https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

EPA notes that the RSL table applies a 'max' soil concentration to the tables for the following reasons:

1. Risk-based RSLs for some chemicals in soil exceed unity (>1,000,000 mg/kg), which is not possible.

2. RSLs currently do not address short-term exposures (e.g., pica children and construction workers). Although extremely high soil SLs are likely to represent relatively non-toxic chemicals, such high values may not be justified if in fact more toxicological data were available for evaluating short-term and/or acute exposures.

TABLE D-16: VOLATILE ORGANIC COMPOUNDS IN SOIL: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND REGIONAL SCREENING LEVELS (formerly Preliminary Remediation Goals)

Volatile Organic Compound	CAS No.	Analytical Method	Soil PRQL (µg/kg)	Industrial Soil RSL[a] (µg/kg)	Residential Soil RSL[a] (µg/kg)	Below RSLs?
1,1,1-Trichloroethane	71-55-6	EPA 8260D	5	36,000,000	8,100,000	YES
1,1,2,2-Tetrachloroethane	79-34-5	EPA 8260D	5	2,700	600	YES
1,1,2-Trichloroethane	79-00-5	EPA 8260D	5	5,000	1,100	YES
1,1-Dichloroethane	75-34-3	EPA 8260D	5	16,000	3,600	YES
1,1-Dichloroethene	75-35-4	EPA 8260D	5	1,000,000	230,000	YES
1,2-Dichloroethane	107-06-2	EPA 8260D	5	2,000	460	YES
1,2-Dichloropropane	78-87-5	EPA 8260D	5	11,000	2,500	YES
2-Butanone (methyl ethyl ketone)	78-93-3	EPA 8260D	20	190,000,000	27,000,000	YES
2-Hexanone	591-78-6	EPA 8260D	20	1,300,000	200,000	YES
4-Methyl-2-pentanone (methyl isobutyl ketone)	108-10-1	EPA 8260D	20	140,000,000	5,300,000	YES
Acetone	67-64-1	EPA 8260D	20	670,000,000	61,000,000	YES
Benzene	71-43-2	EPA 8260D	5	5,100	1,200	YES
Bromodichloromethane	75-27-4	EPA 8260D	5	1,300	290	YES
Bromoform	75-25-2	EPA 8260D	5	86,000	19,000	YES
Bromomethane	74-83-9	EPA 8260D	10	30,000	6,800	YES
Carbon disulfide	75-15-0	EPA 8260D	5	3,5000,000	770,000	YES
Carbon tetrachloride	56-23-5	EPA 8260D	5	2,900	650	YES
Chlorobenzene	108-90-7	EPA 8260D	5	1,300,000	280,000	YES
Chloroethane (Ethyl chloride)	75-00-3	EPA 8260D	10	57,000,000	14,000,000	YES
Chloroform	67-66-3	EPA 8260D	5	1,400	320	YES
Chloromethane	74-87-3	EPA 8260D	10	460,000	110,000	YES
cis-1,2-Dichloroethene	156-59-2	EPA 8260D	5	2,300,000	160,000	YES
cis-1,3-Dichloropropene (total)	542-75-6	EPA 8260D	5	8,200 (total)	1,800 (total)	YES
Dibromochloromethane	124-48-1	EPA 8260D	5	39,000	8,300	YES
Ethylbenzene	100-41-4	EPA 8260D	5	25,000	5,800	YES
Methylene chloride	75-09-2	EPA 8260D	5	1,000,000	57,000	YES
Styrene	100-42-5	EPA 8260D	5	35,000,000	6,000,000	YES
Tetrachloroethene	127-18-4	EPA 8260D	5	100,000	24,000	YES
Toluene	108-88-3	EPA 8260D	5	47,000,000	4,900,000	YES
Total xylenes	1330-20-7	EPA 8260D	15	2,500,000	580,000	YES
trans-1,2-Dichloroethene	156-60-5	EPA 8260D	5	300,000	70,000	YES
trans-1,3-Dichloropropene	10061-02-6	EPA 8260D	5	8,200 (total)	1,800 (total)	YES
Trichloroethene	79-01-6	EPA 8260D	5	6,000	940	YES
Vinyl chloride	75-01-4	EPA 8260D	5	1,700	59	YES

Notes:

[a] Residential and industrial RSLs are presented for initial risk screening of analytical results at 1.0E-06 risk level.

µg/kg Micrograms per kilogram

EPA U.S Environmental Protection Agency

NA Not available

PRG Preliminary remediation goal (EPA 2002)

PRQL Project-required quantitation limit

RSL Regional Screening Level (EPA, May 2021)

TABLE D-17: SEMIVOLATILE ORGANIC COMPOUNDS IN SOIL: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND REGIONAL SCREENING LEVELS (formerly Preliminary Remediation Goals)

Semivolatile Organic Compound	CAS No.	Analytical Method	Soil PRQL (µg/kg)	Industrial Soil RSL[a] (µg/kg)	Residential Soil RSL (µg/kg)	Below RSLs?
1,3-Dichlorobenzene	541-73-1	EPA 8270E	330	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	EPA 8270E	330	11,000	2,600	YES
2,2'-oxybis (1-Chloropropane) Syn: Bis(2-chloro-1-methlethylo)ether	108-60-1	EPA 8270E	330	47,000,000	3,100,000	YES
2,4,5-Trichlorophenol	95-95-4	EPA 8270E	330	82,000,000	6,300,000	YES
2,4,6-Trichlorophenol	88-06-2	EPA 8270E	330	210,000	49,000	YES
2,4-Dichlorophenol	120-83-2	EPA 8270E	330	2,500,000	190,000	YES
2,4-Dimethylphenol	105-67-9	EPA 8270E	330	16,000,000	1,300,000	YES
2,4-Dinitrophenol	51-28-5	EPA 8270E	660	1,600,000	130,000	YES
2,4-Dinitrotoluene	121-14-2	EPA 8270E	330	7,400	1,700	YES
2,6-Dinitrotoluene	606-20-2	EPA 8270E	330	1,500	360	YES
2-Chloronaphthalene (beta-chloronaphthalene)	91-58-7	EPA 8270E	330	60,000,000	4,800,000	YES
2-Chlorophenol	95-57-8	EPA 8270E	330	5,800,000	390,000	YES
2-Methylnaphthalene	91-57-6	EPA 8270E	330	3,000,000	240,000	YES
2-Methylphenol (o-cresol)	95-48-7	EPA 8270E	330	41,000,000	3,200,000	YES
2-Nitroaniline	88-74-4	EPA 8270E	660	8,000,000	630,000	YES
2-Nitrophenol	88-75-5	EPA 8270E	330	NA	NA	NA
3,3'-Dichlorobenzidine	91-94-1	EPA 8270E	330	5,100	1,200	YES
3-Nitroaniline	99-09-2	EPA 8270E	660	NA	NA	NA
4,6-Dinitro-2-methylphenol Syn: 4,6-dinitro-o-cresol	534-52-1	EPA 8270E	660	66,000	5,100NA	YES
4-Bromophenyl phenyl ether	101-55-3	EPA 8270E	330	NA	NA	NA
4-Chloro-3-methylphenol	59-50-7	EPA 8270E	330	82,000,000	6,300,000	YES
4-Chloroaniline (p-chloroaniline)	106-47-8	EPA 8270E	330	11,000	2,700	YES
4-Chlorophenyl phenyl ether Syn: 4-Chlorodiphenyl ether	7005-72-3	EPA 8270E	330	NA	NA	NA
4-Methylphenol (p-cresol)	106-44-5	EPA 8270E	330	82,000,000	6,300,000	YES
4-Nitroaniline	100-01-6	EPA 8270E	330	110,000	27,000	YES
4-Nitrophenol Syn: p-nitrophenol	100-02-7	EPA 8270E	660	NA	NA	NA
Acenaphthene	83-32-9	EPA 8270E	330	45,000,000	3,600,000	YES
Anthracene	120-12-7	EPA 8270E	330	230,000,000	18,000,000	YES
Benzo(a)anthracene	56-55-3	EPA 8270E	330	21,000	1,100	YES
Benzo(a)pyrene	**50-32-8**	**EPA 8270E**	**330**	**2,100**	**110**	**NO[b]**
Benzo(b)fluoranthene	205-99-2	EPA 8270E	330	21,000	1,100	YES

TABLE D-17: SEMIVOLATILE ORGANIC COMPOUNDS IN SOIL: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND REGIONAL SCREENING LEVELS (formerly Preliminary Remediation Goals)

Semivolatile Organic Compounds	CAS No.	Analytical Method	Soil PRQL (µg/kg)	Industrial Soil RSL[a] (µg/kg)	Residential Soil RSL (µg/kg)	Below RSLs?
Benzo(g,h,i)perylene	191-24-2	EPA 8270E	330	NA	NA	NA
Benzo(k)fluoranthene	207-08-9	EPA 8270E	330	210,000	11,000	YES
bis(2-Chloroethoxy)methane	111-91-1	EPA 8270E	330	2,500,000	190,000	YES
bis(2-Chloroethyl)ether (Dichloroethyl ether)	**111-44-4**	**EPA 8270E**	**330**	**1,000**	**230**	**NO[b]**
bis(2-Ethylhexyl)phthalate (Dioctyl phthalate)	117-81-7	EPA 8270E	330	160,000	39,000	YES
Butylbenzylphthalate	85-68-7	EPA 8270E	330	1,200,000	290,000	YES
Carbazole (Diphenylenimine or Dibenzopyrrole)	86-74-8	EPA 8270E	330	NA	NA	NA
Chrysene	218-01-9	EPA 8270E	330	2,100,000	110,000	YES
Dibenzo(a,h)anthracene	**53-70-3**	**EPA 8270E**	**330**	**2,100**	**110**	**NO[b]**
Dibenzofuran	132-64-9	EPA 8270E	330	1,200,000	78,000	YES
Diethylphthalate	84-66-2	EPA 8270E	330	660,000,000	51,000,000	YES
Dimethylterephthalate	120-61-6	EPA 8270E	330	120,000,000	7,800,000	YES
Di-n-butylphthalate	84-74-2	EPA 8270E	330	82,000,000	6,300,000	YES
Di-n-octylphthalate	117-84-0	EPA 8270E	330	8,200,000	630,000	YES
Fluoranthene	206-44-0	EPA 8270E	330	30,000,000	2,400,000	YES
Fluorene	86-73-7	EPA 8270E	330	30,000,000	2,400,000	YES
Hexachlorobenzene	**118-74-1**	**EPA 8270E**	**330**	**960**	**210**	**NO[b]**
Hexachlorobutadiene	87-68-3	EPA 8270E	330	5,300	1,200	YES
Hexachlorocyclopentadiene	77-47-4	EPA 8270E	330	7,500	1,800	YES
Hexachloroethane	67-72-1	EPA 8270E	330	8,000	1,800	YES
Indeno(1,2,3-cd)pyrene	193-39-5	EPA 8270E	330	21,000	1,100	YES
Isophorone	78-59-1	EPA 8270E	330	2,400,000	570,000	YES
Naphthalene	91-20-3	EPA 8270E	330	8,600	2,000	YES
Nitrobenzene	98-95-3	EPA 8270E	330	22,000	5,100	YES
n-Nitrosodimethylamine	**62-75-9**	**EPA 8270E**	**330**	**34**	**2.0**	**NO[b]**
n-Nitroso-di-n-propylamine	**621-64-7**	**EPA 8270E**	**330**	**330**	**78**	**NO[b]**
n-Nitrosodiphenylamine	86-30-6	EPA 8270E	330	470,000	110,000	YES
Pentachlorophenol	87-86-5	EPA 8270E	660	4,000	1,000	YES
Phenanthrene	85-01-8	EPA 8270E	330	NA	NA	NA
Phenol	108-95-2	EPA 8270E	330	250,000,000	19,000,000	YES
Pyrene	129-00-0	EPA 8270E	330	23,000,000	1,800,000	YES

TABLE D-17: SEMIVOLATILE ORGANIC COMPOUNDS IN SOIL: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND REGIONAL SCREENING LEVELS (formerly Preliminary Remediation Goals)

Semivolatile Organic Compounds	CAS No.	Analytical Method	Soil PRQL (µg/kg)	Industrial Soil RSL[a] (µg/kg)	Residential Soil RSL (µg/kg)	Below RSLs?

Notes:

[a] Residential and industrial RSLs are presented for initial risk screening of analytical results.

[b] The listed PRQL reflects the maximum sensitivity of current, routinely used analytical methods. The listed PRQL will be used as the project screening criteria unless reasonable grounds are established for pursuing non-routine methods.

Shaded entries indicate no RSL value provided.

µg/kg	Microgram per kilogram
EPA	U.S Environmental Protection Agency
NA	Not available
PRG	Preliminary remediation goal (EPA 2002)
PRQL	Project-required quantitation limit
RSL	Regional screening level (EPA, May 2021)
SOW	Statement of work

TABLE D-18: METALS ANALYSES IN SOIL: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND REGIONAL SCREENING LEVELS (formerly Preliminary Remediation Goals)

Analyte	Method	Soil PRQL (mg/kg)	Industrial Soil RSL[a] (mg/kg)	Residential Soil RSL[a] (mg/kg)	Hazard Index (mg/kg)	Below RSL?
Aluminum	EPA 3050B/6010B	20	1,100,000	77,000	77,000	YES
Antimony (metallic)	EPA 3050B/6010B	10	470	31	31	YES
Arsenic	EPA 3050B/6010B	10	3	0.68	35	NO
Barium	EPA 3050B/6010B	1	220,000	15,000	15,000	YES
Beryllium	EPA 3050B/6010B	1	2,300	160	160	YES
Cadmium	EPA 3050B/6010B	1	980	71	71	YES
Calcium	EPA 3050B/6010B	100	NA	NA		NA
Chromium (III)	EPA 3050B/6010B	2	1,800,000	120,000	120,000	YES
Chromium (VI)			6.3	0.3	230	
Cobalt	EPA 3050B/6010B	2	350	23	23	YES
Copper	EPA 3050B/6010B	2	47,000	3,100	3,100	YES
Iron	EPA 3050B/6010B	20	820,000	55,000	55,000	YES
Lead	EPA 3050B/6010B	10	800	400	400	YES
Magnesium	EPA 3050B/6010B	100	NA	NA		NA
Manganese	EPA 3050B/6010B	1	26,000	1,800	1,800	YES
Mercury	EPA 7471A	0.1	46	11	11	YES
Nickel	EPA 3050B/6010B	2	22,000	1,500	1,500	YES
Potassium	EPA 3050B/6010B	500	NA	NA		NA
Selenium	EPA 3050B/6010B	10	5,800	390	390	YES
Silver	EPA 3050B/6010B	1	5,800	390	390	YES
Sodium	EPA 3050B/6010B	100	NA	NA		NA
Thallium	EPA 3050B/6010B	5	12	0.78	0.78	NO
Vanadium	EPA 3050B/6010B	1	5,800	390	390	YES
Zinc	EPA 3050B/6010B	2	350,000	23,000	23,000	YES

Notes:

[a] Residential and industrial RSLs are presented for initial risk screening of analytical results. The RSLs replace the PRGs formerly cited.

EPA	U.S. Environmental Protection Agency
HI	Hazard index, where value is equivalent to an HI = 1
mg/kg	Milligrams per kilogram
NA	Not available or not applicable
PRQL	Project-required quantitation limit
PRG	Preliminary remediation goal (EPA 2002)
RSL	Regional screening level (EPA, May 2021)
SOW	Statement of work

TABLE D-19: TOTAL PETROLEUM HYDROCARBONS IN SOIL: PROJECT-REQUIRED QUANTITATION LIMITS

Analyte	Analytical Method	Soil PRQL (mg/kg)
TPH-purgeable[a]	CA LUFT and EPA 8015B/5035	0.1
TPH-extractable[a]	CA LUFT and EPA 8015B	10

Notes:

[a] No PRGs are available for TPH.

CA California
EPA U.S. Environmental Protection Agency
LUFT Leaking underground fuel tank
mg/kg Milligrams per kilogram
PRQL Project-required quantitation limit
TPH Total petroleum hydrocarbons

TABLE D-20: DIOXINS AND FURANS IN SOIL: COMPARISON OF METHOD DETECTION LIMITS AND REGIONAL SCREENING LEVELS (formerly Preliminary Remediation Goals)

Compound[a]	Analytical Method	MDL (µg/kg)	Industrial RSL (µg/kg)[b]	Residential RSL (µg/kg)[b]	HI (µg/kg)	PRQL Below RSLs?
2,3,7,8-TCDD	EPA 8290	0.00013	0.022	0.0048	0.051	Yes
1,2,3,7,8-PeCDD	EPA 8290	0.00019	NA	NA		NA
1,2,3,4,7,8-HxCDD	EPA 8290	0.00053	NA	NA		NA
1,2,3,6,7,8-HxCDD	EPA 8290	0.00057	NA	NA		NA
1,2,3,7,8,9-HxCDD	EPA 8290	0.00068	NA	NA		NA
1,2,3,4,6,7,8-HpCDD	EPA 8290	0.00063	NA	NA		NA
OCDD	EPA 8290	0.00686	NA	NA		NA
2,3,7,8-TCDF	EPA 8290	0.00019	NA	NA		NA
1,2,3,7,8-PeCDF	EPA 8290	0.00028	NA	NA		NA
2,3,4,7,8-PeCDF	EPA 8290	0.00056	NA	NA		NA
1,2,3,4,7,8-HxCDF	EPA 8290	0.00034	NA	NA		NA
1,2,3,6,7,8,-HxCDF	EPA 8290	0.00049	NA	NA		NA
1,2,3,7,8,9-HxCDF	EPA 8290	0.00025	NA	NA		NA
2,3,4,6,7,8-HxCDF	EPA 8290	0.00047	NA	NA		NA
1,2,3,4,6,7,8-HpCDF	EPA 8290	0.00033	NA	NA		NA
1,2,3,4,7,8,9-HpCDF	EPA 8290	0.00050	NA	NA		NA
OCDF	EPA 8290	0.00079	NA	NA		NA

Notes:

[a] Dioxin and furan congeners will be converted to TCDD equivalents using the toxicity equivalency factor (TEF) for each compound.

[b] Residential and industrial RSLs are presented for initial risk screening of analytical results.

µg/kg Micrograms per kilogram
EPA U.S. Environmental Protection Agency
HI Hazard index, where value is equivalent to an HI = 1
HpCDD Heptachlorodibenzo-p-dioxin
HpCDF Heptachlorodibenzofuran
HxCDD Hexachlorodibenzo-p-dioxin
HxCDF Hexachlorodibenzofuran
OCDD Octachlorodibenzo-p-dioxin
OCDF Octachlorodibenzofuran
PeCDD Pentachlorodibenzo-p-dioxin
PeCDF Pentachlorodibenzofuran
PRG Preliminary remediation goal
TCDD Tetrachlorodibenzo-p-dioxin
TCDF Tetrachlorodibenzofuran

TABLE D-21: EXPLOSIVES IN SOIL: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND REGIONAL SCREENING LEVELS (formerly Preliminary Remediation Goals)

Analyte	Analytical Method	CAS No.	Soil PRQL (mg/kg)	Industrial Soil RSL[a] (mg/kg)	Residential Soil RSL[a] (mg/kg)	PRQL Below RSLs?
Explosives						
2-Amino-4,6-Dinitrotoluene	EPA 8330	35572-78-2	0.4	110	7.7	NA
4-Amino-2,6-Dinitrotoluene	EPA 8330	19406-51-0	0.4	110	7.7	NA
1,3-Dinitrobenzene	EPA 8330	99-65-0	0.4	82	6.3	YES
2,4-Dinitrotoluene	EPA 8330	121-14-2	0.4	7.4	1.7	YES
HMX	EPA 8330	2691-41-0	0.4	57,000	3,900	YES
2,6-Dinitro toluene	EPA 8330	606-20-2	0.4	1.5	0.36	NO
Nitrobenzene	EPA 8330	98-95-3	0.4	22	5.1	YES
RDX	EPA 8330	121-82-4	0.4	38	8.3	YES
2-Nitrotoluene	EPA 8330	88-72-2	0.4	15	3.2	YES
3-Nitrotoluene	EPA 8330	99-08-1	0.4	82	6.3	YES
4-Nitrotoluene	EPA 8330	99-99-0	0.4	140	34	YES
Tetryl (Methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	479-45-8	0.4	2,300	160	YES
1,3,5-Trinitrobenzene	EPA 8330	99-35-4	0.4	32,000	2,200	YES
TNT	EPA 8330	118-96-7	0.4	96	21	YES

Notes:

[a] Residential and industrial RSLs are presented for initial risk screening of analytical results.

EPA U.S. Environmental Protection Agency
HMX octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
mg/kg Milligrams per kilogram
PRQL Project-required quantitation limit
PRG Preliminary remediation goal
RDX hexahydro-1,3,5-trinitro-1,3,5 –triazine
RSL Regional screening level (EPA, May 2021)
TNT 2,4,6-Trinitrotoluene

TABLE D-22: CYANIDE AND PERCHLORATE IN SOIL: COMPARISON OF PROJECT-REQUIRED QUANTITATION LIMITS AND REGIONAL SCREENING LEVELS (formerly Preliminary Remediation Goals)

Analyte	Analytical Method	CAS No.	Soil PRQL (mg/kg)	Industrial Soil RSL[a] (mg/kg)	Residential Soil RSL[a] (mg/kg)	HI Soil RSL (mg/kg)	PRQL Below RSLs?
Cyanide	EPA 9010B	57-12-5	1	150	23	23	YES
Perchlorate	EPA 314.0	14797-73-0	0.05	820	55	55	YES

Notes:

[a] Residential and industrial PRGs are presented for initial risk screening of analytical results.

EPA U.S. Environmental Protection Agency
mg/kg Milligrams per kilogram
PRQL Project-required quantitation limit
PRG Preliminary remediation goal
RSL Regional screening level

APPENDIX E

STANDARD OPERATING PROCEDURES

APPENDIX E -- STANDARD OPERATING PROCEDURES FOR THE NEVADA BROWNFIELDS PROGRAM

This appendix contains references and web addresses for numerous standard operating procedures (SOPs) from the U.S. Environmental Protection Agency (EPA). General sampling guidelines are included in the EPA SOP on General Field Sampling Guidelines. SOPs delineate the step-by-step approach that field personnel must follow in collecting samples, taking field measurements, decontaminating equipment, handling IDW and calibrating instruments. Most qualified sampling contractors and State and Federally certified laboratories develop SOPs and analytical methods as part of their overall QA program. SOPs should be developed following "Guidance for Preparation of Standard Operating Procedures for Quality-Related Operations" (EPA 1995) (https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/Guidance_for_Preparation_of_Standard_Operating_Procedures_(SOPs)_for_Quality-Related_Documents.pdf). The field team should document which SOPs they are using in the field and any deviations from an SOP.

EPA SOPs for field sampling methods are available for download at https://response.epa.gov/site/doc_list.aspx?site_id=2107&category=Field%20Activities.

Field personnel will ensure that all sampling equipment has been properly assembled, decontaminated and calibrated, and is functioning properly prior to use. Equipment will be used according to manufacturer's instructions, and should generally be decontaminated according to the EPA SOP for Sampling Equipment Decontamination.

Soil samples are typically collected at Brownfields sites and may include surface and subsurface samples. Sample types may be discrete or composite samples. There are a variety of acceptable methods for collection of soil samples, and selection of an appropriate method will depend on site conditions. Methods commonly used to collect soil samples include drilling soil borings, digging test pits, sampling via hand auger and digging with a shovel or trowel. Additional information on the collection of soil samples can be found in EPA's Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies (1992) (https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/Preparation_of_Soil_Sampling_Protocols_Sampling_Techniques_and_Strategies.pdf) and in the referenced EPA SOP for soil sampling.

Groundwater samples collected using soil borings allow for the collection of one-time discrete groundwater samples at a specific depth interval at a point in time. One-time groundwater samples are often used to help select locations for future monitoring wells. These one-time samples are often collected using a direct-push method, which is described in the SOP for direct-push groundwater sampling (https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/Groundwater_Sampling_and_Monitoring_with_Direct_Push_Technologies.pdf). Collection of groundwater samples from monitoring wells is described in the EPA SOPs for groundwater well sampling, monitoring well installation and monitoring well development.

Surface water samples include representative liquid samples collected from streams, brooks, rivers, lakes, ponds, lagoons, seeps, estuaries, drainage ways, sewers, channels, wetlands, surface water impoundments and other surface water bodies. These samples can also be collected from

the surface or at depth within the water body. Surface water samples should be collected in general accordance with the EPA SOP for surface water sampling.

Sediment samples can be collected for analysis of biological, chemical or physical parameters. There are many factors to consider when choosing sediment sampling equipment, including, but not limited to, site access, sample volume requirements, sediment texture, target depth for sediment collection and flowing versus standing water. In general, piston samplers are best used for soft, fine-grained sediments where sediments at depth are required. Grab/dredge samplers are best for coarse, shallow sediments and where large volumes of sediment are required. Additional information on the collection of sediment samples is provided in EPA's SOP for sediment sampling.

Sampling of sludge could involve a number of different situations and will likely depend upon site conditions. Therefore, details of collecting sludge samples should be described in a site-specific SAP. Common settings where sludge is sampled include catch basins and drywells.

Air sampling is typically conducted at sites where vapor intrusion may be an exposure pathway for contaminants. Air sampling is more complex than soil or water sampling because of the reactivity of chemical compounds in the gas matrix and sample interaction with the sampling equipment and media. Air sampling equipment is selected based on a number of factors including site conditions, sampling objectives, contaminants of concern, analytical methods, and cost. Methods to sample air at active facilities include (but are not limited to) soil gas sampling or sampling with flux chambers. Typical sampling containers include tedlar bags, stainless steel Summa canisters and glass sorbent traps used with sampling pumps. More information on air sampling and analysis can be found in EPA's SOP for general air sampling guidelines (https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_General_Air_Sampling_Guidelines_ERT.pdf).

Because sampling at Brownfields sites can involve buildings slated for reuse, there is a potential for non-routine sampling of unusual sample matrices, such as building materials. These matrices include lead-based paint, asbestos-containing materials and other types of building materials. Site-specific sample collection procedures will likely need to be developed for sampling such non-routine matrices. Sampling personnel should coordinate with the analytical laboratory on the anticipated sample collection and handling methods to ensure that the sample data will not be rejected. Additional information on the collection of non-routine sample matrices is in EPA's SOP for chip, wipe and sweep sampling (https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Chip,_Wipe,_and_Sweep_Sampling_ERT.pdf).

Custody procedures differ among laboratories. Custody procedures of the analyzing laboratory are identified prior to field activities. Field personnel must make arrangements with the appropriate laboratory for proper sample containers, preservatives, holding times and sampling request forms. Sample custody must be traceable from the time of sample collection until results are reported. Sample custody procedures provide a mechanism for documenting information related to sample collection and handling. A chain-of-custody form must be completed after sample collection and prior to sample shipment or release. The chain-of-custody form, sample labels and field documentation must be cross-checked to verify sample identification, type of analyses, number of containers, sample volume, preservatives and type of containers. Additional

information on sample handing and custody procedures can be found in EPA SOPs for specific sample collection methods, Section 4 of EPA's Quality Assurance Guidance for Conducting Brownfields Site Assessments (EPA 1998) (https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/Quality_Assurance_Guidance_for_Conducting_Brownfields_Site_Assessments.pdf), and in Section 3 of EPA's Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (2001) (https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/Environmental_Investigations_Standard_Operating_Procedures_and_Quality_Assurance_Manual.pdf). SOPs and forms for sample handling, custody (chain-of-custody forms) and transport are referenced in this appendix.

The laboratory's QA plan and written SOPs will describe specific preventive maintenance procedures for equipment maintained by the laboratory. These documents identify the personnel responsible for major, preventive, and daily maintenance procedures, the frequency and type of maintenance performed, and procedures for documenting maintenance activities.

The following list provides references and web addresses for a variety of SOPs provided by the EPA:

Field Measurements

pH and Dissolved Oxygen: US EPA Region 6. *SOP for pH and Dissolved Oxygen Instrument Calibration,* May 15, 2000. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_pH_and_Dissolved_Oxygen_Instrument_Calibration_R6.pdf.

Multi-Parameter Measurement: US EPA Region 1. *Standard Operating Procedure for Calibration and Field Measurement Procedures for the YSI Model 6-Series SONDES and Data Logger (Including: Temperature, pH, Specific Conductance, Turbidity, Dissolved Oxygen, Chlorophyll, Rhodamine WT, ORP, and Barometric Pressure)*, Revision 7. June 7, 2005. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Calibration_and_Field_Measurement_Procedures_for_the_YSI_Model_6-Series_Sondes_and_Data_Logger_R1.pdf.

Multi-Parameter Calibration: US EPA Region 1. *Calibration of Field Instruments (Temperature, pH, Dissolved Oxygen, Conductivity/Specific Conductance, Oxidation Reduction Potential [ORP], and Turbidity)*, Revision 3. March 23, 2017. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Calibration_of_Field_Instruments_R1.pdf.

Miscellaneous Field Procedures

General Sampling: Environmental Response Team (ERT), US EPA. *General Field Sampling Guidelines*, SOP No. 2001, Revision 0.0. August 11, 1994. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_General_Field_Sampling_Guidelines_ERT.pdf.

Equipment Decontamination

Environmental Response Team (ERT), US EPA. *Sampling Equipment Decontamination*, SOP No. 2006, Revision 1.1. October 19, 2020. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Sampling_Equipment_Decontamination_ERT.pdf.

US EPA Region 9. *Sampling Equipment Decontamination*, SOP No. 1230, Revision 1. September 1999. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Sampling_Equipment_Decontamination_R9.pdf.

Stream Flow Measurements: US EPA Region 6. *SOP for Streamflow Measurement*. Update Jan. 31, 2003. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Streamflow_Measurement_R6.pdf.

Electrofishing: US EPA Region 1. *Sampling of Fish in Wadeable Streams Through the Use of Electrofishing*, Revision 3. August 14, 2003. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Sampling_of_Fish_in_Wadeable_Streams_Through_the_Use_of_Electrofishing_R1.pdf.

Boat Transport & Operation for Sampling: US EPA Region 1. *Transporting and Operating Boats*, Revision 1. June 26, 2002. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Transporting_and_Operating_Boats_R1.pdf.

Canopy Cover and Gradient/Slope Estimation: US EPA Region 6. *Canopy Cover and Gradient/Slope Estimation Procedures*, February 6, 2004. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Canopy_Cover_and_Gradient_Slope_Estimation_Procedures_R6.pdf.

Surface Water Sampling

Environmental Response Team (ERT), US EPA. *Surface Water Sampling*, SOP No. 2013, Revision 1.0. July 31, 2016. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Surface_Water_Sampling_ERT.pdf.

US EPA Region 1. *Collection of Chemical and Biological Ambient Water Samples*, Revision 1. July 24, 2002. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Collection_of_Chemical_and_Biological_Ambient_Water_Samples_R1.pdf.

US EPA Region 9. *Surface Water Sampling*, SOP No. 1225, Revision 1. September 1999. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Surface_Water_Sampling_R9.pdf.

Methods Associated with Low-Level Metals Analysis

US EPA Region 6. *Collecting Water-Quality Samples for Dissolved Metals in Water*, SOP No. , Revision 0. January 13, 2000. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Collecting_Water-Quality_Samples_for_Dissolved_Metals-in-Water_R6.pdf.

US EPA Region 9. *Trace Metal Clean Sampling of Natural Waters*, SOP No. 1229, Revision 0. July 26, 2004. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Trace_Metal_Clean_Sampling_of_Natural_Waters_R9.pdf.

Sediment Sampling

General Methods: Environmental Response Team (ERT), US EPA. *Sediment Sampling*, SOP No. 2016, Revision 1.0. July 31, 2016. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Sediment_Sampling_ERT.pdf.

US EPA Region 1. *Soil, Sediment, and Solid Waste Sampling*, Revision 2. February 13, 2004. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Soil,_Sediment,_and_Solid_Waste_Sampling_R1.pdf.

US EPA Region 9. *Sediment Sampling*, SOP No. 1215, Revision 1. September 1999. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Sediment_Sampling_R9.pdf.

GROUNDWATER

Geoprobe Operation, Monitoring Well Installation & Development:

Geoprobe - Environmental Response Team (ERT), US EPA. *Model 5400 Geoprobe Operation*, SOP No. 2050, Revision 0.0. March 27, 1996. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Model_5400_Geoprobe_Operation_ERT.pdf.

US EPA Region 1. *Groundwater Monitoring Well Installation Using Geoprobe*, Revision 1. June 20, 2002. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Groundwater_Monitoring_Well_Installation_Using_the_Geoprobe_R1.pdf.

Environmental Response Team (ERT), US EPA. *Water Level Measurement*, SOP No. 2043, Revision 0.0. October 3, 1994. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Water_Level_Measurement_ERT.pdf.

Well Development - Environmental Response Team (ERT), US EPA. *Well Development*, SOP No. 2044, Revision 0.0. October 3, 1994. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Well_Development_ERT.pdf.

Groundwater Sampling:

US EPA Region 1. *Collection of Low Level Metals Ambient Water Samples*, Revision 1. September 4, 2003. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Collection_of_Low_Level_Metals_Ambient_Water_Samples_R1.pdf.

Environmental Response Team (ERT), US EPA. *Groundwater Well Sampling*, SOP No. 2007, Revision 0.0. January 26, 1995. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Groundwater_Well_Sampling_ERT.pdf.

US EPA Region 1. *Ground Water Sampling*, Revision 0. January 9, 2003. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Ground_Water_Sampling_R1.pdf.

US EPA Region 9. *Groundwater Well Sampling*, SOP No. 1220, Revision 1. September 2004. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Groundwater_Well_Sampling_R9.pdf.

Low Flow - US EPA Region 1. *Low-Stress (Low-Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells*, SOP No. GW 0001, Revision 2. July 30, 1996. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Low_Stress_(Low_Flow)_Purging_and_Sampling_Procedure_for_Collection_of_Ground_Water_Samples_from_Monitoring_Wells_R1.pdf.

Soil Sampling

Environmental Response Team (ERT), US EPA. *Soil Sampling*, SOP No. 2012, Revision 0.0. February 18, 2000. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Soil_Sampling_ERT.pdf.

US EPA Region 9. *Soil Sampling*, SOP No. 1205, Revision 2. September 1999. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Soil_Sampling_R9.pdf.

Sampling for Volatile Compounds: US EPA Region 9. *Soil Sampling for Volatile Compounds*, SOP No. 1210, Revision 1. September 1999. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Soil_Sampling_for_Volatile_Compounds_R9.pdf.

Miscellaneous/Documentation

Sample Login/Tracking/Disposition: US EPA Region 1. *Sample Login, Tracking, and Sample Disposition*, EIA-ADMLOG10.SOP, Revision 1. July 26, 2002. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Sample_Login,_Tracking_and_Sample_Disposition_R1.pdf.

Chain of Custody: US EPA Region 1. *Chain of Custody of Samples*, Revision 1. March 25, 2002. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Chain_of_Custody_of_Samples_R1.pdf.

Document Control: US EPA Region 1, Office of Environmental Measurement and Evaluation. *Document Control*, EQASOP-DocContrlSOP0, Revision 0. February 18, 2004. https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Document_Control_R1.pdf.

Website Links

Environmental Response Team (ERT), US EPA:
http://www.ert.org/mainContent.asp?section=Products&subsection=List

Guidance for Preparing Standard Operating Procedures, US EPA:
https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/Guidance_for_Preparing_SOPs.pdf

Standard Operating Procedures for Laboratories, US EPA Region 9:
https://www.epa.gov/aboutepa/epa-region-9-laboratory-standard-operating-procedures

Standard Operating Procedures for NELAC, see: https://nelac-institute.org/content/policy.php

Standard Operating Procedures for Streamflow Measurement, US EPA Region 6:
https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Streamflow_Measurement_R6.pdf

Standard Operating Procedure, Calibration of Field Instruments, US EPA Region 1:
https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Calibration_of_Field_Instruments_R1.pdf

Standard Operating Procedures for Soil, Sediment, and Solid Waste Sampling, US EPA Region 1: https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Soil,_Sediment,_and_Solid_Waste_Sampling_R1.pdf

Module 5. Standard Operating Procedures, US EPA Region 1: https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/Module_5_SOPs.pdf

Standard Operating Procedures for Groundwater Monitoring Well Installation Using the Geoprobe, US EPA Region 1: https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Groundwater_Monitoring_Well_Installation_Using_the_Geoprobe_R1.pdf

Standard Operating Procedures for Soil Sampling, US EPA Environmental Response Team:
https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Soil_Sampling_ERT.pdf

Standard Operating Procedures for Chain of Custody of Samples, US EPA Region 1:
https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Chain_of_Custody_of_Samples_R1.pdf

Standard Operating Procedure for the Standard/Well-Volume Method for Collecting a Ground-Water Sample from Monitoring Wells for Site Characterization, US EPA Region 9:
https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Standard_Well-Volume_Method_for_Collecting_a_Ground-Water_Sample_from_Monitoring_Wells_for_Site_Characterization_R9.pdf

Standard Operating Procedure for Low-Stress (Low Flow) / Minimal Drawdown Ground-Water Sample Collection, US EPA Region 9: https://ndep.nv.gov/uploads/env-brownfields-qaplans-

docs/SOP_Low-Stress_(Low_Flow)_Minimal_Drawdown_Ground-Water_Sample_Collection.pdf

Standard Operating Procedures for Ground Water Sampling, US EPA Region 1: https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Ground_Water_Sampling_R1.pdf

Standard Operating Procedures for Sample Login, Tracking, and Disposition, US EPA Region 1: https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Sample_Login,_Tracking_and_Sample_Disposition_R1.pdf

Standard Operating Procedure for Collection of Air and Precipitation Samples, IADN Project: https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/SOP_Collection_of_Air_and_Precipitation_Samples_IADN_Project.pdf

Data Validation Standard Operating Procedures for CLP Routine Analytical Services, US EPA Region 4: https://www.epa.gov/quality/epa-region-4-data-validation-standard-operating-procedures-contract-laboratory-program

Sampling Questions, US EPA: https://www.epa.gov/hw-sw846/sampling

Environmental Investigations, Standard Operating Procedures and Quality Assurance Manual, US EPA Region 4, November 2001: https://ndep.nv.gov/uploads/env-brownfields-qaplans-docs/Environmental_Investigations_Standard_Operating_Procedures_and_Quality_Assurance_Manual.pdf

Quality Management Tools - Standard Operating Procedures, US EPA: https://www.epa.gov/quality/epa-quality-management-tools-projects#tab-

Laboratory Standard Operating Procedures: https://www.epa.gov/aboutepa/epa-region-9-laboratory-standard-operating-procedures

APPENDIX F

APPROVED ANALYTICAL METHODS

APPENDIX F -- APPROVED ANALYTICAL METHODS FOR THE NEVADA BROWNFIELDS PROGRAM

The Nevada Laboratory Certification Program (LCP) is administered through the Bureau of Safe Drinking Water (BSDW), Nevada Division of Environmental Protection (NDEP). Nevada is not an accrediting authority for the National Environmental Laboratory Accreditation Conference (NELAC); however, the state does assess laboratories to NELAC standards. Appendix A of this QA Plan provides the statutes under the Nevada Administrative Code (NAC) authorizing the authority to certify laboratories.

The State of Nevada certifies laboratories for standard analyses under the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA), as well as SW-846 under RCRA. Certification of laboratories in Nevada for these standard analyses requires review of the laboratory's QA plan, an initial demonstration of analytical capability (IDC), initial and continuing calibration studies, matrix spikes (MSs), demonstration of method detection limits (MDLs), and analysis of laboratory control samples (LCSs).

The state also approves laboratories for unusual compounds and nonstandard methods, based on reporting limit and MS demonstrations. Standard operating procedures (SOPs), IDCs, CCs, reporting limits (RLs), MDLs, MSs, and sensitivity analysis are required for approval of any performance-based measurement system (PBMS).

Bureau of Safe Drinking Water
Environmental Laboratory Services (ELS)

The State of Nevada has primacy to oversee the state's drinking water. As a condition of primacy the State must operate a drinking water laboratory certification program. The regulations governing primacy at 40 CFR 142.10(b)(4) require, as a condition of primary enforcement responsibility (primacy), that a state have laboratory facilities available (the Principal State Laboratory) certified by the regional administrator. In addition, the regulations governing certification (40 CFR 141.28) require that all testing for compliance purposes be performed by certified laboratories except that turbidity, free chlorine residual, temperature, pH, alkalinity, calcium, conductivity, orthophosphate, TOC, SUVA, daily chlorite, and silica may be performed by anyone acceptable to the State.

The authority to certify environmental laboratories for drinking water is granted by NRS 445A.863 Certification of laboratories for analysis of water; requirements for performance of certain analyses. Methods are shown in Table F-1 and F-2.

1. The State Board of Health shall provide by regulation standards for the certification of laboratories for the analysis of water pursuant to NRS 445A.800 to 445A.955, inclusive. An analysis required pursuant to any provision of NRS 445A.800 to 445A.955, inclusive, or required by a lender as a condition precedent to the transfer of real property must be performed by a laboratory that is certified in accordance with the standards adopted by the State Board of Health pursuant to this subsection.

2. The certifying officer shall conduct an evaluation at the site of each laboratory to determine whether the laboratory is using the methods of analysis required by this section in an acceptable manner, applying procedures required by regulation for the control of quality and making results available in a timely manner.
3. For analyses required pursuant to NRS 445A.800 to 445A.955, inclusive, or by a lender as a condition precedent to the transfer of real property, the methods used must comply with the Federal Act. We perform the laboratory certification for the Health Division via an inter-agency agreement.

For the certification of wastewater laboratories the authority is granted by NRS445A.428.

1. The Commission shall provide by regulation standards for the certification of laboratories for the analysis of water pursuant to NRS 445A.300 to 445A.730, inclusive. An analysis required pursuant to any provision of NRS 445A.300 to 445A.730, inclusive, must be performed by a certified laboratory.
2. The certifying officer shall conduct an evaluation at the site of each laboratory to determine whether the laboratory is using the methods of analysis required by this section in an acceptable manner, applying procedures required by regulation for the control of quality and making results available in a timely manner.
3. For analyses required pursuant to NRS 445A.300 to 445A.730, inclusive, the methods of analysis must comply with 40 C.F.R. Part 136.
4. A laboratory may be certified to perform analyses for the presence of one or more specified contaminants, or to perform all analyses required pursuant to NRS 445A.300 to 445A.730, inclusive. (Added to NRS by 1995, 1584)

For hazardous waste testing laboratories the authority is granted by NRS 445A.427 Analysis to detect hazardous waste or regulated substance to be performed by certified laboratory; exception.

1. Except as otherwise provided in subsection 2, any analysis performed to detect the presence of hazardous waste or a regulated substance in soil or water as required for the purposes of NRS 445A.300 to 445A.730, inclusive, must be performed by a laboratory certified pursuant to the regulations adopted pursuant to NRS 445A.425.
2. The provisions of subsection 1 do not apply to an analysis of waste that is managed by a facility for the management of hazardous waste. (Added to NRS by 2003, 2113)

Article 8 - Analytical Methods Developed by the USEPA Office of Ground Water and Drinking Water.

The Office of Ground Water and Drinking Water's (OGWDW) Technical Support Center (TSC) is one of the many EPA offices responsible for coordinating and developing analytical methods for drinking water. To date, TSC has developed, or participated in the development, of eighteen methods for the analyses of a variety of chemical constituents in water. Nine of these, 504.1, 507, 508, 508.1, 509, 515.1, 531.1, 551.1, and 552.2 can be found in "Methods for the Determination of Organic Chemicals In Drinking Water, Supplement III," available through NTIS by requesting order number PB95-261616.

Eight additional methods, 300.1, 314.0, 317.0, 515.3, 526, 532, 556 (jointly developed with ORD) and 556.1 can be found in "Methods for the Determination of Organic and Inorganic Compounds in Drinking Water, Volume 1" (EPA815-R-00-014) available through NSCEP and individually listed below in downloadable electronic format. The eighteenth, and most recently completed procedure, EPA Method 515.4, has yet to be included in a manual and is currently a stand alone method which is available electronically below.

Some, but not all, of these methods have been promulgated as approved methods for compliance monitoring of specific parameters under the Safe Drinking Water Act. As a result of the recently published, "Analytical Methods for Chemical and Microbiological Contaminants and Revisions to Laboratory Certification Requirements" [64 FR 67449], all of the methods listed in "Methods for the Determination of Organic Chemicals In Drinking Water, Supplement III," except Method 515.1, Rev. 4.1, have been promulgated as approved methods. Also, Method 300.1 has been promulgated as an approved method for bromate and chlorite under the Stage 1 Disinfectants and Disinfection Byproducts Rule (Dec 16, 1998) [63 FR 69389]. Method 314.0 has been promulgated as the approved method [42 FR 11371] for assessment monitoring of perchlorate under the Unregulated Contaminant Monitoring Regulation (UCMR).

The Nevada LCP approves laboratories for analysis of hazardous waste. The EPA publication SW-846, entitled Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, is OSW's official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with the RCRA regulations. SW-846 functions primarily as a guidance document setting forth acceptable, although not required, methods for the regulated and regulatory communities to use in responding to RCRA-related sampling and analysis requirements. EPA guidance for SW-846 and more information can be found at https://www.epa.gov/hw-sw846.

Table F-1. EPA SDWA Approved Methods for Organic Chemicals

Contaminant	EPA method	SM	ASTM	Other
Benzene	502.2, 524.2			
Carbon tetrachloride	502.2, 524.2, 551.1			
Chlorobenzene	502.2, 524.2			
1,2-Dichlorobenzene	502.2, 524.2			
1,4-Dichlorobenzene	502.2, 524.2			
1,2-Dichloroethane	502.2, 524.2			
cis-Dichloroethylene	502.2, 524.2			
trans-Dichloroethylene	502.2, 524.2			
Dichloromethane	502.2, 524.2			
1,2-Dichloropropane	502.2, 524.2			
Ethylbenzene	502.2, 524.2			
Styrene	502.2, 524.2			
Tetrachloroethylene	502.2, 524.2, 551.1			
1,1,1-Trichloroethane	502.2, 524.2, 551.1			
Trichloroethylene	502.2, 524.2, 551.1			
Toluene	502.2, 524.2			
1,2,4-Trichlorobenzene	502.2, 524.2			
1,1-Dichloroethylene	502.2, 524.2			
1,1,2-Trichloroethane	502.2, 524.2, 551.1			
Vinyl chloride	502.2, 524.2			
Xylenes (total)	502.2, 524.2			
2,3,7,8-TCDD (dioxin)	1613			
2,4-D [3] (as acid, salts and esters)	515.2, 555, 515.1, 515.3, 515.4		D5317-93	
2,4,5-TP [3] (Silvex)	515.2, 555, 515.1, 515.3, 515.4		D5317-93	
Alachlor [1]	505, 507, 525.2, 508.1, 551.1			
Atrazine [1]	505, 507, 525.2, 508.1, 551.1			Syngenta AG-625
Benzo(a)pyrene	525.2, 550, 550.1			
Carbofuran	531.1, 531.2,	6610		
Chlordane	505, 508, 525.2, 508.1			
Dalapon	552.1, 515.1, 515.3, 552.2, 515.4,			
Di(2-ethylhexyl)adipate	506, 525.2			
Di(2-ethylhexyl)phthalate	506, 525.2			
Dibromochloropropane (DBCP)	504.1, 551.1			
Dinoseb[3]	515.2, 555, 515.1, 515.3 515.4			
Diquat	549.2			

Endothall	548.1		
Endrin	505, 508, 525.2, 508.1, 551.1		
Ethylene dibromide (EDB)	504.1, 551.1		
Glyphosate	547	6651	
Heptachlor	505, 508, 525.2, 508.1, 551.1		
Heptachlor Epoxide	505, 508, 525.2, 508.1, 551.1		
Hexachlorobenzene	505, 508, 525.2, 508.1, 551.1		
Hexachlorocyclopentadiene	505, 508, 525.2, 508.1, 551.1		
Lindane	505, 508, 525.2, 508.1, 551.1		
Methoxychlor	505, 508, 525.2, 508.1, 551.1		
Oxamyl	531.1, 531.2	6610	
PCBs (as decachlorobiphenyl)[2]	508A		
PCBs (as Aroclors)[2]	505, 508, 508.1, 525.2		
Pentachlorophenol	515.2, 525.2, 555, 515.1, 515.3, 515.4		D5317-93
Picloram [3]	515.2, 555, 515.1, 515.3, 515.4		D5317-93
Simazine [1]	505, 507, 525.2, 508.1, 551.1		
Toxaphene	505, 508, 508.1 525.2		
Haloacetic acids (five)(HAA5)[4]	552.1, 552.2	6251 B	
Total Trihalomethanes[5]	502.2, 524.2, 551.1		

Footnotes

[1] Substitution of the detector specified in Method 505, 507, 508 or 508.1 for the purpose of achieving lower detection limits is allowed as follows. Either an electron capture or nitrogen phosphorous detector may be used provided all regulatory requirements and quality control criteria are met.

[2] PCBs are qualitatively identified as Aroclors and measured for compliance purposes as decachlorobiphenyl. Users of Method 505 may have more difficulty in achieving the required detection limits than users of Methods 508.1, 525.2 or 508.

[3] Accurate determination of the chlorinated esters requires hydrolysis of the sample as described in EPA Methods 515.1, 515.2, 515.3, 515.4 and 555 and ASTM Method D5317-93.

[4] Five haloacetic acids - monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

[5] Total trihalomethanes - chloroform, bromodichloromethane, chlorodibromomethane, and bromoform.

Table F-2. EPA SDWA Approved Methods for Inorganic Chemicals

Contaminant	Methodology[13]	EPA	ASTM[3]	SM[4] (18th, 19th ed.)	SM[4] (20th ed.)	Other
Alkalinity	Titrimetric		D1067-92B	2320 B	2320 B	
	Electrometric titration					I-1030-85[5]
Antimony	ICP-Mass Spectrometry	200.8[2]				
	Hydride-Atomic Absorption		D3697-92			
	Atomic Absorption; Platform	200.9[2]				
	Atomic Absorption; Furnace			3113 B		
Arsenic[14]	Inductively Coupled Plasma[15]	200.7[2]		3120 B	3120 B	
	ICP-Mass Spectrometry	200.8[2]				
	Atomic Absorption; Platform	200.9[2]				
	Atomic Absorption; Furnace		D2972-97C	3113 B		
	Hydride Atomic Absorption		D2972-97B	3114 B		
Asbestos	Transmission Electron Microscopy	100.1[9]				
	Transmission Electron Microscopy	100.2[10]				
Barium	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	
	ICP-Mass Spectrometry	200.8[2]				
	Atomic Absorption; Direct			3111 D		
	Atomic Absorption; Furnace			3113 B		
Beryllium	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	
	ICP-Mass Spectrometry	200.8[2]				
	Atomic Absorption; Platform	200.9[2]				
	Atomic Absorption; Furnace		D3645-97B	3113 B		
Bromate	Ion Chromatography	300.1				
Cadmium	Inductively Coupled Plasma	200.7[2]				
	ICP-Mass Spectrometry	200.8[2]				
	Atomic Absorption; Platform	200.9[2]				

	Atomic Absorption; Furnace			3113 B		
Calcium	EDTA titrimetric		D511-93A	3500-Ca D	3500-Ca B	
	Atomic Absorption; Direct Aspiration		D511-93B	3111 B		
	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	
Chlorite (daily monitoring)[19]	Ion Chromatography	300.0 300.1				
	Amperometric Titraton (SM 19th Ed. only)			4500-ClO_2 E		
Chlorite (distribution system monitoring)[19]	Ion Chromatography	300.0 300.1				
Chromium	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	
	ICP-Mass Spectrometry	200.8[2]				
	Atomic Absorption; Platform	200.9[2]				
	Atomic Absorption; Furnace			3113 B		
Copper	Atomic Absorption; Furnace		D1688-95C	3113 B		
	Atomic Absorption; Direct Aspiration		D1688-95A	3111 B		
	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	
	ICP - Mass Spectrometry	200.8				
	Atomic Absorption; Platform	200.9				
Conductivity	Conductance		D1125-95A	2510 B	2510 B	
Cyanide	Preliminary Distillation Step		D2036-98A	4500-CN- C	4500-CN- C	
	Spectrophotometric Manual		D2036-98A	4500-CN- E	4500-CN- E	I-3300-85[5]
	Spectrophotometric Semi-automated	335.4[6]				
	Spectrophotometric, Amenable		D2036-98B	4500-CN- G	4500-CN- G	
	Selective Electrode			4500-CN- F	4500-CN- F	
	UV/Distillation/ Spectrophotometric					Kelada 01 [17]
	Distillation/ Spectrophotometric					QuikChem 10-204-00-1-X [18]
Fluoride	Ion Chromatography	300.0[6]	D4327-97	4110 B	4110 B	
	Preliminary Distillation Step; Colorimetric SPADNS			4500-F- B,D	4500-F- B,D	

	Manual Electrode		D1179-93B	4500-F-C	4500-F- C	
	Automated Electrode					380-75WE[11]
	Automated Alizarin			4500-F-E	4500-F- E	129-71W[11]
Lead	Atomic Absorption; Furnace		D3559-96D	3113 B		
	ICP-Mass spectrometry	200.8[2]				
	Atomic Absorption; Platform	200.9[2]				
	Differential Pulse Anodic Stripping Voltammetry					Method 1001[16]
Magnesium	Atomic Absorption		D511-93B	3111 B		
	ICP	200.7 [2]		3120 B	3120 B	
	Complexation Titrimetric Methods		D511-93A	3500-Mg E	3500-Mg B	
Mercury	Manual, Cold Vapor	245.1[2]	D3223-97	3112 B		
	Automated, Cold Vapor	245.2[1]				
	ICP-Mass Spectrometry	200.8[2]				
Nickel	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	
	ICP-Mass Spectrometry	200.8[2]				
	Atomic Absorption; Platform	200.9[2]				
	Atomic Absorption; Direct			3111 B		
	Atomic Absorption; Furnace			3113 B		
Nitrate	Ion Chromatography	300.0[6]	D4327-97	4110 B	4110 B	B-1011[8]
	Automated Cadmium Reduction	353.2[6]	D3867-90A	4500-NO3- F	4500-NO3- F	
	Ion Selective Electrode			4500-NO3- D	4500-NO3- D	601[7]
	Manual Cadmium Reduction		D3867-90B	4500-NO3- E	4500-NO3- E	
Nitrite	Ion Chromatography	300.0[6]	D4327-97	4110 B	4110 B	B-1011[8]
	Automated Cadmium Reduction	353.2[6]	D3867-90A	4500-NO3- F	4500-NO3- F	B-1011[8]
	Manual Cadmium Reduction		D3867-90B	4500-NO3- E	4500-NO3- E	
	Spectrophotometric			4500-NO2- B	4500-NO2- B	
Ortho-phosphate[12]	Colorimetric, Automated, Ascorbic Acid	365.1[6]		4500-P F	4500-P F	
	Colorimetric, Ascorbic acid, single reagent		D515-88A	4500-P E	4500-P E	
	Colorimetric Phosphomolybdate					I-1601-85[5]

	Automated-segmented Flow					I-2601-90[5]
	Automated Discrete					I-2598-85[5]
	Ion Chromatography	300.0[6]	D4327-97	4110 B	4110 B	
pH	Electrometric	150.1[1] 150.2[1]	D1293-95	4500-H+ B	4500-H+ B	
Selenium	Hydride-Atomic Absorption		D3859-98A	3114 B		
	ICP-Mass Spectrometry	200.8[2]				
	Atomic Absorption; Platform	200.9[2]				
	Atomic Absorption; Furnace		D3859-98B	3113 B		
Silica	Colorimetric, Molybdate Blue					I-1700-85[5]
	Automated-segmented Flow					I-2700-85[5]
	Colorimetric		D859-95			
	Molybdosilicate			4500-Si D	4500-SiO2 C	
	Heteropoly Blue			4500-Si E	4500-SiO2 D	
	Automated for Molybdate-reactive Silica			4500-Si F	4500-SiO2 E	
	Inductively Coupled Plasma	200.7[2]		3120 B	3120 B	
Sodium	Inductively Coupled Plasma	200.7[2]				
	Atomic absorption; Direct Aspiration			3111 B		
Temperature	Thermometric			2550	2550	
Thallium	ICP-Mass Spectrometry	200.8[2]				
	Atomic Absorption; Platform	200.9[2]				

Footnotes

The procedures shall be done in accordance with the documents listed below. The incorporation by reference of the following documents listed in footnotes 1-11 and 16 was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of the documents may be obtained from the sources listed below. Information regarding obtaining these documents can be obtained from the Safe Drinking Water Hotline at 800-426-4791. Documents may be inspected at EPA's Drinking Water Docket, EPA West, 1301 Constitution Avenue, NW, Room B135, Washington, DC, telephone 202-566-2426; or at the Office of the Federal Register, 800 North Capitol Street, NW, Suite 700, Washington, DC.

[1] "Methods for Chemical Analysis of Water and Wastes", EPA/600/4-79/020, March 1983. Available at (NTIS) , PB84-128677.

[2] "Methods for the Determination of Metals in Enviornmental Samples-Supplement I", EPA/600/R-94/111, May 1994. Available at (NTIS) , PB95-125472.

[3] *Annual Book of ASTM Standards*, 1994, 1996 or 1999, Vols. 11.01 and 11.02, American Society for Testing and Materials International (ASTM) ; any year containing the cited version of the method may be used. The previous versons of D1688-95A, D1688-95C (copper), D3559-95D (lead), D1293-95 (pH), D1125-91A (conductivity) and D859-94 (silica) are also approved. These previous versions D1688-90A, C; D3559-90D, D1293-84, D1125-91A and D859-88, respectively are located in the *Annual Book of ASTM Standards*, 1994, Vol. 11.01. Copies may be obtained from

ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

[4] *Standard Methods for the Examination of Water and Wastewater*, 18th edition (1992), 19th edition (1995), or 20th edition (1998). American Public Health Association **(APHA)**, 1015 Fifteenth Street, NW, Washington, DC 20005. The cited methods published in any of these three editions may be used, except that the versions of 3111 B, 3111 D, 3113 B and 3114 B in the 20th edition may not be used.

[5] Method I-2601-90, Methods for Analysis by the U.S. Geological Survey National Water Quality Laboratory--Determination of Inorganic and Organic Constituents in Water and Fluvial Sediment, Open File Report 93-125, 1993; for Methods I-1030-85; I-1601-85; I-1700-85; I-2598-85; I-2700-85; and I-3300-85 see Techniques of Water Resources Investigation of the U.S. Geological Survey, Book 5, Chapter A-1, 3rd ed., 1989; available from Information Services, **U.S. Geological Survey**, Federal Center, Box 25286, Denver, CO 80225-0425.

[6] "Methods for the Determination of Inorganic Substances in Environmental Samples," EPA/600/R-93/100, August 1993. Available at **(NTIS)** , PB94-120821.

[7] The procedure shall be done in accordance with the Technical Bulletin 601 "Standrd Method of Test for Nitrate in Drinking Water," July 1994, PN 221890-001, Analytical Technology, Inc. Copies may be obtained from **ATI Orion**, 529 Main Street, Boston, MA 02129

[8] Method B-1011, "Waters Test Method for Determination of Nitrite/Nitrate in Water Using Single Column Ion Chromatography," August 1987. Copies may be obtained from **Waters Corporation**, Technical Services Division, 34 Maple Street, Milford, MA 01757.

[9] Method 100.1, "Analytical Method For Determination of Asbestos Fibers in Water," EPA/600/4-83/043, September 1983. Available at **(NTIS)** , PB83-260471.

[10] Method 100.2, "Determination of Asbestos Structure Over 10µm In Length In Drinking Water," EPA/600/R-94/134, June 1994. Available at **(NTIS)** , PB94-201902.

[11] Industrial Method No. 129-71W, "Fluoride in Water and Wastewater," December 1972, and Method No. 380-75WE, "Fluoride in Water and Wastewater," February 1976, **Technicon Industrial Systems**. Copies may be obtained from Bran and Luebbe, 1025 Busch Parkway, Buffalo Grove, IL 60089.

[12] Unfiltered, no digestion or hydrolysis.

[13] Because MDLs reported in EPA Methods 200.7 and 200.9 were determined using a 2X preconcentration step during sample digestion, MDLs determined when samples are analyzed by direct analysis (i.e., no sample digestion) will be higher. For direct analysis of cadmium and arsenic by Method 200.7, and arsenic by Method 3120 B sample preconcentration using pneumatic nebulization may be required to achieve lower detection limits. Preconcentration may also be required for direct analysis of antimony, lead, and thallium by Method 200.9; antimony and lead by Method 3113 B; and lead by Method D3559-90D unless multiple in-furnace depositions are made.

[14] If ultrasonic nebulization is used in the determination of arsenic by Methods 200.7, 200.8, or SM 3120 B, the arsenic must be in the pentavalent state to provide uniform signal response. For Methods 200.7 and 3120 B, both samples and standards must be diluted in the same mixed acid matrix concentration of nitric and hydrochloric acid with the addition of 100µl of 30% hydrogen peroxide per 100ml of solution. For direct analysis of arsenic with Method 200.8 using ultrasonic nebulization, samples and standards must contain one mg/L of sodium hypochlorite.

[15] After Januay 23, 2006 analytical methods using the ICP-AES tecnology, may not be used because the detection limits for these methods are 0.008 mg/L or higher. This restriction means that the two ICP-AES methods (EPA Method 200.7 and SM 3120 B) approved for use for the MCL of 0.05 mg/L may not be used for compliance determinations for the revised MCL of 0.010 mg/L. However, prior to 2005 systems may have compliance samples analyzed with these less sensitive methods.

[16] The description for Method Number 1001 for lead is available from **Palintest** , LTD, 21 Kenton Lands Road, P.O. Box 18395, Erlanger, KY 41018. Or from the **Hach** Company, P.O. Box 389, Loveland, CO 80539.

[17] The description for the Kelada 01 Method, "Kelada Automated Test Methods for Total Cyanide, Acid Dissociable Cyanide, and Thiocyanate," Revision 1.2, August 2001, EPA 821-B-01-009 for cyanide is available from the National Technical Information Service **(NTIS)**, PB 2001-108275, 5285 Port Royal Road, Springfield, VA 22161. The toll free telephone number is 800-553-6847.

[18] The description for the QuikChem Method 10-24-00-1-X, "Digestion and distillation of total cyanide in drinking and wastewaters using MICRO DIST and determination of cyanide by flow injection analysis," Revision 2.1, November 30, 2000 for cyanide is available from **Lachat Instruments**, 6645 W. Mill Rd., Milwaukee, WI 53218. Telephone 414-358-4200.

[19] Amperometric titraton may be used for routine daily monitoring of chlorite at the entrance to the distribution system, as prescribed in §141.132(b)(2)(i)(A). Ion chromatography must be used for routine monthly monitoring of chlorite and additional monitoring of chlorite in the distribution system, as prescribed in 141.132(b)(2)(i)(B) and (b)(2)(ii).

APPENDIX G

FIELD FORMS

APPENDIX G – FIELD FORMS

Contractors working on projects for the Nevada Brownfields Program (NBP) are expected provide their own field log sheets and field forms for common tasks, such as drilling and logging borings, drilling and installing monitoring wells, and sampling environmental media. Daily field logbook entries also constitute part of the record and should be included as an appendix to investigation reports prepared for the NBP.

Copies of the chain-of-custody forms should be reported along with the analytical data from the laboratory. These are typically reported as a separate appendix in the investigation report. Sampling sheets filled out during sample collection should correlate with the information reported on the chain-of-custody forms.

APPENDIX H

AUDIT CHECKLISTS
FOR THE
NEVADA BROWNFIELDS PROGRAM

APPENDIX H -- AUDIT CHECKLISTS FOR THE NEVADA BROWNFIELDS PROGRAM

General Audit Procedures

1. Scope and Application

1.1. The following procedures describe the process of examination applied to laboratory-generated analytical results and outside laboratory results after the final data packages are available.

1.2. These procedures are intended to detect issues with sampling design and implementation, laboratory analytical procedures, quality control (QC) results, and conformance to the needs of the project

1.3. This standard operating procedure (SOP) describes the process to be taken and the responsibility of the Nevada Brownfields Program (NBP) Quality Coordinator and U.S. Environmental Protection Agency (EPA) Quality Assurance Officer (QA Officer), primarily.

2. Summary of procedure

2.1. During sampling events, the QA Officer or designee will fill out Field Audit Checklist.

2.2. The QA Officer or designee will prepare Field Audit Reports within two weeks for the Project Manager.

2.3. Samples analyzed by the laboratory will be subjected to three levels of review, involving the Laboratory Manager, the QA Officer and Laboratory Director.

2.4. Upon completion of analysis of samples and receipt of final data package, the QA Officer will go through the Data Audit Checklist, noting any deficiencies.

2.5. The QA Officer will prepare a Data Audit Report within two weeks for the Project Manager (Laboratory Director).

2.6. The Project Manager will have the responsibility of instituting corrective action and applying supplied reports to program needs and data quality objectives for final decision making.

3. Comments

3.1. This procedure is applicable to all activities of the EPA and all federally funded programs carried out by the NBP.

3.2. This procedure coincides with Option 3 of the tiered validation approach summarized in the table, “Region 9 QA Office’s General Guidelines for Superfund Data Validation/Review”.

3.3. Qualifiers/flags used by the Laboratory are as follows:

3.3.1. Green flag (g): note issue, but accept result as valid unless other problem indicators arise

3.3.2. Yellow flag (y): note issue, results suspect and/or data inclusion requires caution

3.3.3. Red flag (r): note issue, results invalid or unacceptable for inclusion in decision-making

4. Procedure

4.1. In the field, during sampling, the QA Officer has the responsibility of overseeing activities of sampling staff and documenting deficiencies through the use of the Field Audit Checklist (see attached).

4.2. The QA Officer must stop sampling activities that may compromise sample quality and, therefore, data quality.

4.3. Based on observations in the field, the QA Officer will prepare a Field Audit Report within two weeks to keep the Project Manager informed.

4.4. The Field Audit Report will summarize the event, including a table of samples collected, a description of any deviations from procedures, and notes of all issues surrounding samples that could lead to data quality issues (from Field Audit Checklist):

4.4.1. If data is recorded in pencil, the author will be requested to rerecord data and initial the correction.

4.4.2. Any deviation from SOPs will be flagged appropriately depending on the gravity of the issue and noted in the Field Audit Report.

4.4.3. Lack of trained personnel or QA oversight will be noted in report and data will be assigned a yellow flag.

4.4.4. Sample containers that are not certified clean will not be used. If they are mistakenly used to collect samples, a red flag will be assigned to resulting data.

4.4.5. Lack of preservative in samples will be noted in report and data assigned a yellow flag.

4.4.6. Samples collected from incorrect locations are assigned red flags and this is noted in report.

4.4.7. If not all samples are collected; a green flag is assigned so that the issue of completeness can be examined.

4.4.8. If expired standards are used this will be noted in the Field Audit Report. The field analysis is invalid (adequate purge questionable) and data resulting from collected samples will be assigned a yellow flag.

4.4.9. Field calibration and documentation issues raise the same question as 4.4.8 and if uncorrected, data will be assigned a yellow flag.

4.4.10. If samples are kept cold by sampling personnel, the mistake will be corrected in the field or the time elapsed will be noted and the Project Manager will make a decision concerning level of concern.

4.4.11. Chain-of-custody issues will be resolved prior to sample shipment. If uncorrected, flags will be assigned to data based on the seriousness of the mistake.

4.4.12. Samples not delivered within holding times will be noted in Field Audit Report and data will be assigned red flags.

4.5. Samples submitted to laboratory should be subjected to three levels of review that include recalculation and a check of transcription from logbooks to electronic form.

4.6. After the Laboratory performs the analysis and submits a final report or final results are received from an outside laboratory, the QA Officer will use the Data Audit Checklist (see attached) as a guide to examine whether the measurement quality objectives, as well as all other requirements of the QAPP, have been met.

4.7. The QA Officer will prepare, within two weeks, a Data Audit Report based on the checklist, deliverable to the Project and Laboratory Managers.

4.8. The Data Audit Report will include, in addition to details from the Data Audit Checklist, information from the Field Audit Report that has relevance to sample results and possible data quality (e.g. all flagged samples will be noted and described or referenced back to field documentation, corrective actions at any stage of sampling or analysis).

4.8.1. If Chain-of-custody forms are not included, the lab is contacted. If forms are lost, unsigned or unavailable, this will be noted in the Data Audit Report and the sampling data will be assigned a red flag.

4.8.2. If custody seals are broken in transit, this will be noted in the Data Audit Report and the sampling data will be assigned a red flag.

4.8.3. If samples are not received cold by the laboratory, the time elapsed in transit will be noted and the Project Manager will make a decision what level of concern is appropriate.

4.8.4. QA/QC reports are required in the final data package, if not received, the lab will be contacted and a note will be included in the report. If no QA/QC info is supplied, the data will be assigned a red flag.

4.8.5. Method blank information is not required of outside laboratories, but is required in Laboratory final data package.

4.8.6. Calibration curves are not required of outside laboratories, but are required in Laboratory final data package.

4.8.7. Calibration curves containing less than 5 points will be noted and data assigned a green flag (use spikes as accuracy indicators). If curve does not bracket samples, data will be assigned a red flag.

4.8.8. If calibration checks differ by more than 15%, this will be noted and the data will be assigned a red flag.

4.8.9. If QC samples are not included in each batch, this will be noted and the data will be assigned a yellow flag.

4.8.10. If blanks show contamination, this will be noted and the data will be assigned a red flag.

4.8.11. For surrogate and matrix spike recoveries:

4.8.11.1. If there is no detection, a red flag is warranted.

4.8.11.2. If the compounds are detected, but below ranges, a yellow flag is assigned (quantitation suspect).

4.8.11.3. If the compounds are recovered above the specified ranges, a green flag will be given.

4.8.12. If the matrix spike duplicate differs by more than 15%, this will be noted and the data will be assigned a yellow flag.

4.8.13. If not all target analytes are included, the lab will be contacted and requested to reanalyze if the holding time has not expired (no flag). If the holding time has expired, this issue will be noted in reference to completeness of monitoring (green flag).

4.8.14. If methods used by the laboratory were inappropriate, the lab will be contacted and reanalyzed requested if holding times have not expired (no flag). A yellow flag will be assigned if samples cannot be reanalyzed.

4.8.15. Samples analyzed outside of holding times will be assigned a red flag.

4.8.16. The lab will be contacted to describe report flags and detection limits if not included in analytical report. This information will be included in Data Audit Report.

4.8.17. If the results are not reported in agreement with listed detection limits, the lab will be contacted for clarification or the result will be recalculated. If results are less than the limits provided by the lab, the data will be assigned a red flag.

4.8.18. A yellow flag will be given to all data that differs by more than 15% from data from another lab.

4.9. Annually, the Project Manager will compile the reports for federally funded projects for decisions on sample design and collection, choice of laboratory and overall program execution.

4.10. The QA Officer will resolve issues (with Project Manager oversight) encountered in the field or with laboratories if the problem pertains to quality assurance/quality control.

4.11. The Project Manager confirms the proper resolution of issues in the field, resolves administrative problems uncovered in Field or Data Audits or in the annual review, and decides what data to use for decision-making based on profession judgment and all available information.

5. Bibliography

5.1. EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, February 1998.

5.2. Region 9 Tiered Approach to Validation

Checklists Attached Below

Appendix H - Field Audit Checklist

Sampling Project: _____

Date of Sampling: _____

_____ All relevant information recorded in bound logbooks using ink

_____ Sampling personnel are in possession of relevant, current SOPs

_____ SOPs are followed or deviations are noted in logbooks with appropriate flags for the samples involved

_____ All samplers are trained or supervised by trained personnel

_____ QA oversight is provided during sampling activities

_____ Sample containers are appropriate for the intended analyses and certified clean, either by laboratory or manufacturer

_____ Sample containers have preservatives if needed for the intended analyses

_____ The sampled are collected from the proper sites

_____ All required QC samples are collected

_____ Standards for field analyses are fitting for the intended use and are not expired

_____ Field calibrations performed were performed successfully within QC limits

_____ Field calibration and calibration verification data appropriately recorded in bound logbook

_____ Results of field sample analysis appropriately recorded in bound logbook

_____ Samples are stored at 4 degrees C

_____ All chain-of-custody documentation is complete and included in sample delivery

_____ Custody seals are present and intact at time of delivery

_____ Samples are delivered within prescribed holding times

Printed name of auditor: _____

Signature of auditor: _____

Title of auditor: _____

Address and phone number of auditor: _____

Date of audit: _____

Appendix H - Data Audit Checklist

Sampling Project: _____

Date of Sampling: _____

Analytical Laboratory: _____

_____ Copies of the chain-of-custody forms are included in the final data package

_____ Chain-of-custody forms are signed by all parties involved in sample transit

_____ Custody seals were listed as intact upon receipt by the laboratory

_____ Sample conditions was listed as cold upon receipt by the laboratory

_____ The final data package includes a QA/QC report. Check the following:

_____ Method blank information is included and results are acceptable

_____ Calibration curve is supplied

_____ Calibration curve contains at least five points and brackets concentrations of samples unless impractical for method.

_____ Calibration checks are listed and relative differences are within 15%

_____ Calibration checks, matrix spikes and duplicates are analyzed with each batch of 20 samples

_____ Field and equipment blanks show no contamination with analytes of interest or with contaminants that interfere with target analytes

_____ Surrogate recoveries are listed and are within the ranges specified by the QA Plan or project-specific SAP

_____ Results of matrix spike samples are listed and are within the ranges specified by the QA Plan or project-specify SAP

_____ Results of matrix spike duplicates are within 15% of matrix spike results

_____ All target compounds are included in laboratory analytical reports as stated in the QA Plan or project-specify SAP

_____ Proper analytical methods were employed by the laboratory to analyze samples as stated in the QA Plan or project-specify SAP

_____ Samples were extracted and analyzed within holding times

_____ Descriptions of qualifiers and flags are provided in the report

_____ Method detection limits or practical quantitation limits are listed in the report

_____ Reported results agree with listed MDLs or PQLs

_____ If two or more laboratories analyzed the same sample, results are within 15%

Printed name of auditor: _____

Signature of auditor: _____

Title of auditor: _____

Address and phone number of auditor: _____

Date of audit: _____

The Nevada Laboratory Certification Program (LCP) is administered through the Bureau of Water Quality Planning, Nevada Division of Environmental Protection (NDEP). Nevada is not an accrediting authority for the National Environmental Laboratory Accreditation Conference (NELAC); however, the state does assess laboratories to NELAC standards. Assessment forms from the LCP are attached below.

Laboratory:	**Audit Date:**		**Assessor:**
Item	**Line of Inquiry**	**Status**	**Summary of Observations/Objective Evidence Reviewed**
1.1	**Quality Assurance Documents**		
1.1.1	The laboratory has developed a Laboratory Quality Assurance Plan (QAP) consistent with NELAC 5.5.2 that is issued and maintained as a controlled document.		
1.1.2	The QAP defines the laboratories policies and its commitment to: • ethical standards • client confidentiality • good laboratory practices • client service		
1.1.3	The QAP includes a listing of certifications and accreditations or a reference to the location of such a list if not part of the QAP.		
1.1.4	The QAP describes the: • organizational structure • functional responsibilities • levels of authority • interfaces for those managing, performing and assessing work.		
1.1.5	The QAP is accessible to all laboratory personnel and they are aware of its location.		
1.1.6	The QAP includes an organizational chart showing that QA personnel: • operate independently from line management • are not directly involved with cost, schedule or production functional areas • report directly to the highest level of laboratory management		

Laboratory:	**Audit Date:**		**Assessor:**
Item	**Line of Inquiry**	**Status**	**Summary of Observations/Objective Evidence Reviewed**
1.2	**Quality Assurance Management**		
1.2.1	General Quality Assurance responsibilities include: • Oversight of corrective actions • Oversight of PT analysis • Reports directly to management • Internal audits • Review of SOPs		
1.2.2	A quality assurance officer has been designated in writing who is empowered to: • stop unsatisfactory work • prevent reporting results from an out of control measurement system • initiate and monitor corrective action procedures • revise, control and distribute the QAP		
1.3	**Performance Evaluation Programs**		
1.3.1	The laboratory demonstrates successful participation for two of the last three NIST recognized PT programs conducted at six month intervals		
1.3.2	The laboratory documents the root cause and corrective action for failed PT samples.		

Laboratory:	**Audit Date:**		**Assessor:**
Item	**Line of Inquiry**	**Status**	**Summary of Observations/Objective Evidence Reviewed**
1.4	**Personnel Training and Qualification**		
1.4.1	The laboratory organization possesses well-defined and documented roles and responsibilities for each position.		
1.4.2	The laboratory maintains records of indoctrination and training in the form of: • attendance sheets • training logs • personnel training records • a description of the training and indoctrination		
1.4.3	Documentation is maintained indicating training in: • technical skills • laboratory analytical methods • QC Procedures • safety policies • waste management practices • radiation worker training		
1.4.4	The laboratory has a written analyst proficiency evaluation policy that provides a means to gauge and document the continuing competence of experienced individuals, as well as specifying additional training and documentation practices applicable to all personnel.		
1.4.5	The following personnel criteria have been satisfied: • management and supervisory personnel possess a BS or BA in chemistry or related science and 2 years directly related experience • laboratory manager/director with at least a BS or BA in chemistry or related science and 5 years directly related experience • written documentation to support qualifications of staff consisting of listing personnel, their assignments, responsibilities, degrees of education and years of applicable experience.		

Laboratory:	**Audit Date:**		**Assessor:**
Item	**Line of Inquiry**	**Status**	**Summary of Observations/Objective Evidence Reviewed**
1.5	**Quality Control Systems**		
1.5.1	The laboratory has established a system to identify, document, correct, and prevent quality problems.		
1.5.2	There has been documented review by management to assess the effectiveness of the quality improvement system.		
1.5.3	The laboratory has established a "Non-Conformance System" to identify problems, out-of-control events and issues that are not part of scheduled assessments.		
1.5.4	A corrective action process has been implemented which determines: • events leading to the adverse condition • technical activities associated with the problem • generic implications of the problem • extent to which similar problems have occurred • assignment of personnel to corrective action • documentation of corrective action plan • effectiveness of corrective actions • actions taken to preclude recurrence • review of regulatory requirements • client notification		
1.5.5	Written procedures are in place for the notification to affected organizations of nonconforming items.		
1.5.6	The laboratory has a system that tracks corrective actions to completion.		

Laboratory:	**Audit Date:**		**Assessor:**
Item	**Line of Inquiry**	**Status**	**Summary of Observations/Objective Evidence Reviewed**
1.6	**Documents and Records**		
1.6.1	Laboratory activities affecting quality are defined in documented instructions or procedures which are: • distributed in a controlled manner • periodically reviewed and updated • available to all laboratory personnel • retained in the laboratory's archives		
1.6.2	The laboratory has established a minimum frequency for review of controlled documents and procedures		
1.6.3	Documents are retained for a minimum of 5 years		
1.6.4	Standard Operating Procedures are in place for (but not limited to) the following areas: • Analytical tests • Sample tracking and COC (from receipt to disposition) • Sample preparation (including subsampling) • Sample storage and security • Prevention of sample contamination • Facility security • Data reduction, verification, and reporting • Acceptance criteria (e.g., QC limits, calibrations, etc.) • Document control • Data packages review prior to submittal • Shipment of deliverables • Records disposition • Preparation and traceability of standards • Catastrophic failure of a refrigerator, incubator, etc. • Glassware cleaning • Equipment maintenance • Qualification of personnel and training		

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1.6.5	At a minimum the SOPs define, establish and implement the following: • identification of the test method • applicable matrix or matrices • detection limit • scope and application, including components to be analyzed • summary of the test method • definitions • interferences • safety • equipment and supplies • reagents and standards • sample collection, preservation, shipment, storage • quality control • calibration and standardization • procedure • calculations • method performance • pollution prevention • data assessment and acceptance criteria for quality control measures • corrective actions for out-of-control or unacceptable data • waste management • references • any tables, diagrams, flowcharts and validation data		
1.6.6	A system is in place to ensure that quality records are legible, accurate, and complete, e.g., independent review of records, logbooks, etc.		
1.6.7	Corrections to documents that will become quality records are made by drawing a single line through the error, initialing and dating the error, and justifying the correction (if not self-explanatory).		

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1.6.8	The laboratory has a procedure delineating the records control system that includes: • Specifications of items, data, and processes of which records are to be controlled • Requirements for the preparation, review, approval, and maintenance of records to accurately reflect completed work and to fulfill statutory requirements • Requirements and responsibilities for record transmittal distribution, change, retention, protection, preservation, traceability, archival, retrieval, and disposal • Verification that records received are legible and are in agreement with the transmittal document • Requirements for access to and control of the files • Procedures for the control, client confidentiality, and accountability of records removed from the storage location • Procedures for filing of supplemental information and disposition of superseded records • Storage of records in a manner approved by the organizations responsible for the records • Replacement, restoration, or substitution of lost or damaged records • Procedures for data correction, which include how corrections are to be made and establish who is authorized to change or correct data.		

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1.6.9	The laboratory has procedures in place to validate non-standardized methods, laboratory designed/developed methods, standardized methods used outside their intended range and amplifications of standardized methods to confirm that the methods are fit for the intended use. The procedures include: • scope • description of the type of item to be tested or calibrated • parameters or quantities to be determined • apparatus, equipment, reference standards and reference materials required • environmental conditions required and any stabilization period needed • description of the procedure, including affixing identification marks, handling, transporting, storing and preparing of items, checks to be made before the work is started, checking that the equipment is working properly and, where required, calibrations and adjusting the equipment before each use, method of recording the observations and results, any safety measures to be observed • criteria and/or requirements for approval/rejection • data to be recorded and method of analysis and presentation • uncertainty or procedure for estimating uncertainty		
1.6.10	The laboratory has procedures for reviewing and documenting changes made to data after report preparation that ensure traceability of updates		
1.6.11	Records of data and other technical information are maintained in environmentally secure controlled access storage which shall protect the records from unauthorized access or damage. Alternatively, the laboratory stores duplicate records at a different location.		

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1.7	**Work Process**		
1.7.1	The laboratory maintains: • a list of typical method detection limits, achieved for water, soil and other matrices commonly analyzed • procedures for determining limits of detection and frequency of verification		
1.7.2	A standard Operating Procedure is in place for reagent and deionized water production which includes (at a minimum): • preventative maintenance of water purification equipment • control criteria • corrective action process for out-of-spec water		
1.7.3	The laboratory has a water system capable of meeting the ASTM specifications of "Type II" water		
1.7.4	The conductivity and/or resistivity of the water from the purification system is monitored daily and the results are recorded in a logbook.		
1.7.5	Sample glassware and containers are either designated as disposable or cleaned according to recommended procedures that are listed in the individual Analytical Master Specifications.		
1.7.6	A copy of the laboratory-specified Standard Operating Procedure (SOP) for glassware is posted in the glassware cleaning area. The sample preparation area is kept clean to avoid contamination or cross-contamination.		

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1.7.7	A refrigerator storage blank is present for the storage of all volatile organic samples. Specific procedures for assessing the adequacy of these storage blank data and taking action for nonconforming conditions is established. The refrigerator storage is analyzed every 14 days when samples are being stored in the laboratory. The data from the analysis of the refrigerator storage blanks is available for review.		
1.7.8	The laboratory maintains hard copy laboratory notebooks that detail: • the sample bottle preparation and analytical work, including the analyses being performed • samples being analyzed • procedures used • reading taken • calculations performed • analytical results • any observations during analysis		
1.7.9	Standards and reference materials shall be stored separately from samples and standards protected in a controlled cabinet or refrigerator.		
1.7.10	Reagent grade or higher purity chemicals are used. Reagents are checked prior to use and the supporting documentation of the checks shall be filed in a manner that can be easily retrieved.		

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1.8	**Statistical Control Methods**		
1.8.1	The laboratory Quality Control manager or his/her designee periodically reviews control charts at a specified frequency for out of control conditions and initiates appropriate corrective action procedures.		
1.8.2	Control methods are accessible to the individual performing the analyses, data reviewers, and the quality assurance staff.		
1.9	**Procurement**		
1.9.1	A process is established and implemented to control purchased items and services. This process is subject to ongoing review by management to assess its effectiveness.		
1.9.2	Contracted items and services that have the potential to affect the quality of analytical tests are controlled to ensure conformance with contractual requirements. Such control includes one or more of the following: • Source evaluation and selection (pre-performance/pre-award survey) • Source verification • Audit • Examination of items or services before use		
1.9.3	Procurement system controls makes provision for the following: • Identify applicable technical and administrative requirements from the Statement of Work for contracted services and items including acceptance criteria • The process for selecting and qualifying subcontractors • Establishing processes to ensure that qualified subcontractors continue to provide acceptable products and/or services • Accepting purchased item and/or services • Receiving and maintaining procurement records, including evidence of conformance • Documenting nonconforming items and services		

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1.9.4	When there are indications that subcontractors knowingly supplied items or services of substandard quality, this information is forwarded to appropriate management for action.		
1.10	**Internal Audit Procedures**		
1.10.1	The laboratory has established an internal audit program which includes: • Independent assessments by technically qualified personnel • Maintenance of an audit schedule • Audit procedures • Standard formats for reporting findings to laboratory management • Methods for implementing and verifying corrective actions		
1.10.2	Personnel conducting independent assessments have sufficient authority, access to work areas, and organizational freedom necessary to observe all activities affecting quality and to report the results of such assessments to laboratory management.		
1.10.3	Assessment results are documented, reported to and reviewed by the level of management with authority to affect any necessary corrective actions.		
1.11	**Sample Receiving**		
1.11.1	The laboratory has procedures in place to address the following: • Checking sample preservation (pH, temperature) • Proper containers • Preserving samples when required • Notifying clients of shipping or sample anomalies • Checking holding times and notification of lab personnel of short holding times • Use of fume hoods for opening samples and shipping containers • Radiation screening of samples, lab notification and labeling requirements for radioactive samples		
1.11.2	Sample custodians document anomalies encountered in the sample receiving process.		

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1.12	**Sample Control and Building Security**		
1.12.1	Physical or administrative controls exist to ensure that: • Chain of Custody (COC) is not broken during times that laboratory staff are present or not present. • Visitor access is controlled by positive administrative controls and strict escort rules developed for all visitors • The facility has controlled entrance and egress points		
1.12.2	A sample receiving logbook or equivalent system is used to record the chronology of sample entry into the laboratory including time, date, customer, sample identification numbers, etc.		
1.12.3	When samples are received by the laboratory, an internal chain of custody procedure is initiated.		
1.12.4	Internal custody is maintained until final disposition or return of the sample to the client.		
1.12.5	The laboratory maintains an indexed sample storage system which facilitates sample retrieval.		
1.12.6	The laboratory has established, implemented and documented procedures to ensure the sample's radioactivity levels are consistent with the accompanying documentation and that laboratory regulatory levels are not exceeded.		
1.13	**Inspection and Acceptance Testing**		
1.13.1	The laboratory maintains a current list of available (on hand) equipment types, models, and years and a general description of the facility.		

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1.13.2	A schedule of preventative maintenance activities is developed and the performance of preventive maintenance is documented.		
1.13.3	Procedures are defined for ensuring that balances, refrigerators, ovens, and other laboratory equipment are accurate and that their performance is monitored and documented.		
1.13.4	Balances are checked each day that they are used and are calibrated at least annually by an independent company or source.		
1.13.5	Refrigerator temperatures shall be monitored daily.		