Nevada
Environmental
Management
Operations Activity

DOE/NV--1478

Soils Activity Quality Assurance Plan

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Revision No.: 0

May 2012

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U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office

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SOILS ACTIVITY QUALITY ASSURANCE PLAN

U.S. Department of Energy, National Nuclear Security Administration
Nevada Site Office
Las Vegas, Nevada

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SOILS ACTIVITY
QUALITY ASSURANCE PLAN

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List of Acronyms and Abbreviations

CADD	Corrective action decision document
CADD/CAP	Corrective action decision document/corrective action plan
CADD/CR	Corrective action decision document/closure report
CAIP	Corrective action investigation plan
CAP	Corrective action plan
CAS	Chemical Abstracts Service
CFR	*Code of Federal Regulations*
COPC	Contaminant of potential concern
COTS	Commercial off the shelf
CR	Closure report
CSM	Conceptual site model
DOE	U.S. Department of Energy
DOECAP	U.S. Department of Energy Consolidated Audit Program
DOELAP	U.S. Department of Energy Laboratory Accreditation Program
DOT	U.S. Department of Transportation
DQA	Data quality assessment
DQI	Data quality indicator
DQO	Data quality objective
DTRA	Defense Threat Reduction Agency
EMIS	Environmental Management Information System
EPA	U.S. Environmental Protection Agency
FAL	Final action level
FAR	Federal Acquisition Regulation
FFACO	*Federal Facility Agreement and Consent Order*
GC	Gas chromatography
GC/MS	Gas chromatography/mass spectrometry

List of Acronyms and Abbreviations (Continued)

GPS	Global Positioning System
GSA	General Services Administration
HASL	Health and Safety Laboratory
HPLC	High-performance liquid chromatography
IDW	Investigation-derived waste
KeV	Kiloelectron volt
LANL	Los Alamos National Laboratory
LCS	Laboratory control sample
LQC	Laboratory quality control
MDC	Minimum detectable concentration
MeV	Megaelectron volt
mg/kg	Milligrams per kilogram
mrem/yr	Millirem per year
MSD	Matrix spike duplicate
M&TE	Measuring and test equipment
NCR	Nonconformance report
ND	Normalized difference
NDEP	Nevada Division of Environmental Protection
NELAC	National Environmental Laboratory Accreditation
N-I	Navarro-Intera, LLC
NIST	National Institute of Standards and Technology
NNSA	National Nuclear Security Administration
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NNSS	Nevada National Security Site
NTTR	Nevada Test and Training Range
OAM	Operations Activity Manager

List of Acronyms and Abbreviations *(Continued)*

PAL	Preliminary action level
pCi/g	Picocuries per gram
QA	Quality assurance
QAP	Quality Assurance Plan
QC	Quality control
RCRA	*Resource Conservation and Recovery Act*
REOP	Real Estate/Operations Permit
RL	Reporting limit
RRMG	Residual Radioactive Material Guideline
RPD	Relative percent difference
RSL	Regional Screening Level
SAFER	Streamlined Approach for Environmental Restoration
SOP	Standard Operating Procedure
SOW	Statement of work
TED	Total effective dose
TLD	Thermoluminescent dosimeter
TTR	Tonopah Test Range
UGTA	Underground Test Area
VOA	Volatile organic analysis
%R	Percent recovery
µg/kg	Micrograms per kilogram

List of Symbols for Elements and Compounds

Ag	Silver
Al	Aluminum
Am	Americium
Ar	Argon
Ba	Barium
C	Carbon
Ca	Calcium
Cd	Cadmium
Ce	Cerium
Cl	Chlorine
Cm	Curium
Co	Cobalt
Cs	Cesium
Eu	Europium
H-3	Tritium
Ho	Holmium
I	Iodine
K	Potassium
Kr	Krypton
Lu	Lutetium
Mn	Manganese
Nb	Niobium
Ni	Nickel
Np	Neptunium
Pd	Palladium
Pr	Praseodymium

List of Symbols for Elements and Compounds *(Continued)*

Pu	Plutonium
Rh	Rhodium
Ru	Ruthenium
Sb	Antimony
Sm	Samarium
Sn	Tin
Sr	Strontium
Tc	Technetium
Th	Thorium
U	Uranium
Xe	Xenon
Y	Yttrium
Zr	Zirconium

Definitions

Accuracy/Bias

Accuracy is the degree of agreement between an observed value (sample result) and an accepted reference value; bias describes the systematic or persistent distortion associated with a measurement process. (The terms *accuracy* and *bias* are used interchangeably in this document.) (IDQTF, 2005)

Acquired Software

Software that is supplied through basic procurements, two-party agreements, or other contractual arrangements. Acquired software includes commercial off-the-shelf (COTS) software such as operating systems, database management systems, compilers, software development tools, and commercial calculation software and spreadsheet tools (e.g., Microsoft Excel). Downloadable software that is available at no cost to the user (referred to as freeware) is also considered acquired software. Firmware is acquired software. Firmware is usually provided by a hardware supplier through the procurement process and cannot be modified after receipt. (DOE, 2005)

Activity

An all-inclusive term describing a specific set of operations or related tasks to be performed, either serially or in parallel (e.g., research and development, field sampling, analytical operations, equipment fabrication), that in total result in a product or service. (ANSI/ASQ, 2004)

Assessment

The evaluation process used to measure the performance or effectiveness of a system and its elements. Assessment is an all-inclusive term used to denote any of the following: audit, performance evaluation, management systems review, peer review, inspection, or surveillance. (ANSI/ASQ, 2004)

Calibration

Comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies, and to report or eliminate those inaccuracies by adjustments. (ANSI/ASQ, 2004)

Closure Report (CR)

Verifies that the completed corrective action was conducted in accordance with the approved action plan and provides (to the State) necessary support data to confirm the appropriate action took place. (FFACO, 1996; as amended)

Definitions *(Continued)*

Comparability

The degree to which different methods or data agree or can be represented as similar. It describes the confidence that two datasets can contribute to a common analysis and interpolation. (IDQTF, 2005)

Completeness

A measure of the amount of valid data obtained from a measurement system. (IDQTF, 2005)

Corrective Action

An action taken to eliminate the causes of an existing nonconformance, deficiency, or other undesirable situation in order to prevent recurrence. (ANSI/ASQ, 2004)

Corrective Action Decision Document (CADD)

Provides a summary of the corrective action investigation; and describes the selected remedy and the rationale for its selection, documenting remedial alternatives ranging from no action to clean closure. (FFACO, 1996; as amended)

Corrective Action Decision Document/Corrective Action Plan (CADD/CAP)

Combines both the results of the corrective action investigation (normally presented in the CADD) and the remediation plan (normally presented in the CAP). The document is developed as a time-saving method when the compliance boundary is well defined, and the remediation alternatives are limited. (FFACO, 1996; as amended)

Corrective Action Decision Document/Closure Report (CADD/CR)

Developed when results from the corrective action investigation indicate that contaminant concentrations are below the level of regulatory concern. The document provides the rationale for no further corrective action, and may recommend closure with or without use restrictions or long-term monitoring. (FFACO, 1996; as amended)

Corrective Action Investigation Plan (CAIP)

Provides or references all specific information for planning investigation activities associated with corrective action units or sites. (FFACO, 1996; as amended)

Definitions *(Continued)*

Corrective Action Plan (CAP)

Prepared when the CADD requires a corrective action. The CAP outlines the method for implementing the selected corrective action alternative and explains how the action will be completed. (FFACO, 1996; as amended)

Data Quality Indicators (DQIs)

The quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of data to the user. The principal DQIs are precision, accuracy/bias, representativeness, completeness, comparability, and sensitivity. (IDQTF, 2005)

Data Quality Objectives (DQOs)

Qualitative and quantitative statements derived from the DQO process that clarify technical and quality objectives, define the appropriate types 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. (ANSI/ASQ, 2004)

Data Usability

The process of ensuring or determining whether the quality of the data produced meets the intended use of the data. (ANSI/ASQ, 2004)

Deficiency

An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ANSI/ASQ, 2004)

Document

Any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results. (ANSI/ASQ, 2004)

Environmental Data

Any measurements or information that describe environmental processes or conditions, or the performance of environmental technology. (ANSI/ASQ, 2004)

Inspection

An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformance is achieved for each characteristic. (ANSI/ASQ, 2004)

Definitions *(Continued)*

Item

An all-inclusive term used in place of any of the following: appurtenance, facility, sample, assembly, component, equipment, material, module, part, product, structure, subassembly, subsystem, system, unit, documented concepts, or data. (ANSI/ASQ, 2004)

Measuring and Test Equipment (M&TE)

Tools, gauges, instruments, sampling devices, or systems used to calibrate, measure, test, or inspect in order to control or acquire data to verify conformance to specified requirements. (ANSI/ASQ, 2004)

Method

A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification) systematically presented in the order in which they are to be executed. (ANSI/ASQ, 2004)

Nonconformance

A deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate; nonfulfillment of a specified requirement. (ANSI/ASQ, 2004)

Precision

The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. Precision is usually expressed as standard deviation, variance, percent difference, or range, in either absolute or relative terms. (IDQTF, 2005)

Procedure

A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks. (ANSI/ASQ, 2004)

Process

A set of interrelated or interacting activities that transform inputs into outputs. (ANSI/ASQ, 2004)

Quality

The totality of features and characteristics of a product or service that bear on its ability to meet the stated or implied needs and expectations of the user. (ANSI/ASQ, 2004)

Definitions *(Continued)*

Quality Assurance (QA)

An integrated system of management activities involving planning, implementation assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the customer. (ANSI/ASQ, 2004)

Quality Control (QC)

The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality. (ANSI/ASQ, 2004)

Quality Improvement

A management program for improving the quality of operations. Such management programs generally entail a formal mechanism for encouraging work recommendations with timely management evaluation and feedback or implementation. (ANSI/ASQ, 2004)

Record

A document stating results achieved or providing evidence of activities performed. A record is a document that furnishes objective evidence of the quality of items or activities and that has been verified and authenticated as technically complete and correct. Records may include photographs, drawings, magnetic tape, and other data recording media. (ANSI/ASQ, 2004)

Representativeness

A qualitative term that describes the extent to which a sampling design adequately reflects the environmental conditions of a site. It takes into consideration the magnitude of the site area represented by one sample and indicates the feasibility and reasonableness of that design rationale. Representativeness also reflects the ability of the sample team to collect samples and the ability of the laboratory personnel to analyze those samples so the generated data accurately and precisely reflect site conditions. (IDQTF, 2005)

Service

The result generated by activities at the interface between the supplier and the customer, and by supplier internal activities to meet customer needs. Such activities in environmental programs include design, inspection, laboratory and/or field analysis, repair, and installation.
(IDQTF, 2005)

Definitions *(Continued)*

Streamlined Approach for Environmental Restoration (SAFER) Plan

Provides a process for initiating and completing corrective actions at units where enough information exists to select the appropriate remedy before completing an investigation. (FFACO, 1996; as amended)

Traceability

The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standard, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for quality for the project. (IDQTF, 2005)

Validation

Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Data validation is a sampling and analytical process evaluation that includes evaluating compliance with methods, procedures, or contracts, and comparison with criteria based upon the quality objectives. (IDQTF, 2005)

Verification

Confirmation by examination and provision of objective evidence that specified sampling and analytical requirements have been completed. This is to be a completeness check. (IDQTF, 2005)

1.0 Management

This Quality Assurance Plan (QAP) provides the overall Quality Assurance (QA) program requirements, technical planning, and general quality practices to be applied to the U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO) Nevada Environmental Management Operations Activity. The QAP requirements are consistent with the *Quality Systems for Environmental Data and Technology Programs–Requirements with Guidance for Use* (ANSI/ASQ, 2004); the Intergovernmental Data Quality Task Force Uniform Federal Policy for Quality Assurance Project Plans (IDQTF, 2005); and 10 *Code of Federal Regulations* (CFR) 830.120, *Quality Assurance* (CFR, 2012a), which apply to specific activities performed under the Soils Activity.

NNSA/NSO, or designee, will review the QAP every two years for adequacy and for changing objectives or regulatory requirements. Changes not affecting the overall activity scope or a requirement will not require a QAP revision but will be incorporated into a subsequent revision.

This QAP provides for the evaluation of environmental, safety, and health risks associated with the activities to be performed by using the graded approach to determine the required level of quality assurance. The graded approach must be applied with varying degrees of rigor, control, documentation, and actions commensurate with the risks to personnel safety, the public, and the environment. When determining the level of rigor required, the following issues must be taken into consideration:

- The environmental decision to be made
- The impact on human health and the environment
- The regulatory requirements for the site-specific environmental problem

Section 1.0 describes Soils objectives, participant roles and responsibilities, and administrative and management quality requirements (i.e., training, records, procurement). Section 1.0 also details data quality indicators (DQIs), data management, computer software, and procurement requirements. Section 2.0 establishes the requirements to ensure newly collected data are valid and are managed appropriately. Section 3.0 provides feedback loops through assessments and reports to management

as well as the framework for corrective actions. Section 4.0 provides the requirements for assessing the validity and usability of the data. Section 5.0 provides references for this document.

1.1 Problem Definition and Background

NNSA/NSO is responsible for protecting members of the public, including site workers, from harmful exposure to both chemical and radiological contaminants as these sites are remediated. In 1996, the DOE, U.S. Department of Defense, and the State of Nevada entered into the *Federal Facility Agreement and Consent Order* (FFACO) (1996, as amended) which describes the strategies employed to plan, implement, and complete environmental corrective action activities.

The Soils Activity is responsible for evaluating sites identified in the FFACO with surface and shallow subsurface soil contamination resulting from various types of nuclear experiments or testing at the NNSS, the Nevada Test and Training Range (NTTR), and the Tonopah Test Range (TTR). To evaluate the need for (and extent of) corrective action required at these sites, the Soils Activity assesses impacts to public health and the environment by comparing measurements of soil contaminant levels to risk-based (chemical) and dose-based (radionuclide) action levels. Preliminary action levels (PALs), as presented in Sections 1.5.2 and 1.5.3, are established as part of the data quality objectives (DQO) process and are documented in the applicable FFACO planning document. PALs are used for contaminant screening purposes. They are not intended for use as remediation standards. Site contaminants that do not exceed PALs are removed from further corrective action evaluations.

For site contaminants that exceed PALs, appropriate final action levels (FALs) (as presented in Section 1.5.4) are determined in a risk evaluation documented in the applicable FFACO report. FALs (i.e., remediation standards) are established by conducting a risk based corrective action site evaluation using ASTM Method E1739-95 (ASTM, 1995) or an equivalent method. ASTM Method E1739-95 uses a three-tiered approach in evaluating the DQO decisions. Each tier establishes an action level using increasingly sophisticated (and site-specific) calculations. The PAL is used as the Tier 1 FAL while FALs calculated for Tier 2 and Tier 3 are site-specific calculations. This process for the Soils Activity is defined in the *Soils Risk-Based Corrective Action Evaluation Process* (NNSA/NSO, 2012b).

To evaluate site contamination levels against these remediation standards, data are gathered or generated as part of a corrective action investigation that is designed and implemented using the DQO process as presented in Section 1.5. The results of the investigations are evaluated, and corrective action decisions are determined using the data quality assessment (DQA) process as presented in Section 4.3.

1.2 Schedule

NNSA/NSO and the Nevada Division of Environmental Protection (NDEP) establish milestones and schedules for Soils activities in accordance with the FFACO (1996, as amended). Part XII.4 of the FFACO requires annual meetings to establish priorities, milestones, and due dates for the current fiscal year. Monthly progress reports and lifecycle schedules must be posted to the Environmental Management Information System (EMIS) website.

1.3 Roles and Responsibilities

NNSA/NSO personnel are responsible for achieving quality within the specific tasks they manage. Roles and responsibilities for NNSA/NSO personnel and supporting contractors (referred to as participants) are described in the following sections.

1.3.1 Environmental Management Operations Activity Manager

The Environmental Management Operations Activity Manager (OAM) is responsible for the administration of the Nevada Environmental Management Operations Activity and reports to the Assistant Manager for Environmental Management. The OAM has oversight and management responsibilities for environmental restoration, and is responsible for ensuring that quality requirements are established and implemented.

1.3.2 Activity Lead

The Activity Lead reports to and is the prime point of contact for the OAM. The Activity Lead has day-to-day management responsibilities for technical, financial, and scheduling aspects; and monitors contractor performance. The Activity Lead is also responsible for ensuring effective communication between participants.

1.3.3 Participants

Participants are responsible for developing the procedures for their assigned scope of work and ensuring that work is performed in accordance with applicable federal, state, and local regulations; and with plans and procedures consistent with individual contracts. To fulfill QA responsibilities, participants must, at a minimum, be responsible for the following duties:

- Report information regarding scope, schedule, cost, technical execution, and quality achievement of task order activities to the Activity Lead.
- Implement individual quality programs and procedures that demonstrate the requirements of this QAP are met.
- Ensure the proper resources are provided for QA activities and that QA activities are integrated into operations.
- Evaluate activities to ensure requirements are implemented.
- Implement applicable procedures and instructions.
- Verify that work is technically sound, defensible, consistent with objectives, and conducted in accordance with this QAP.
- Ensure personnel are trained and qualified to achieve initial proficiency; maintain proficiency; and adapt to changes in technology, methods, or job responsibilities.
- Perform assessments to verify compliance with applicable requirements in accordance with Section 3.1.1.
- Identify deficient areas and nonconformances, implement effective corrective actions, and verify corrective actions are effective.
- Notify the Activity Lead and other involved personnel of significant conditions adverse to quality, safety, health, the environment, or any adverse trends.

1.4 Qualifications and Training

NNSA/NSO and participants' management must ensure that personnel are qualified and knowledgeable in the activities they perform. Training should emphasize correct performance of assigned work and provide an understanding of why quality requirements exist. Personnel qualification and training records must be maintained as records in accordance with Section 1.7.

1.4.1 Personnel

Participant personnel must be trained and qualified to perform the tasks to which they are assigned. Objective evidence of qualifications may include academic credentials; individual resumes; registrations; and/or certifications, licenses, and training records. Participants will evaluate personnel qualifications against assigned responsibilities and address identified training needs. Training should be provided to achieve and maintain proficiency; adapt to changes in technology, methods, or job description; and allow for feedback and effectiveness of job performance. Training may take the form of orientation and/or indoctrination, formal classroom training, self study, reading, or on-the-job training. Training should include regulatory requirements, scopes of work, QA/quality control (QC) requirements, and applicable work instructions.

1.4.2 Subcontracts

Subcontractor personnel must be qualified and trained to perform the duties for which they were contracted. The contracting organization is responsible for verifying the qualifications of their subcontractors.

1.5 Data Quality Objectives

The U.S. Environmental Protection Agency's (EPA) DQO process (EPA, 2006c) will be used as guidelines for planning and assessing investigation results. Participants, including NNSA/NSO and NDEP personnel, must establish DQOs for each site.

In accordance with the graded approach described in Section 1.0, the DQO process will determine which measurements are (1) required to make critical decisions about health, the environment, and regulatory compliance; (2) used to support such decisions; and (3) provided for informational purposes only. Critical decision measurements will undergo closer scrutiny during the data gathering and review processes. DQO participants will determine and define the required data quality for each type of measurement in the planning documents.

During the DQO process, representatives from the involved organizations will perform the following:

- Clarify the study objective.
- Develop a conceptual site model (CSM).
- Identify critical decisions.
- Identify data needs.
- Determine data use.
- Determine what the data represent.
- Define appropriate type of data to collect.
- Specify tolerable limits on decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision.

During the DQO process, criteria for selecting sample locations will be identified, and contaminants of potential concern (COPCs) and PALs will be defined. Sampling and thermoluminescent dosimeter (TLD) placement plans will be developed after the DQOs are established. At the end of investigations, a DQA must be conducted and documented in the applicable FFACO report.

1.5.1 Chemical and Radiological COPCs

A chemical COPCs list for the NNSS was determined using the 40 CFR Part 264, Appendix IX groundwater monitoring list (CFR, 2011b). Chemicals were excluded from the list if there was little or no potential for their use at the NNSS and/or existing data did not indicate their presence at appreciable levels. Table A.1-1 identifies the excluded chemicals and the justification for exclusion. Table A.1-2 is the list of remaining COPCs and required methods. The action levels identified in Table A.1-2 are based on the regional screening levels and are used to establish minimum detections limits for the COPCs, which is set at least 10 times less than the action level.

The radiological COPC list was determined using the radionuclides listed in the following documents:

- *Nevada Test Site Radionuclide Inventory, 1951–1992* (Bowen et al., 2001)
- *Radionuclide Inventory and Distribution Program: The Galileo Area* (McArthur and Kordas, 1983)
- *Development of the Scientific Bases for Establishing the Boundary Conditions between "Unrestricted Use" and "Posting" for Exposure Due to Residual Radioactive Contamination of Soil at the Nevada Test Site* (Anspaugh and Daniels, 1995)

Radionuclides were excluded from the combined list based on short half-life, physical characteristics leading to dispersion (e.g., gasses), and very low production rate or yield. Table B.1-1 identifies the radionuclides excluded from consideration and exclusion comments. Table B.1-2 is the remaining COPC list. Table B.1-3 is a list of additional radionuclides to be considered if indicator radionuclides are found at 10 percent or more of the Residual Radioactive Material Guideline (RRMG) value during field investigations. RRMGs are radionuclide-specific values for radioactivity in surface soils (expressed in units of picocuries per gram [pCi/g]) that would result in a dose of 25 millirem per year (mrem/yr) to a receptor without any other sources of radioactivity present.

1.5.2 Chemical PALs

Chemical PALs are defined as the EPA Region 9 Regional Screening Levels for chemical contaminants in industrial soils (EPA, 2011a). Contaminants that exceed a PAL may be further evaluated by establishing a FAL using the process defined in the *Soils Risk-Based Corrective Action Evaluation Process* (NNSA/NSO, 2012b).

For chemical COPCs without established screening levels, the protocol used by EPA Region 9 in establishing screening levels (or similar) must be used to establish PALs. If used, this process will be documented in the applicable FFACO reports.

Background concentrations for *Resource Conservation and Recovery Act* (RCRA) metals (CFR, 2011a) will be used instead of screening levels when natural background concentrations exceed the screening level (e.g., arsenic on the NNSS). The background concentrations are based on a statistical study conducted by the Nevada Bureau of Mines and Geology of the distribution of

42 natural chemical species from 380 stream drainages throughout the NTTR (formerly the Nellis Air Force Range) (NBMG, 1998; Moore, 1999). If the concentration of a native metal element exceeds the 95 percent UCL concentration listed in the study, the sample is assumed to exceed native background levels.

1.5.3 Radionuclide PALs

The PAL for radioactive contaminants is a total effective dose (TED) of 25 mrem/yr that is based on the Industrial Area exposure scenario (as defined in the *Soils Risk-Based Corrective Action Evaluation Process* [NNSA/NSO, 2012b]). The dose for any sample location (that will be compared to the PAL) will be calculated as the combined dose provided from all radionuclide contaminants present at that location. Contamination that exceeds the PAL may be further evaluated using the process defined in NNSA/NSO (2012b).

1.5.4 Final Action Levels

FALs must be established for all contaminants in accordance with the *Soils Risk-Based Corrective Action Evaluation Process* (NNSA/NSO, 2012b) and documented in the applicable FFACO report. FALs will be calculated using the ASTM method described in Section 1.1 using the PAL (Tier 1) or using site-specific inputs and a site-specific evaluation of the time a worker could be exposed to site contamination (Tier 2 or Tier 3). Corrective action decisions based on chemical and radiological FALs must consider the combined effect of the significant contaminants present. For chemical contaminants, the risks from individual carcinogenic contaminants will be combined, and the risks from individual toxic contaminants will be combined. For radioactive contaminants, the risks from individual radiological contaminants will be combined. These combined effects will be calculated using the multiple contaminant analysis method as described in NNSA/NSO (2012b)

1.5.5 Data Quality Indicators

DQIs are qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of data. DQIs include precision, accuracy, representativeness, completeness, and comparability. DQI criteria must be established during the site-specific DQO process to properly support the overall activity or sampling task objectives. For each investigation, the data must be assessed against the DQI criteria. The assessment results must be reported in the applicable FFACO

report. If any of these criteria are not met, an impact assessment will be conducted, and target analyte results affected will be listed in the FFACO report. Sample and/or TLD results identified as rejected or estimated values during the data validation process are considered qualified data. The label "qualified" is used in this document to identify those results.

1.5.5.1 Precision

The performance criteria for precision is that no more than 20 percent of sample or TLD results for each measured COPC are qualified due to duplicate results with a relative percent difference (RPD) normalized difference (ND), or absolute difference exceeding its respective acceptance limits (see Section 4.2.1).

1.5.5.2 Accuracy/Bias

The performance criteria for accuracy is that no more than 20 percent of sample of TLD results for each measured COPC are qualified for accuracy (see Section 4.2.2).

1.5.5.3 Representativeness

To ensure representativeness, probabilistic and judgmental sampling designs and sample collection standard operating procedures (SOPs) are used.

Judgmental sampling will be designed to collect samples and place TLDs in areas most likely to contain the maximum contaminant concentrations. This design identifies locations of potential contamination based on biasing information.

Probabilistic sampling schemes will be designed to collect samples from and place TLDs at unbiased locations that represent overall contamination within the sampling unit.

1.5.5.4 Completeness

Completeness will be achieved when 80 percent of the environmental sample and TLD results are valid.

1.5.5.5 Comparability

The comparability criteria is that sampling, handling, preparation, analysis, reporting, and data validation were performed and documented in accordance with procedures based on standard methods.

1.5.5.6 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. Analytical methods must be sufficient to detect COPCs present in the samples at concentrations less than or equal to the corresponding FALs. The TLD sensitivity must be less than the FAL.

1.6 Document Control

Systems and controls must be implemented by participants for identifying, preparing, reviewing, approving, revising, collecting, indexing, filing, storing, maintaining, retrieving, distributing, and disposing of pertinent quality documentation and records. Documents that prescribe technical processes, specify quality requirements, or establish management controls must be developed, reviewed, and approved in accordance with the participants' procedures. For characterization and remediation at sites located in the state of Nevada, the following reports will be developed in accordance with FFACO outlines:

- Corrective Action Investigation Plan (CAIP)
- Streamlined Approach For Environmental Restoration (SAFER) Plan
- Corrective Action Decision Document (CADD)
- Corrective Action Decision Document/Closure Report (CADD/CR)
- Corrective Action Plan (CAP)
- Corrective Action Decision Document/Corrective Action Plan (CADD/CAP)
- Closure Report (CR)

Plans and reports must be reviewed for quality requirements, technical adequacy, completeness, and accuracy before approval and issuance. A system or process for identifying documents that require control, and for controlling those documents, must be implemented to ensure that the latest revision of a document is used. The participant management is responsible for ensuring that personnel who perform work are in possession of the most current version of the documents applicable to the

activities being conducted. Revisions to controlled documents must be approved by the same level of authority or organization as the original. Documents no longer in use should have their status clearly indicated, and record copies should be maintained in accordance with DOE Order 243.1A, *Records Management Program* (DOE, 2011b), and the applicable records inventory and disposition schedule.

1.6.1 Revisions

Changes or modifications to procedures or plans may become necessary to adjust to actual field conditions or revise programmatic methods. Participants must have procedures to ensure changes are properly identified, documented, approved, and controlled. Verbal authorization of changes must be documented and followed up with a written change notice as soon as practicable. Changes must be approved commensurate with the original document before the change is implemented. NNSA/NSO must be notified of changes that impact the technical scope, cost, or schedule.

1.6.2 Protection of Documents

Documents, plans, procedures, presentations, and data must be reviewed in accordance with DOE Order 475.2A, *Identifying Classified Information* (DOE, 2011a).

1.7 Records Management

Records of Soils activities must be prepared, reviewed, and maintained. Participants must maintain their records, or submit their records to a storage and retrieval system that is consistent with applicable environmental regulations and DOE Order 243.1A (DOE, 2011b). This includes a storage system for computer-based information (e.g., software, models, and data) that is retrievable and protected from loss, compromise, or catastrophic events. Records must include sufficient detail to allow for the reconstruction of activities as well as provide traceability. Participants' plans, procedures, and program documents must identify the resultant records, appropriate storage, and retention time frames.

Participants should consider the following when identifying a document, including electronic information, as a record:

- Is the document a specific and original source?

- Does the document support a regulatory decision?
- Is the document valuable for assessments?
- Does the document support other documents?
- Is the document a deliverable?
- Does the document describe work performed (e.g., completed forms, field logbooks)?
- Does the document support functions such as training, procurement, or accounting?
- Does the document require action?
- Does the document reflect a decision, action, or lack of action?
- Is the document necessary to understand a decision, action, or non-action?
- Does the document provide context of a decisional document?

The following controls must be applied to records. This is not intended to be an exhaustive list, and additional controls may be applied:

- Do not use whiteout, correction tape, or black permanent markers to correct errors.
- If an error is made on a record, draw a single line through the error, note the correction, then initial and date the correction.
- Take necessary actions to ensure records are not damaged or susceptible to loss, liquid/food spillage, or weather elements.
- Maintain records at job sites in a manner that facilitates ease of retrieval.
- Use blue or black indelible ink to enter information into handwritten logs, logbooks, and forms.
- Number each page of logbooks sequentially.
- When handwriting information, draw a diagonal line through a page or portion of a page if it is intentionally left blank, then initial and date the page.
- Back up electronic records on a regular cycle, and store backup media in a separate location or in a two-hour fire-rated safe to safeguard against the loss of information due to equipment malfunctions or human error.

Participants must ensure that records are legible and complete. Incomplete information within a record reduces its overall value. For example, meeting minutes without a date or list of attendees have little value when establishing events.

1.8 Software

Computer software is subjected to controls if it (1) performs hazard analysis; (2) models environmental contaminant migration to determine dose and exposure consequences; (3) provides any other function that could impact worker and/or public safety or health; or (4) manages or analyzes data. The Soils Activity does not anticipate the need to develop software; if a need is identified, the Underground Test Area (UGTA) Quality Assurance Project Plan (NNSA/NSO, 2011) will be followed.

Acquired software is supplied through basic procurements, two-party agreements, or other contractual arrangements. Acquired software includes commercial off-the-shelf (COTS) software such as operating systems, database management systems, and commercial calculation software and spreadsheets. Downloadable software that is available at no cost to the user (referred to as freeware) is also considered acquired software.

Calculation applications are user-developed algorithms or data structures using COTS software. The use of web-based calculators must be documented in accordance with Section 1.8.5.

1.8.1 Verification

Software and calculation applications must be verified for use based on their ability to provide acceptable results for the intended use. The extent of verification required will depend on the complexity, risk, and uniqueness of the application. Verification documentation must include the following, at a minimum:

- Description and equations of mathematical models, algorithms, and numerical solution techniques, as applicable
- Software and version
- Description of test case(s) and results
- Range of input parameter values for which results were verified
- Identification of any limitations on applications

Software or calculation modifications must be verified in accordance with the same requirements as the original. Verification of changes may be limited to the scope of the modification.

Acquired software may be used without verification if the code has widespread use, verification, and documentation (often referred to as industry standard or industry proven). There must be a method for error reporting and configuration control. The intended use of the software must be within the applications identified capabilities and constraints (usually identified in user's manuals). Acquired software used without modification must have operational checks performed to verify that the software is installed and functioning as intended.

1.8.2 Control

Participants must maintain a configuration management process to identify and define the configuration items in a system. The system must control the release and change of these items throughout the system lifecycle, record and report the status of configuration items and change requests, and verify the completeness and correctness of configuration items. The process must address the following:

- Determine and identify those entities of the software product that need to be controlled.
- Ensure those entities have necessary and accurate documentation.
- Ensure changes are made to the entities in a controlled manner.
- Ensure that the correct version of the entities/software product are being used.
- Ascertain, at any point in time, the status of the entity.

1.8.3 Storage

The physical media on which software is stored must be controlled and protected so that software and data are physically retrievable and protected from loss or compromise by catastrophic events. Backup copies must be maintained so that a single event will not cause a significant loss of software or data.

1.8.4 Documentation

Acquired software must be uniquely identified. Software documentation must be maintained with associated calculations and reference material. Documentation will consist of reference material, verification/validation records, operational test records, and user-oriented information.

1.8.5 Operational Use

Operational use of software must be documented. The minimum information should include the version of software used, input, output, and the date. If input parameters other than those in the *Soils Risk-Based Corrective Action Evaluation Process* (NNSA/NSO, 2012b) are used, the justification for use must be documented in the applicable FFACO reports.

1.9 Procurement

Procurement of items and services must be consistent with Federal Acquisition Regulations (FARs) and purchase order terms and conditions. Vendors must meet the requirements of their subcontracts or agreements.

1.9.1 Procurement Control

Vendors must meet or exceed specifications delineated in the subcontract/purchase order documents. Vendors must adhere to the contractor's requirements mandated by General Services Administration (GSA)/FAR Standard Form 33; the Schedule, Part I, Section H "Special Contract Requirements" for the procurement of quality affected items and services.

The procuring contractor will assess the capabilities of subcontractor key personnel to verify qualifications and determine whether any training is needed for environmental restoration activities. Subcontractors should be evaluated for prior experience, the ability to perform specific tasks, and cost.

1.9.1.1 Subcontracts

Participants' subcontracts must define prices/costs, specifications/statement of work (SOW), packaging/marking, inspection/acceptance, deliveries or performance, special contract requirements, contract clauses, list of attachments, and evaluation factors for award of the item or service being procured. Subcontract documents must be reviewed for accuracy and completeness by qualified technical personnel before award. Changes to a subcontract require the same level of review and approval as the original document.

1.9.1.2 Measuring and Test Equipment

Participants subcontracts must also require that purchased and rented measuring and test equipment (M&TE) is compliant with existing National Institute of Standards and Technology (NIST) before acceptance and that calibration certification documentation is provided. Instrument manufacturers' manuals should be available. Schedules for recalibration must be established and adhered to for M&TE.

1.9.2 Laboratory Performance

Participants subcontracts with commercial analytical laboratories must ensure that samples are received, handled, stored, and analyzed in accordance with the analytical laboratory's QA program. Verification of laboratory conformance is the responsibility of the contracting organization. Subcontracts must incorporate the requirements found in Section 2.2.

1.9.3 Verification of Quality Conformance

The contractor must require access to the subcontractor's or vendor's facilities, including their subtier facilities, work areas, and records for assessments to verify acceptability. Upon receipt, procured items or services must be inspected for conformance to specifications and requirements before items are released or placed into service. Procured items must be evaluated for suspect/counterfeit parts. Personnel have the authority to stop work if significant quality problems are identified.

1.9.4 Inspection and Acceptance Testing

Inspections and acceptance testing must be accomplished in accordance with inspection documents and test procedures that reflect acceptance and performance criteria. Individuals performing inspections and acceptance testing must be independent of those who performed the work. Quality-affecting materials used during characterization, corrective action, or sampling activities must be inspected upon receipt for adequacy. M&TE used in the performance of inspections or acceptance tests must be calibrated and properly maintained. Any item or work determined to be defective must be controlled to avoid inadvertent use.

1.10 Identification and Control of Items

Participants must establish and document sufficient controls to ensure that quality-affecting items (e.g., equipment, components, and material) can be readily identified. These controls must be established to prevent incorrect use, retain integrity of materials, and preserve the desired operating characteristics of equipment.

1.10.1 Suspect and Counterfeit Items

Participants must establish effective controls to prevent, detect, and dispose of suspect and counterfeit items (such as bolts and lifting straps) when such items could lead to unexpected equipment failures or to negative impacts to mission, the environment, or personnel. Trend analyses for improving the suspect/counterfeit item prevention process must be performed.

1.11 Measuring and Test Equipment

Participants must uniquely identify and control their M&TE, and establish a system of calibration and preventive maintenance to ensure proper operation. Reference standards of the correct type and range must be used for collecting data consistent with objectives. M&TE records must be maintained in accordance with Section 1.7.

1.11.1 Calibration

Participants must calibrate M&TE in accordance with their procedures or the manufacturer's instructions. The frequency of periodic or factory calibrations will be based on the manufacturer's recommendations, national standards of practice, equipment type and characteristics, and past experience. Calibrations must be performed on M&TE before work begins and at intervals prescribed by participant organization procedures.

Equipment that becomes inoperable, fails calibration, or is past its calibration expiration date must be tagged "out of service" and, when possible, segregated to prevent inadvertent use. Results of activities performed using equipment that is out of calibration must be evaluated for adverse affects and the appropriate personnel notified.

Physical and chemical standards must have certifications traceable to NIST, EPA, or other nationally recognized agencies. Supporting documentation on reference standards and equipment must be maintained.

1.11.2 Preventive Maintenance

Participants will perform periodic preventive maintenance on field and laboratory equipment in accordance with manufacturers' specifications and warranties. The frequency of preventive maintenance will be based on manufacturers' recommendations and the users' professional knowledge and experience.

2.0 Work and Data Processes

Details of specific environmental data-collection activities will be discussed in the applicable site-specific planning documents. Appropriate technical methods or a scientific rationale must be employed. Activities must be performed in accordance with procedures and site-specific plans that comply with the applicable requirements of DOE orders, procedures, this QAP, and planning documents. Upon request, participants must supply NNSA/NSO with copies of applicable procedures. Deviations from plans and procedures must be documented and approved from the original approving organization.

The quality required of a dataset is determined by its intended use in the decision making process. Data must be classified into one of three categories: decisional, decision supporting, and informational. Decisional data will be used to make primary decisions on environmental contaminant action levels or closure standards being met; decision-supporting data will contribute to such decisions; and informational data will support conceptual models or guide investigations related to such decisions. Descriptions of these categories and how they relate to data quality are discussed in Sections 2.5 through 2.7.

2.1 Planning

Participants must perform fieldwork safely and within the controls established by Real Estate/Operations Permits (REOPs) and Work Packages or equivalent. Activities must be documented in the associated task plans, activity plans, field instructions, and/or SOPs. Data acquisition methods for which a procedure does not exist (those that are unique, experimental, or under development) must be detailed in field documentation. Field sampling and laboratory analytical procedures must incorporate QC criteria.

Personnel responsible for data collection must verify that activities are defined, controlled, verified, and documented. Planning must incorporate the principles of Integrated Safety Management to mitigate hazards to workers. Work assignments must be clearly communicated with lines of communication established among all participants. Organizations that are assigned lead responsibilities must coordinate planning with decision makers and participants.

2.1.1 Task Planning

Key personnel must be briefed on the purpose, expected outcome, schedule, and responsibilities when assigned tasks. Responsible managers must monitor the planning process to ensure communication of status, assess progress and, if necessary, implement issue resolution.

2.1.2 Readiness Determination

Readiness reviews must be performed as required by participating organizations before work resumes (after stop work orders) to verify and document that planning and prerequisites have been satisfactorily completed. At a minimum, readiness reviews must verify that the following issues have been addressed:

- Scope of work is defined and understood.
- Planned work is appropriate to meet DQO objectives.
- Work instructions have been approved and issued to personnel.
- Hazards have been identified and analyzed, and controls have been implemented.
- Proper resources (e.g., personnel, equipment, and materials) have been identified and are available.
- Assigned personnel have been trained and qualified.
- Internal and external interfaces have been defined.
- Work authorizations and permits have been obtained.
- Calibration of M&TE is current.
- A feedback mechanism has been established to facilitate process improvement.

2.2 Field Documentation

Participants' procedures must include field documentation of sufficient detail to facilitate the reconstruction of field activities. Instrument identification numbers and applicable calibration must be documented. Field personnel must document activities in a notebook, log book, or form as required by the participant organization. The field documentation must be reviewed (i.e., with an

initial and date) for completeness and accuracy by someone, other than those performing the work, who is knowledgeable in the area being reviewed. Field records and related documentation must be developed and maintained in accordance with Section 1.7.

Participants taking photographs must have NNSA/NSO approval and be in compliance with NNSS and U.S. Air Force requirements (if on the NTTR). The photographs must be processed and stored in accordance with National Nuclear Security Administration (NNSA) Policy Letter NAP 70.4, *Information Security* (NNSA, 2010), and DOE Order 475.2A, *Identifying Classified Information* (DOE, 2011a).

2.3 Decontamination

Equipment parts in contact with samples must be decontaminated to prevent cross-contamination. Contractor procedures should address decontamination methods for the sample matrices involved and the potential contaminants of concern.

2.4 Investigation-Derived Waste

Investigation-derived waste (IDW) must be managed in accordance with DOE orders, U.S. Department of Transportation (DOT) regulations, RCRA regulations, Nevada laws and regulations, the FFACO (1996, as amended), State and DOE agreements, relevant permits, and site-specific requirements.

2.5 Decisional Data Collection

Decisional data are directly compared to FALs. These data require the highest level of QA/QC in collection and measurement systems because the data are used to resolve primary decisions (i.e., rejecting or accepting the null hypothesis), and/or verifying closure standards have been met. Environmental TLD and media analytical data are classified as decisional data. If other methods of collecting decisional data are identified, they will be addressed in the applicable FFACO report. Decisional data documentation must be maintained as records in accordance with Section 1.7.

2.5.1 Environmental TLDs

When TLDs are used for determining external dose rates, they must be stored to prevent exposure to elevated levels of radioactivity. Participants must document and implement procedures to account for dose other than field exposure (e.g., pre- and post-deployment).

TLDs must be placed in accordance with the *Soils Risk-Based Corrective Action Evaluation Process* (NNSA/NSO, 2012b) and activity-specific plans (e.g., CAIP, SAFER plan). TLDs must be identified by a unique serial number and a documented anneal date before deployment. Placement and retrieval date and location must be documented for each TLD. Placement coordinates must be obtained for each TLD location. Chain of custody forms must be used to transfer TLDs after collection (see Section 2.5.2.2).

At least one additional TLD must be placed at a location representative of background conditions that are not impacted by the area under investigation to provide background measurements. These areas are selected based on aerial flyover data and radiological maps of the sites.

TLDs must be annealed and processed in accordance with the *Nevada Test Site Routine Radiological Environmental Monitoring Plan* (BN, 2003) or equivalent. The analytical results must include read dates and individual element results, and be documented in a format that facilitates analyses in accordance with the *Soils Risk-Based Corrective Action Evaluation Process* (NNSA/NSO, 2012b) and activity-specific plans (e.g., CAIP, SAFER plan).

2.5.2 Environmental Media Samples

Sample collection plans must establish proper sampling protocols to ensure that personnel collect representative samples and that cross-contamination is not introduced during collection.

Either composite or grab samples may be collected. If composite samples are collected, the compositing protocol will be established in the sample collection plan and documented in the applicable FFACO report.

2.5.2.1 Labels and Collection Documentation

Sample labels must be affixed to containers in a manner that does not obscure any data preprinted on the containers. The label must be protected to ensure legibility and sample integrity (e.g., clear tape over the label). The unique sample number must be written in indelible ink on the label.

Sample collection documentation must include the following information:

- Unique sample number
- Sample location
- Sample date and time (24-hour clock)
- Sample medium
- Preservation or conditioning of the sample
- Collection method
- Name of individual collecting sample

2.5.2.2 Chain of Custody

Chain of custody must be maintained for each field sample collected to provide the traceability of possession from the time the samples are collected until disposal. A sample is considered to be in custody if it meets any of the following criteria:

- Is in a person's physical possession
- Is in a person's unobstructed view after being in the person's physical possession
- Is in a secured area to prevent tampering after having been in the person's physical possession
- Is in a designated secured storage area where access is restricted to authorized personnel only
- Is in secure packaging and sealed with a custody seal during shipment to laboratory

Environmental media sample containers must be sealed with a custody seal that is initialed and dated by the sample custodian before it leaves the sample collection site. The seal must be placed such that the container cannot be opened without breaking the seal.

The sample custodian is responsible for sample custody until the sample is relinquished to another individual or a secure storage area via the chain of custody form. The chain of custody form does not document transfers to and from shipping entities; therefore, waybills must be retained and included with sample documentation. This transfer does not interrupt the chain of custody as long as the package remains sealed. Whenever samples are transferred to a new sample custodian, the new custodian must sign his or her name, the company name, and the time and date that the transfer

occurred. The chain of custody form must accompany the samples during handling and shipment. The chain of custody forms and shipping papers must be maintained in accordance with Section 1.7.

2.5.2.3 Sample Handling, Preservation, Packaging, and Shipping

The site-specific planning documents must identify the appropriate sample containers, preservation procedures, and holding times for specific analyses. Contractor procedures for sample handling, preservation, packaging, and shipping should include instructions for maintaining the integrity of the samples by the applicable preservation methods. Procedures should specify steps necessary for packing the shipping containers. Procedures for the shipment of samples must comply with 49 CFR, Parts 171–177 (CFR, 2011d), for the packaging, labeling, and placarding. If temporary secure storage is used, the procedure should state under what conditions the samples may be stored.

2.5.2.4 Field QC Samples

Field QC samples provide a mechanism for assessing and documenting that the sample collection process meets the quality objectives. To minimize handling, analysis, and data evaluation bias, field QC samples must be submitted to the laboratory without indicating they are QC samples (blind). Field QC sample collection and documentation must be in accordance with procedures and plans. Field QC samples include, as applicable, equipment rinsate blanks, field blanks, trip blanks, and field duplicates. The number and type of field QC samples required will be determined during the DQO process for each site. Other types of data collected, such as observational data and measurements, must have the appropriate QC checks applied to ensure the information collected is of a quality that meets the objectives of the activity. Records must be preserved and maintained in accordance with Section 1.7 of this document.

2.5.2.4.1 Blanks

If blank analytical results indicate possible contamination of samples, sample results must be reviewed to determine whether qualifiers should be assigned to the data or whether the source should be resampled. Blank analytical results must be maintained with the corresponding sample data in the

laboratory records file and reported in the data package. The following types of blanks should be analyzed when field or shipping events warrant:

- ***Equipment rinsate*** is collected from the final rinse solution in the equipment rinse process to determine the effectiveness of the process. The blanks are analyzed for the same analytes as the corresponding environmental samples.
- ***Field blanks*** should be collected at specified frequencies according to the probability of contamination or cross-contamination. Field blanks should be collected as closely in time and space to the sample as possible. The blanks are analyzed for the same analytes as the corresponding environmental samples.
- ***Trip blank*** is a volatile organic analysis (VOA) container of organic-free water that is shipped to the field along with the other VOA sample containers to determine whether contaminants can enter through the vial during storage and transport.

2.5.2.4.2 Field Duplicate Samples

Field duplicate samples are collected only in coordination with grab samples. They are collected as closely in time and space to the grab sample as possible and used to assess sampling and analytical variability. The field duplicates must follow the original sample collection procedure and analytical profile. The duplicate must be assigned a unique sample number, and duplicate collection must be evenly distributed throughout the sampling.

2.6 Decision-Supporting Data Collection

Decision-supporting data contribute, but are not generally used, to resolve primary decisions and affect DQOs. They are used primarily for sample location planning and preliminary corrective action boundary identification. When decision supporting data are used, limitations and explanations of data quality must be presented in the applicable FFACO reports.

If existing or historical data are part of scoping or design for more data collection, many quality issues can be determined by the resolution of the new effort. If estimates are appropriate, proven reliability of historical or existing data may be unnecessary. This is especially true when additional sampling leads to the decision.

2.6.1 Radiological Land Area Surveys

Radiological land area surveys conducted to characterize radiological conditions at a site must be performed with a radiation detector. Detectors may be linked to a Global Positioning System (GPS) and/or a computer that logs the data at predetermined intervals. Operational methods, calibration, and/or response checks of radiological instruments must be proceduralized to identify criteria for acceptable instrument performance (e.g., control charts and upper confidence levels).

Radiological land area survey documentation must include the following:

- Method of collection, instrument identification and type, and GPS unit
- Coordinate system in which the data have been collected
- Location and/or task-specific information

2.6.2 Geophysical Surveys

Geophysical survey instruments are used to identify subsurface anomalies or buried metallic debris. Operational methods and instrument response checks against a known source before each use must be documented and proceduralized.

2.6.3 Aerial Radiological Surveys

Aerial radiological surveys are conducted periodically on the NNSS and NTTR by multiple organizations. When these data are used as decision-supporting data in an FFACO report, the author must document the limitations of the data and appropriateness for use, and address data quality (including considerations of data accuracy per Section 4.2.2 of this document) in accordance with Section 2.6.

2.7 Informational Data

Informational data do not directly affect DQOs but provide information to support conceptual models and guide investigations. If informational data are extracted from published documents, no quality determination is required. If informational data are generated, the source or process of generation must be documented. Information must be reviewed by someone other than the initiator to ensure correct collection, transcription, and manipulation.

Informational data may be upgraded to decision-supporting data; however, an intended use quality evaluation must be documented.

2.7.1 Air Filter Samples

Air filter samples must be collected and analyzed in accordance with requirements of the *Nevada Test Site Routine Radiological Environmental Monitoring Plan* (BN, 2003), Community Environmental Monitoring Program (DRI, 2004), or equivalent.

2.8 Laboratory Types

Laboratories used by the Soils Activity must meet one of the following criteria.

2.8.1 TLD Laboratories

TLD laboratories must maintain a dosimetry accreditation from the DOE Laboratory Accreditation Program (DOELAP) and demonstrate compliance with Subpart C of 10 CFR 835 (CFR, 2012b; NNSA/NSO, 2012a). These laboratories must comply with the requirements of the *Nevada Test Site Routine Radiological Environmental Monitoring Plan* (BN, 2003) or equivalent.

2.8.2 Subcontracted Commercial Analytical Laboratories

Subcontracted commercial laboratories analyzing decisional environmental samples must comply with the following requirements:

- Participate in Performance Evaluation/Proficiency Testing programs appropriate to sample matrices and analyses, and provide performance evaluation results and corrective action reports for identified deficiencies.
- Participate in the DOE Consolidated Audit Program (DOECAP).
- Be NDEP certified.
- Possess a Radioactive Materials license.
- Be National Environmental Laboratory Accreditation (NELAC) accredited.

These participation, accreditation, and certifications must be maintained throughout the term of the contract.

2.8.3 Other Laboratories

Non-decisional samples may be analyzed under the requirements of the *Nevada Test Site Routine Radiological Environmental Monitoring Plan* (BN, 2003), Community Environmental Monitoring Program (DRI, 2004), industrial hygiene, or equivalent.

2.9 Subcontracted Commercial Laboratory Requirements

Subcontracted commercial laboratories must meet the following criteria.

2.9.1 Sample Storage and Disposal

Samples received at the analytical laboratory that have been entered into the sample tracking system must be placed into a storage refrigerator or secure area. The methods of storage are generally intended to ensure the following:

- Retard biological action.
- Retard hydrolysis of chemical compounds and complexes.
- Reduce volatility of constituents.
- Reduce adsorption effects.
- Reduce light exposure.

Preservation methods are generally limited to pH control, preservative addition, and refrigeration. Radiological samples do not require preservation or refrigeration. The possibility of reanalysis requires that proper environmental control of samples post-analysis be provided. Sample storage procedures must be documented and described in laboratory-specific SOPs. Samples, residual samples, and secondary waste must be disposed of in accordance with 40 CFR Parts 260–271 and 761 (CFR, 2011a and c); 49 CFR Parts 171–180 (CFR, 2011d); and all applicable federal, state, and local statutes, regulations, ordinances, orders, and rules. Disposal must be appropriately documented, and copies of disposal records must be made available upon request.

2.9.2 Laboratory Quality Control Samples

Laboratory quality control (LQC) samples must be analyzed using the same analytical procedures used to analyze environmental samples (see Tables A.1-2 and B.1-2). Each analytical laboratory must generate QC samples during each analytical run to assess and document accuracy and precision associated with each analytical measurement. Data from concurrently analyzed LQC samples and other quality controls that are used to demonstrate analytical control must be included in the laboratory's analytical report. The requirements for the types and number of LQC samples will depend on the analytical procedure or method and the laboratory's QA objective for each test.

LQC samples may include method blanks, laboratory control samples (LCSs), surrogate-spike, and matrix spike/matrix spike duplicate (MSD) samples. If LQC sample results are outside statistical control limits, corrective action(s) must be performed and reported in the analytical report case narrative.

2.9.2.1 Laboratory Control Sample

The LCS is a known matrix spiked with compounds representative of the target analytes. The LCS must be carried throughout the sample preparation and analysis procedures to assess laboratory accuracy and precision. The LCS must be analyzed concurrently with each analytical batch for each analyte of interest and must be prepared from standards independent of the calibration standard. Results of duplicate LCS analyses must be reported as RPD and percent recovery (%R) and included with the associated analytical report.

2.9.2.2 Method Blank

A method blank is an analyte-free matrix to which all reagents are added in the same volumes and proportions as environmental samples. Method blanks must be analyzed by the laboratory to check for instrument contamination and interference from reagents. A method blank must be concurrently prepared and analyzed for each analyte of interest for each analytical batch. Method blank data must be reported in the same units (when applicable) as the corresponding environmental samples, and results must be included with each analytical report.

2.9.2.3 Surrogate-Spike Samples

A surrogate-spike is an organic compound that is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but is not normally found in environmental samples. Surrogate-spike sample analysis must be performed for all samples analyzed by gas chromatography (GC), gas chromatography/mass spectrometry (GC/MS), and high-performance liquid chromatography (HPLC) to monitor the percent efficiency of sample preparation methods on a sample-by-sample basis. Surrogate standards are nontarget compounds added to GC, GC/MS, HPLC standards, blanks, and samples before extraction or purging. Surrogate compounds and concentrations added must be those specified in the applicable analytical method. Results of surrogate spike sample analyses must be reported as %R.

2.9.2.4 Matrix Spike/MSD Samples

Matrix spikes/MSDs are aliquots of environmental samples spiked with a known concentration of target analyte(s). The spiking occurs before sample preparation and analysis. Matrix spike/MSD samples must be analyzed by the laboratory to determine interferences of the sample matrix. Matrix spike results must be reported as %R and RPD and be included with the analytical report.

2.9.2.5 Laboratory Duplicate Samples

For inorganic analysis, the laboratory must split an environmental sample for each matrix in every batch of up to 20 samples using the same sample preparation and analysis methods.

2.9.3 Documentation

Data documentation requirements, as well as QA and technical requirements, must be specified in the subcontracted laboratory's SOW. Reported analytical data must include the following documentation:

- Sample receipt and tracking documentation, including identification of the organization and individuals performing the analysis and dates of sample receipt, preparation (if applicable), and analysis.
- Results of LCSs, matrix spikes, replicates, laboratory blanks, calibrations, and calibration verifications, as appropriate for the methods used.

- Identification of nonconformances that may affect the laboratory's measurement system during the time period in which the analysis was performed.
- Analytical results or data deliverables, including reduced data, detection limits, and identification of data qualifiers.

2.10 Data Management

Data must be controlled and managed to guarantee data integrity throughout acquisition and development. Systems must be established for directing data into a controlled data management system. Requirements must be established for identification, collection, selection, control, and transfer of data. Data management must include procedures for documenting the origin of data to ensure that data used to support decisions are of known quality. Procedures must be used to optimize the detection and correction of errors and prevent data loss during data reduction, reporting, and data entry into databases. Participating organizations must have a system in place for the control and transfer of data and interpretive work products, which will provide guidance for gathering, manipulating, and distributing data.

3.0 Assessment and Oversight

3.1 Assessments

Assessment personnel have authority to suspend or stop work in progress upon detection and identification of an immediate adverse condition affecting quality. Resumption of work must be in accordance with Section 2.1.2.

3.1.1 Participant Assessments

Planned and periodic assessments will be conducted and will involve management participation. Management assessments identify and correct problems that hinder the organization from achieving its objectives. Independent assessments are conducted by qualified individuals or groups that are not a part of the organization directly performing the work being assessed. Independent assessments measure item and service quality, adequacy of work performance, and promote improvement. Assessments should focus on issues such as the following:

- Adequacy of implementation of the QA program, with emphasis on quality improvement
- Management biases or organizational barriers that impede the improvement process
- Adequacy of organization's structure, staffing, and physical facilities
- Training programs

Results of assessments must be documented in reports and issued to managers. Participants must ensure follow-up of corrective actions, including evaluations of effectiveness of management's actions. Results of management assessments should be entered into a tracking system for the purposes of identifying trends and lessons learned. The responsibilities and authorities of personnel conducting assessments must be defined and documented, particularly for the authority to suspend or stop work in progress upon detection and identification of an immediate adverse condition affecting the quality of results.

3.1.2 NNSA/NSO Oversight Assessments

Oversight assessments must be performed periodically by NNSA/NSO personnel, or their designees, to verify compliance with applicable quality requirements, DOE policies, and procedures.

Assessments must be conducted in accordance with NSO Order 1226.X, *Assessment and Oversight* (NNSA/NSO, 2010).

3.2 Reports to Management

Participants must inform the Activity Lead of planned activities through receipt, review, and/or approval of any of the following:

- Task plans, schedules, and procedures
- Assessment reports
- Issues, corrective action requests, corrective actions, and schedules
- Nonconformance reports (NCRs)

Participants' procedures must ensure the documentation, reporting, and correction of nonconforming conditions or issues. In addition, periodic assessment of QA/QC activities and data quality parameters must be evaluated and reported.

3.3 Issue Resolution

Soils Activity objectives are to produce quality products and to continuously improve both processes and products. This section establishes the methods and responsibilities for identifying, reporting, controlling, and resolving issues for activities performed.

3.3.1 Issues

Issues are any findings, deficiencies, NCRs, incidents, opportunities for improvement, or any other items of interest that warrant or demand management attention. Issues must be resolved and tracked to closure. Issues can also be defined as strengths and noteworthy practices that are tracked and used for process improvement.

Individuals identifying issues are responsible for the appropriate documentation and reporting. Responsible personnel should be notified when issues are identified. Participants must document, resolve, and report issues in accordance with internal procedures.

3.3.2 Cause

A cause is the most basic element that, if corrected, will prevent recurrence of the same (or similar) issue. Causal analysis should be used where the understanding of the basic underlying cause is important to prevent similar or related issues. The causal analysis should be used to gain an understanding of the deficiency, its causes, and the necessary corrective actions to prevent recurrence. The level of effort expended should be based on the possible negative consequences of a repeat occurrence of an issue. The analysis must be maintained as a record.

3.3.3 Trend Analysis

Trend analyses should be performed on nonconforming conditions, deficiencies, and causes to identify any possible trends. Participants should bring adverse trends to the attention of the appropriate management. Positive trends, such as improved performance or cost savings resulting from enhancements or the application of new technology, should be shared to facilitate improvement in other areas or projects. As appropriate, information obtained from trend analyses should be included in a lessons learned system.

3.3.4 Lessons Learned

NNSA/NSO has implemented a lessons learned system as a focal point for reporting and retrieving important information concerning experiences gained through previous activities. Continuous improvement can be fostered through incorporation of applicable lessons learned into work processes and planning activities, including work plan development, budget development, and strategic planning. The lessons learned program should be used interactively with other management tools such as critiques, assessments, readiness reviews, and evaluations of field activities.

4.0 Environmental Data Usability

Analytical data documentation, verification, and validation requirements must ensure that data used in the decision-making process are scientifically valid, defensible, traceable, and of known precision and accuracy. The data should be of sufficient known quality to withstand scientific and legal challenge relative to the use for which the data are obtained.

Analytical data users must assess documentation for acceptability against the requirements stipulated in the applicable document. Analytical reports (printed or electronic) should note any data use limitations. Data usability records must be maintained in accordance with Section 1.7.

4.1 Verification

Analytical data verification must be performed to evaluate the completeness, correctness, and conformance of each dataset. This verification should include a review of sample collection, handling and transfer, and documentation associated with sampling activities. Laboratory results must be checked upon receipt. If there appears to be an error in the analysis, the laboratory must be contacted immediately, and corrective action(s) must be taken. If investigation reveals that processes were not in control, corrective action(s) must be taken and the resulting data evaluated to determine any impacts.

4.2 Validation

Analytical data validation must be performed on a portion of the environmental sample results to determine the analytical quality of a dataset. Data validation criteria must be based upon the DQOs and the intended use of the data. Validation should include an evaluation of method and contract compliance, data calculations, QC and calibration verifications, raw data, and data generation methods. Validation can include qualifying data that may restrict or limit data use. Analytical data validation must include DQI criteria as stated below. Five percent of validated samples must also be validated by a third party as an assessment of the validation process.

Sample results falling outside acceptable ranges for precision and accuracy must be evaluated for corrective action.

4.2.1 Precision

Precision is used to qualify individual parameter results when corresponding QC sample results are not within established control limits. Precision is quantified by the RPD between the samples. RPD is calculated as the difference between the two samples divided by the average of the two samples and multiplied by 100.

Precision must be determined with field and laboratory duplicate samples. Field duplicate samples will be collected simultaneously with samples from the same source under similar conditions in separate containers. The duplicate samples will be treated independently of the original sample in order to assess field impacts and laboratory performance on precision through a comparison of results. Laboratory sample duplicates are an aliquot, or subset, of a field sample generated in the laboratory. They are not a separate sample but a split, or portion, of an existing sample. Typically, laboratory duplicate QC samples include MSD and LCS duplicate samples for organic, inorganic, and radiological analyses. The following are the criteria for precision:

- ***Inorganic chemical precision criteria***
  - When sample and duplicate results are greater than or equal to 5x the reporting limit (RL), the RPD criteria are 20 and 35 percent for aqueous and soil samples, respectively.
  - When sample or duplicate results are less than 5x the RL, control limits are ±1x RL and ±2x RL for aqueous and soil samples, respectively.
- ***Organic chemical precision criteria***
  - Criteria are based on professional judgment using laboratory-defined control limits.
- ***Radiological precision criteria***
  - When sample and duplicate results are greater than or equal to 5x the minimum detectable concentration (MDC), the RPD criteria are 20 and 35 percent for aqueous and soil samples, respectively.
  - When sample or duplicate results are less than 5x the MDC, the control limit is ±2 for both aqueous and soil samples.

- ***TLD criteria***
  - When the raw read result is greater than 45, the relative standard deviation criterion is 10 percent.

Any values outside the specified criteria do not necessarily result in the qualification of analytical data. It is only one factor in making an overall judgment about the quality of the reported analytical results.

4.2.2 Accuracy/Bias

Accuracy is a measure of the closeness of an individual measurement to the true value. It is used to assess the performance of laboratory measurement processes.

Accuracy is determined by analyzing a reference material of known parameter concentration, or by reanalyzing a sample of known concentration or amount of parameter that has been added (spiked). The %R (measured sample concentration divided by true concentration multiplied by 100) is used to measure accuracy.

Accuracy will be evaluated based on results from three types of spiked samples: matrix spike, LCS, and surrogates (organics). The following are the criteria for accuracy:

- ***Inorganic chemical accuracy criteria*** are 75 to 125 percent for matrix spike recoveries and 80 to 120 percent for LCS recoveries.
- ***Organic chemical accuracy, matrix spike, and LCS laboratory-specific %R criteria*** are developed and generated in-house by the laboratory in accordance with laboratory procedures.
- ***Radiochemical accuracy criteria*** are 80 to 120 percent for LCS and matrix spike recoveries.
- ***Survey data*** must indicate horizontal and vertical accuracy (e.g., spatial data related to sample location, field measurement, boundary, or other spatial feature).

Any values outside the specified criteria do not necessarily result in the qualification of analytical data. It is only one factor in making an overall judgment about the quality of the reported analytical results. Factors beyond laboratory control, such as sample matrix effects, can cause the measured values to be outside the established criteria. Therefore, the entire sampling and analytical process must be evaluated when determining the usability of the affected data.

4.2.3 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. Analytical methods must be sufficient to detect target compounds present in the samples at concentrations less than or equal to the corresponding FALs.

4.3 Data Quality Assessment

A DQA must be performed to determine whether the data met the performance criteria specified in the DQO process. The DQA considers how the data relate to decisions to be made, the intended use of the data, and whether data are suitable for making those decisions. The DQA must be performed on data of known and documented quality. The DQA must be documented in the applicable FFACO report. Information on DQA can be found in EPA QA/G-9R, *Data Quality Assessment: A Reviewer's Guide* (EPA, 2006a), and its companion document EPA QA/G-9S, *Data Quality Assessment: Statistical Tools for Practitioners* (EPA, 2006b). The DQA process must include the following steps:

- ***Review the DQO Process*** to provide context for analyzing the data. State the primary statistical hypotheses; confirm the limits on decision errors for committing false negative (Type I) or false positive (Type II) decision errors; and review any special features, potential problems, or deviations to the sampling design.

- ***Perform a preliminary data review*** by reviewing QA reports and inspecting the data both numerically and graphically, validating and verifying the data to ensure that the measurement systems performed in accordance with the criteria specified, and using the validated dataset to determine whether the quality of the data is satisfactory.

  - When sample results are greater than one-half the FALs and DQIs for those results do not meet established criteria, the data assessment must include explanations or justifications for their use or rejection.

- ***Select the test*** based on the population of interest, population parameter, and hypotheses. Identify the key underlying assumptions that could cause a change in one of the DQO decisions.

- ***Verify the assumptions.*** Perform tests of assumptions. If data are missing or are censored, determine the impact on DQO decision error.

- ***Draw conclusions from the data.*** Document conclusions drawn as a result of the statistical analysis.

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Appendix A

Chemical COPCs

Table A.1-1
Chemicals Excluded from NNSS and NTTR Potential Contaminant List
(Page 1 of 5)

CAS No.	Constituent	Date Analyzed	Number of Samples	Nondetects	Detects	Site Results or Maximum Concentration	Main Uses
122-39-4	Diphenylamine	--	--	--	--	No N-I data	Pre- or post-harvest scald inhibitor for apples
62-44-2	Phenacetin	--	--	--	--	No N-I data	Analgesic
91-94-1	3,3'-Dichlorobenzidine	1993–2007	7,975	7,975	0	All nondetect	Azo dye production
88-74-4	o-Nitroaniline	1993–2007	8,102	8,101	1	240 μg/kg 1.4% of RSL	Chemical intermediate for orange pigment, used solely by dye manufacturers
91-59-8	2-Naphthylamine	--	--	--	--	No N-I data	Azo dye production
119-93-7	3,3'-Dimethylbenzidine	--	--	--	--	No N-I data	Dye production
92-67-1	4-Aminobiphenyl	--	--	--	--	No N-I data	Azo dye production
99-55-8	5-Nitro-o-toluidine	--	--	--	--	No N-I data	Hair dye production
60-11-7	p-(Dimethylamino)azobenzene	--	--	--	--	No N-I data	Dye production
106-50-3	p-Phenylenediamine	--	--	--	--	No N-I data	Component of engineering polymers and composites, ingredient in hair dyes
82-68-8	Pentachloronitrobenzene	--	--	--	--	No N-I data	Fungicide
55-18-5	n-Nitrosodiethylamine	--	--	--	--	No N-I data	Gasoline and lubricant additive, copolymer softener
120-83-2	2,4-Dichlorophenol	1993–2007	8,081	8,080	1	Rio Blanco 3,100 μg/kg	Intermediate in the preparation of the herbicide 2,4-Dichlorophenoxyacetic acid (2,4-D)
107-02-8	Acrolein	1998–2006	513	513	0	All nondetect	Preparation of polyester resin, herbicide to control submersed and floating weeds and algae
2303-16-4	Diallate	--	--	--	--	No N-I data	Herbicide
924-16-3	n-Nitrosodi-n-butylamine	--	--	--	--	No N-I data	Weed killer
23950-58-5	Pronamide	--	--	--	--	No N-I data	Herbicide
534-52-1	4,6-Dinitro-o-cresol	1993–2007	7,456	7,455	1	120 μg/kg	Insecticide, fungicide, herbicide, and defoliant
140-57-8	Aramite	--	--	--	--	No N-I data	Insecticide for mites

Table A.1-1
Chemicals Excluded from NNSS and NTTR Potential Contaminant List
(Page 2 of 5)

CAS No.	Constituent	Date Analyzed	Number of Samples	Nondetects	Detects	Site Results or Maximum Concentration	Main Uses
510-15-6	Chlorobenzilate	--	--	--	--	No N-I data	Insecticide for mites
60-51-5	Dimethoate	--	--	--	--	No N-I data	Insecticide that kills insects on contact
70-30-4	Hexachlorophene	--	--	--	--	No N-I data	Disinfectant, fungicide, and insecticide for mites
143-50-0	Kepone	--	--	--	--	No N-I data	Insecticide for ants and rodents
66-27-3	Methyl methanesulfonate	--	--	--	--	No N-I data	Cancer treatment
56-38-2	Parathion	--	--	--	--	No N-I data	Insecticide for mites
3689-24-5	Tetraethyl dithiopyrophosphate	--	--	--	--	No N-I data	Insecticide, acaricide, and mitocide
298-04-4	Disulfoton	--	--	--	--	No N-I data	Insecticide
298-02-2	Phorate	--	--	--	--	No N-I data	Insecticide for mites, leafhoppers, leafminers, nematodes, and rootworms in pine forests and field crops
51-28-5	2,4-Dinitrophenol	1993–2007	7,943	7,943	0	All nondetect	Scientific research, dye and other organic chemicals production, wood preservatives, photographic developer, explosives, and pesticides
59-50-7	p-Chloro-m-cresol	1993–2007	7,484	7,470	14	4,800 μg/kg mostly DTRA	External germicides; fungicide; preservative for glues, gums, paints, inks, textiles, and leather goods; medication: topical antiseptic, disinfectant, intrauterine lubricants as antiseptic preservative, injectable formulations as preservative, preservative and antifungal agent in eye drops
96-18-4	1,2,3-Trichloropropane	1998–2006	5,609	5,609	0	All nondetect	Paint or varnish remover, cleaning and degreasing agent, production of pesticides
100-01-6	p-Nitroaniline	1993–2007	7,502	7,502	0	All nondetect	Intermediate in the synthesis of dyes, antioxidants, pharmaceuticals and gasoline; in gum inhibitors and poultry medicines; corrosion inhibitor

Table A.1-1
Chemicals Excluded from NNSS and NTTR Potential Contaminant List
(Page 3 of 5)

CAS No.	Constituent	Date Analyzed	Number of Samples	Nondetects	Detects	Site Results or Maximum Concentration	Main Uses
108-60-1	Bis(2-chloro-1-methylethyl) ether	1993–2007	8,102	8,102	0	All nondetect	Intermediate in dye, resin, and pharmaceutical production; nematocide in Japan; no evidence of U.S. commercial use; combatant in liver fluke infections, in the preparation of glycol esters, and in fungicidal preparations; insecticidal wood preservative not registered for U.S. use; for use as a pesticide; solvent for fats, greases, extractant, paint, varnish removers, spotting agents, and cleaning solutions
99-65-0	m-Dinitrobenzene	1994–2009	643	641	2	26 mg/kg	Chemical intermediate for m-Phenylenediamine, aramid fibers, spandex fibers, dyes, and explosives; detection of 17-Ketosteroid; preparation of aminocresols by electrolytic reduction; intermediate in the production of aromatic amines
59-89-2	n-Nitrosomorpholine	--	--	--	--	No N-I data	No commercial use
608-93-5	Pentachlorobenzene	--	--	--	--	No N-I data	Soil and vegetation fungicide, slime inhibitor in industrial waters
77-47-4	Hexachlorocyclopentadiene	1993–2007	7,906	7,905	1	1,200 μg/kg	Pesticide production
106-93-4	1,2-Dibromoethane	1998–2006	5,630	5,630	0	All nondetect	Additive in leaded gasoline, pesticide, fumigant for treatment of logs for termites and beetles, for control of moths in beehives, and as a preparation for dyes and waxes
110-57-6	trans-1,4-Dichloro-2-butene	2001–2006	52	52	0	All nondetect	Nematocides and as intermediates in the manufacture of pesticides
95-94-3	1,2,4,5-Tetrachlorobenzene	--	--	--	--	No N-I data	Intermediate or building block in herbicide production, insecticides, and defoliants
94-59-7	Safrole	--	--	--	--	No N-I data	Pharmaceutical production
606-20-2	2,6-Dinitrotoluene	1993–2009	8,681	8,680	1	6 mg/kg	Precursor to trinitrotoluene (TNT); polymer industry

Table A.1-1
Chemicals Excluded from NNSS and NTTR Potential Contaminant List
(Page 4 of 5)

CAS No.	Constituent	Date Analyzed	Number of Samples	Nondetects	Detects	Site Results or Maximum Concentration	Main Uses
107-13-1	Acrylonitrile	1998–2006	575	570	0	All nondetect	Synthesis of polyamides, fumigant, precursor in the industrial manufacture of acrylamide and acrylic acid
98-86-2	Acetophenone	--	--	--	--	No N-I data	Resin production, by-product of ethybenzene oxidation
53-96-3	2-Acetylaminofluorene	--	--	--	--	No N-I data	Biochemical tool in the study of carcinogenesis
56-49-5	3-Methylcholanthrene	--	--	--	--	No N-I data	Laboratory research of chemical carcinogenesis
57-97-6	7,12-Dimethylbenz(a)anthracene	--	--	--	--	No N-I data	Laboratory research of chemical carcinogenesis
298-00-0	Methyl parathion	--	--	--	--	No N-I data	Insecticide for mites
100-75-4	n-Nitrosopiperidine	--	--	--	--	No N-I data	Experimental carcinogen
930-55-2	n-Nitrosopyrrolidine	--	--	--	--	No N-I data	Experimental carcinogen
62-75-9	n-Nitrosodimethylamine	1998–2006	4,867	4,867	0	All nondetect	Industrial by-product or waste product of industrial processes such as the production of rocket fuel
86-30-6	n-Nitrosodiphenylamine	1993–2007	8,093	8,084	9	5 hits are Offsites Gasbuggy, Salmon & Roller Coaster max 2,300 μg/kg Fire Training Pit = 4,700 μg/kg (1.4% of RSL)	Vulcanization retarder in curing natural rubber and the synthetic elastomers styrene-butadiene and nitrile-butadiene
111-91-1	Bis(2-chloroethoxy)methane	1993–2007	8,101	8,101	0	All nondetect	Solvent, intermediate for polysulfide rubber
111-44-4	Bis(2-chloroethyl)ether	1993–2007	8,097	8,097	0	All nondetect	Solvent for lacquers, resins, and oils; soil fumigant; wetting agent; cleaning compound and textile finishing agent

Table A.1-1
Chemicals Excluded from NNSS and NTTR Potential Contaminant List
(Page 5 of 5)

CAS No.	Constituent	Date Analyzed	Number of Samples	Nondetects	Detects	Site Results or Maximum Concentration	Main Uses
78-59-1	Isophorone	1993–2007	8,076	8,071	6	5 hits from TTR 14–20 μg/kg Fire Training Pit = 950 μg/kg (53% of RSL)	Solvent in printing inks, paints, lacquers, adhesives, copolymers, coatings, finishings, and pesticides; chemical intermediate; ingredient in wood preservatives and floor sealants
91-58-7	2-Chloronaphthalene	1993–2007	8,102	8,102	0	All nondetect	Solvent; wood preservative; immersion oil for testing refractive index; additives in cable insulation, engine oil, electroplating compounds, and capacitors; dye production
156-60-5	trans-1,2-Dichloroethylene	1994–2006	6,387	6,383	4	All hits at Salmon site	Solvent for waxes, resins, polymers, fats, and lacquers
74-95-3	Dibromomethane	1998–2006	5,634	5,634	0	All nondetect	Solvent, gauge fluid
76-01-7	Pentachloroethane	--	--	--	--	No N-I data	Solvent for oil and grease in metal cleaning, separation of coal from impurities, dry cleaning
10595-95-6	n-Nitrosomethylethalamine	--	--	--	--	No N-I data	Water treatment processes
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin	1998–2010	44	44	0	All nondetect	Chemical by-product from burning or incinerating chlorinated industrial chemicals and other hydrocarbons
7440-31-5	Tin	--	--	--	--	No N-I data	Electroplating

CAS = Chemical Abstracts Service
DTRA = Defense Threat Reduction Agency
mg/kg = Milligrams per kilogram
N-I = Navarro-Intera, LLC
RSL = Regional Screening Level
μg/kg = Micrograms per kilogram

Table A.1-2
NNSS and NTTR Potential Contaminant List with Required Analytical Methods
(Page 1 of 7)

EPA Method[a]	CAS No.	Constituent	PAL[b] (mg/kg)
6010/6020	7440-38-2	Arsenic	1.6
6010/6020	7440-39-3	Barium	190,000
6010/6020	7440-41-7	Beryllium	2,000
6010/6020	7440-43-9	Cadmium	800
6010/6020	7440-47-3	Chromium	33.6[c]
6010/6020	7439-92-1	Lead	800
6010/6020	7782-49-2	Selenium	5,100
6010/6020	7440-22-4	Silver	5,100
7196	18540-29-9	Hexavalent chromium	5.6
7471	7439-97-6	Mercury	43
8081	72-54-8	4,4'-DDD	7.2
8081	72-55-9	4,4'-DDE	5.1
8081	50-29-3	4,4'-DDT	7.0
8081	309-00-2	Aldrin	0.1
8081	319-84-6	Alpha-BHC	0.27
8081	5103-71-9	Alpha-Chlordane	6.5
8081	319-85-7	Beta-BHC	0.96
8081	12789-03-6	Chlordane (technical)	6.5
8081	319-86-8	Delta-BHC	0.27
8081	60-57-1	Dieldrin	0.11
8081	959-98-8	Endosulfan I	3,700
8081	33213-65-9	Endosulfan II	3,700
8081	1031-07-8	Endosulfan sulfate	3,700
8081	72-20-8	Endrin	180
8081	7421-93-4	Endrin aldehyde	180

Table A.1-2
NNSS and NTTR Potential Contaminant List with Required Analytical Methods
(Page 2 of 7)

EPA Method[a]	CAS No.	Constituent	PAL[b] (mg/kg)
8081	53494-70-5	Endrin ketone	180
8081	58-89-9	Gamma-BHC	2.1
8081	5103-74-2	Gamma-Chlordane	6.5
8081	76-44-8	Heptachlor	0.38
8081	1024-57-3	Heptachlor epoxide	0.19
8081	72-43-5	Methoxychlor	3,100
8081	8001-35-2	Toxaphene	1.6
8082	12674-11-2	Aroclor 1016	21
8082	11104-28-2	Aroclor 1221	0.54
8082	11141-16-5	Aroclor 1232	0.54
8082	53469-21-9	Aroclor 1242	0.74
8082	12672-29-6	Aroclor 1248	0.74
8082	11097-69-1	Aroclor 1254	0.74
8082	11096-82-5	Aroclor 1260	0.74
8082	11100-14-4	Aroclor 1268	0.74
8151	93-76-5	2,4,5-T	6,200
8151	94-75-7	2,4-D	7,700
8151	94-82-6	2,4-DB	4,900
8151	75-99-0	Dalapon	18,000
8151	1918-00-9	Dicamba	18,000
8151	120-36-5	Dichloroprop	4,900
8151	88-85-7	Dinoseb	620
8151	94-74-6	MCPA	310
8151	93-65-2	MCPP	620
8151	93-72-1	2,4,5-TP (Silvex)	4,900

Table A.1-2
NNSS and NTTR Potential Contaminant List with Required Analytical Methods
(Page 3 of 7)

EPA Method[a]	CAS No.	Constituent	PAL[b] (mg/kg)
8260	630-20-6	1,1,1,2-Tetrachloroethane	9.3
8260	71-55-6	1,1,1-Trichloroethane	38,000
8260	79-34-5	1,1,2,2-Tetrachloroethane	2.8
8260	79-00-5	1,1,2-Trichloroethane	5.3
8260	75-34-3	1,1-Dichloroethane	17
8260	75-35-4	1,1-Dichloroethene	1,100
8260	120-82-1	1,2,4-Trichlorobenzene	99
8260	95-63-6	1,2,4-Trimethylbenzene	260
8260	96-12-8	1,2-Dibromo-3-chloropropane	0.069
8260	95-50-1	1,2-Dichlorobenzene	9,800
8260	107-06-2	1,2-Dichloroethane	2.2
8260	78-87-5	1,2-Dichloropropane	4.7
8260	108-67-8	1,3,5-Trimethylbenzene	10,000
8260	541-73-1	1,3-Dichlorobenzene	9,800
8260	106-46-7	1,4-Dichlorobenzene	12
8260	78-93-3	2-Butanone	200,000
8260	95-49-8	2-Chlorotoluene	20,000
8260	591-78-6	2-Hexanone	1,400
8260	108-10-1	4-Methyl-2-pentanone	53,000
8260	67-64-1	Acetone	630,000
8260	75-05-8	Acetonitrile	3,700
8260	107-05-1	Allyl chloride	3.4
8260	71-43-2	Benzene	5.4
8260	75-27-4	Bromodichloromethane	1.4
8260	75-25-2	Bromoform	220

Table A.1-2
NNSS and NTTR Potential Contaminant List with Required Analytical Methods
(Page 4 of 7)

EPA Method[a]	CAS No.	Constituent	PAL[b] (mg/kg)
8260	74-83-9	Bromomethane	32
8260	75-15-0	Carbon disulfide	3,700
8260	56-23-5	Carbon tetrachloride	3.0
8260	108-90-7	Chlorobenzene	1,400
8260	75-00-3	Chloroethane	61,000
8260	67-66-3	Chloroform	1.5
8260	74-87-3	Chloromethane	500
8260	126-99-8	Chloroprene	0.047
8260	156-59-2	Cis-1,2-dichloroethene	2,000
8260	124-48-1	Dibromochloromethane	3.3
8260	75-71-8	Dichlorodifluoromethane	780
8260	97-63-2	Ethyl methacrylate	7,500
8260	100-41-4	Ethylbenzene	27
8260	78-83-1	Isobutyl alcohol	310,000
8260	98-82-8	Isopropylbenzene	11,000
8260	126-98-7	Methacrylonitrile	18
8260	80-62-6	Methyl methacrylate	21,000
8260	75-09-2	Methylene chloride	53
8260	104-51-8	n-Butylbenzene	51,000
8260	103-65-1	n-Propylbenzene	21,000
8260	99-87-6	4-Isopropyltoluene	11,000
8260	1330-20-7	Total xylenes	2,700
8260	135-98-8	sec-Butylbenzene	45,400
8260	100-42-5	Styrene	36,000
8260	98-06-6	tert-Butylbenzene	45,400

Table A.1-2
NNSS and NTTR Potential Contaminant List with Required Analytical Methods
(Page 5 of 7)

EPA Method[a]	CAS No.	Constituent	PAL[b] (mg/kg)
8260	127-18-4	Tetrachloroethene	2.6
8260	108-88-3	Toluene	45,000
8260	79-01-6	Trichloroethene	6.4
8260	75-69-4	Trichlorofluoromethane	3,400
8260	108-05-4	Vinyl acetate	4,100
8260	75-01-4	Vinyl chloride	1.7
8270	123-91-1	1,4-Dioxane	17
8270	58-90-2	2,3,4,6-Tetrachlorophenol	18,000
8270	105-67-9	2,4-Dimethylphenol	12,000
8270	121-14-2	2,4-Dinitrotoluene	5.5
8270	95-95-4	2,4,5-Trichlorophenol	62,000
8270	88-06-2	2,4,6-Trichlorophenol	160
8270	95-57-8	2-Chlorophenol	5,100
8270	91-57-6	2-Methylnaphthalene	4,100
8270	95-48-7	2-Methlyphenol (o-cresol)	31,000
8270	88-75-5	2-Nitrophenol	None Available[d,e]
8270	100-02-7	4-Nitrophenol	None Available[d]
8270	83-32-9	Acenaphthene	33,000
8270	208-96-8	Acenaphthylene	33,000
8270	62-53-3	Aniline	300
8270	120-12-7	Anthracene	170,000
8270	56-55-3	Benzo(a)anthracene	2.1
8270	50-32-8	Benzo(a)pyrene	0.21
8270	205-99-2	Benzo(b)fluoranthene	2.1
8270	191-24-2	Benzo(ghi)perylene	17,000

Table A.1-2
NNSS and NTTR Potential Contaminant List with Required Analytical Methods
(Page 6 of 7)

EPA Method[a]	CAS No.	Constituent	PAL[b] (mg/kg)
8270	207-08-9	Benzo(k)fluoranthene	21
8270	65-85-0	Benzoic acid	2,500,000
8270	100-51-6	Benzyl alcohol	62,000
8270	117-81-7	Bis(2-ethylhexyl) phthalate	120
8270	85-68-7	Butyl benzyl phthalate	910
8270	86-74-8	Carbazole	95.8
8270	218-01-9	Chrysene	210
8270	53-70-3	Dibenzo(a,h)anthracene	0.21
8270	132-64-9	Dibenzofuran	1,000
8270	84-66-2	Diethyl phthalate	490,000
8270	131-11-3	Dimethyl phthalate	6,840,000
8270	84-74-2	di-n-Butyl phthalate	62,000
8270	117-84-0	di-n-Octyl phthalate	27,400
8270	206-44-0	Fluoranthene	22,000
8270	86-73-7	Fluorene	22,000
8270	118-74-1	Hexachlorobenzene	1.1
8270	87-68-3	Hexachlorobutadiene	22
8270	67-72-1	Hexachloroethane	43
8270	193-39-5	Indeno(123-cd)pyrene	2.1
8270	108-39-4	3-Methylphenol (m-cresol) *(May be reported as 3+4-methylphenol)*	31,000
8270	91-20-3	Naphthalene	18
8270	98-95-3	Nitrobenzene	24
8270	621-64-7	n-Nitroso-di-n-propylamine	0.25
8270	106-47-8	4-Chloroaniline	8.6
8270	106-44-5	4-Methylphenol (p-cresol) *(May be reported as 3+4-methylphenol CAS 108-39-4)*	3,100

Table A.1-2
NNSS and NTTR Potential Contaminant List with Required Analytical Methods
(Page 7 of 7)

EPA Method[a]	CAS No.	Constituent	PAL[b] (mg/kg)
8270	87-86-5	Pentachlorophenol	2.7
8270	85-01-8	Phenanthrene	170,000
8270	108-95-2	Phenol	180,000
8270	123-31-9	Hydroquinone	29
8270	129-00-0	Pyrene	17,000
8270	110-86-1	Pyridine	1,000
8330	99-35-4	1,3,5-Trinitrobenzene	27,000
8330	118-96-7	2,4,6-Trinitrotoluene	79
8330	19406-51-0	4-Amino-2,6-dinitrotoluene	1,900
8330	99-99-0	4-Nitrotoluene	110
8330	35572-78-2	2-Amino-4,6-dinitrotoluene	2,000
8330	2691-41-0	HMX	49,000
8330	99-08-1	3-Nitrotoluene	62
8330	88-72-2	2-Nitrotoluene	13
8330	121-82-4	RDX	24
8330	479-45-8	Tetryl	2,500

[a]EPA, 2012
[b]PALs may change as a result of EPA Region 9 risk-based evaluations, thus must be periodically reviewed.
[c]Assuming the hexavalent chromium to trivalent chromium is 1:6 (EPA, 2011)
[d]The EPA has determined there are inadequate data for the establishment of a reference concentration (RfC) for 4-Nitrophenol and is currently reviewing the reference dose (RfD) for future determination of a screening level.
[e]2-Nitrophenol uses 4-Nitrophenol as a surrogate for establishing screening levels.

A.1.0 References

EPA, see U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency. 2011. *Mid-Atlantic Risk Assessment Regional Screening Table - User's Guide.* As accessed at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm on 23 April 2012. Prepared by EPA Office of Superfund and Oak Ridge National Laboratory.

U.S. Environmental Protection Agency. 2012. *SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. As accessed at http://www.epa.gov/epawaste/hazard/testmethods/sw846 on 23 April.

Appendix B

Radiological COPCs

Table B.1-1
Radionuclides Excluded from NNSS and NTTR Potential Contaminant List
(Page 1 of 2)

Radionuclide	Reason	Half-Life	Comments
Ag-110m	Half-life	250 d	Beta emitter.
Ar-39	Disbursal	269 y	Beta emitter. Activation product via neutron activation of normal air. Would disburse quickly in the plume over very large areas and remain in the air.
Ba-133	Not seen in gamma spectroscopy	10.52 y	Decays by electron capture. Has a 356 keV gamma with a 62% abundance but has not been seen in soil samples.
Ba-137m	Daughter	2.552 m	Decay by internal transition. Has a strong gamma. Daughter of Cs-137 and included with Cs-137.
C-14	Disbursal	5,730 y	Beta emitter. Can be produced in atmospheric tests due to the activation of oxygen with thermal neutrons. The C-14 would be formed in air and widely disbursed with the plume (all goes to the troposphere). The dose conversion factor is quite low, so C-14 contributes little to internal dose.
Cd-113m	Low yield	14.1 y	Beta emitter. Fast fission yield 0.0152%. Insignificant activation product.
Ce-144	Half-life	284.9 d	Beta emitter.
Cm-244	Half-life	18.1 y	Used by LANL as a tracer. Can also be a contaminant in the production of Pu, although chemical separation in pit production should remove the Cm.
Cs-134	Half-life	2.06 y	Has strong gammas with good abundances but has not been seen in soil samples.
Cs-135	Low yield	2,300,000 y	Beta emitter. Thermal fission yield for its Xe-135 parent is high (7.62%) but it is destroyed by neutron capture before being converted to Cs-135.
Eu-150	Not seen in gamma spectroscopy	36.9 y	Decay by electron capture. Emits many gammas but has not been seen in soils samples.
H-3	Exposure pathway	12.3 y	Beta emitter. Typical soil moisture at the NNSS is <10%; therefore, H-3 will not be present in surface soils in notable amounts. The hazards from H-3 are primarily from drinking water, which is considered in the UGTA program but is not an exposure pathway for the Soils activity.
Ho-166m	Low yield	1,200 y	Beta emitter. Emits many gammas but has not been seen in soils samples. Thermal fission yield 1.32E-07%.
I-129	Disbursal	1.57E+07 y	Beta emitter. Highly volatile and will disburse widely in air.
K-40	Natural	1.278E+09 y	Naturally occurring. Use as a quality check when soils are subjected to gamma spectroscopy.
Kr-85	Disbursal	10.8 y	Beta emitter. Exists as a gas and will quickly disburse. Skin dose concern only. Thermal fission yield 0.12%.

Table B.1-1
Radionuclides Excluded from NNSS and NTTR Potential Contaminant List
(Page 2 of 2)

Radionuclide	Reason	Half-Life	Comments
Lu-174	Half-life	3.31 y	Decays by electron capture.
Mn-54	Half-life	312 d	Decays by electron capture.
Nb-92	Low abundance	3.47E+07 y	Beta emitter. Not a neutron activation product.
Nb-93m	Daughter	16.13 y	Decay by internal transition with weak Auger electrons. Daughter of Zr-93, and RRMG for Zr-93 would consider the daughter. Insignificant in activated soils or metals, especially compared to Co-60.
Ni-59	Low abundance	76,000 y	Decay by electron capture. Cosmogenic radionuclide. Not significant in activated soil. If metal is activated, Ni-59 would be <0.01% of Co-60.
Pr-144	Half-life	17.28 m	Beta emitter.
Pu-246	Half-life	10.84 d	Half-life of 10.84 days. Used by LANL as a tracer.
Rh-101	Half-life	3.3 y	Decays by electron capture.
Rh-102m	Half-life	2.9 y	Decay by internal transition.
Rh-106	Half-life	29.8 s	Thermal fission yield 4.35%. Fast fission yield 3.56%.
Ru-106	Half-life	373 d	Beta emitter. Thermal fission yield 4.35%. Fast fission yield 3.54%.
Sb-125	Half-life	2.76 y	Beta emitter.
Sn-121m	Low yield	55 y	Beta emitter. Fission yield of 0.00003%.
Sn-126	Low yield	100,000 y	Beta emitter. Fission product. Fission yield 0.06%. Daughter is Sb-126, which has strong gammas and has not been seen.
U-232	Not seen in gamma spectroscopy	68.9 y	Alpha emitter. Contaminant of U-233 during its production. Emits strong gamma rays and not seen in gamma spectroscopy of soil samples to date. Introduction does not fit the CSM.
U-236	Low yield	2.34E+07 y	Alpha emitter. Produced only when U-235 captures a neutron, and does not fission (low probability). Is fissionable by fast neutrons in a device, so much will be consumed. Not seen in soil samples analyzed for isotopic U.
Y-90	Daughter	64 h	In equilibrium with Sr-90. Considered in the limits applied to Sr-90. Thermal fission yield 2.1%.

keV = Kiloelectron volt
LANL = Los Alamos National Laboratory
MeV = Megaelectron volt

d = Day
h = Hour
m = Minute
s = Second
y = Year

Table B.1-2
NNSS and NTTR Potential Radiological Contaminant List with Required Analytical Methods

Radionuclide COPC	By Method	Primary Source
Ag-108m	HASL-300[a]	Activation product
Al-26	HASL-300[a]	Activation product
Am-241	HASL-300[a]	Contaminant in fuel, tracer
Am-243	HASL-300[a]	Tracer
Cm-243	HASL-300[a]	Activation product
Co-60[b]	HASL-300[a]	Activation product
Cs-137	HASL-300[a]	Fission product
Eu-152	HASL-300[a]	Activation product
Eu-154	HASL-300[a]	Activation product
Eu-155	HASL-300[a]	Activation product
Nb-94	HASL-300[a]	Activation product
Ni-63	CHEM-TP-NI1[c]	Activation product
Np-237	HASL-300[a]	Tracer
Pu-238	HASL-300[a]	Contaminant in fuel
Pu-239	HASL-300[a]	Fuel
Pu-240	HASL-300[a]	Contaminant in fuel
Pu-241	HASL-300[a]	Contaminant in fuel, tracer
Pu-242	HASL-300[a]	Contaminant in fuel
Sr-90	HASL-300[a]	Fission product
Tc-99[b]	Lab Specific[d]	Fission product
Th-232	HASL-300[a]	Device component
U-233	HASL-300[a]	Tracer
U-234	HASL-300[a]	Contaminant in fuel
U-235	HASL-300[a]	Fuel
U-238	HASL-300[a]	Surrogate for fuel

[a]DOE, 1997
[b] Indicator radionuclide; see Table B.1-3.
[c]RESL, 1999
[d]The most current EPA, DOE, or equivalent accepted analytical method may be used, including laboratory SOPs approved by the contractor in accordance with industry standards and the contractor's SOW requirements.

HASL = Health and Safety Laboratory

Table B.1-3
Potential Additional Radionuclides

Radionuclide[a]	By Method	Indicator Radionuclide from Table B.1-2
Ca-41	Lab Specific[a]	Co-60
Cl-36	Lab Specific[a]	Co-60
Pd-107	Lab Specific[a]	Tc-99
Sm-151	Lab Specific[a]	Co-60
Zr-93	Lab Specific[a]	Tc-99

[a]The most current EPA, DOE, or equivalent accepted analytical method may be used, including laboratory SOPs approved by the contractor in accordance with industry standards and the contractor's SOW requirements.

B.1.0 References

DOE, see U.S. Department of Energy.

RESL, see U.S. Department of Energy, Radiological and Environmental Services Laboratory.

U.S. Department of Energy. 1997. *The Procedures Manual of the Environmental Measurements Laboratory*, HASL-300. 28th Edition, Vol. I. February. New York, NY.

U.S. Department of Energy, Radiological and Environmental Services Laboratory. 1999. *RESL Technical Procedure CHEM-TP-Ni.1, Determination of ^{63}Ni in Water.* As accessed at https://www.nemi.gov/pls/nemi_pdf/nemi_data.download_pdf?p_file=187 on 28 March 2012.

Appendix C

Nevada Division of Environmental Protection Comments

(*5* Pages)

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY

DOCUMENT REVIEW SHEET

1. Document Title/Number:	Draft Soils Sites Quality Assurance Plan (QAP)	**2. Document Date:**	4/27/2012
3. Revision Number:	0	**4. Originator/Organization:**	Navarro-INTERA
5. Responsible NNSA/NSO Activity Lead:	Tiffany A. Lantow	**6. Date Comments Due:**	
7. Review Criteria:	Full		
8. Reviewer/Organization/Phone No:	Jeff MacDougall, NDEP, 486-2850 ext. 233	**9. Reviewer's Signature:**	

10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept
1.) General		While the overuse of the passive voice is prevalent, overall the QAP is acceptable.	No changes were made to the document.	
2.) Section 1.1, Page 2 of 42, 1st Paragraph, 2nd Sentence	Mandatory	"...As a consequence of these tests, surface and shallow subsurface soils... Not all soils at the NNSS were contaminated. I suggest the word related be added. ...related surface and shallow subsurface soils...	This section was revised. The intent of the comment was incorporated in the revision.	
3.) Section 1.2, Page 2 of 42, 1st Paragraph, 3rd Sentence	Mandatory	"...using standard DQOs." This should read something like "...standard techniques to determine DQOs."	Section 1.2 was deleted and the DQO/DQA information was incorporated into Section 1.1. The wording was changed to: “using the DQO process as presented in Section 1.5.”	

NEVADA ENVIRONMENTAL MANAGEMENT OPERATIONS ACTIVITY
DOCUMENT REVIEW SHEET

1. Document Title/Number:	Draft Soils Sites Quality Assurance Plan (QAP)	**2. Document Date:**	4/27/2012
3. Revision Number:	0	**4. Originator/Organization:**	Navarro-INTERA
5. Responsible NNSA/NSO Activity Lead:	**Tiffany A. Lantow**	**6. Date Comments Due:**	
7. Review Criteria:	Full		
8. Reviewer/Organization/Phone No:	Jeff MacDougall, NDEP, 486-2850 ext. 233	**9. Reviewer's Signature:**	

10. Comment Number/Locatio	11. Type*	12. Comment	13. Comment Response	14. Accept
4.) Section 1.5.5.2, Page 9 of 42, 1st Paragraph, 1st Sentence	Mandatory	"The performance metric for accuracy is that at least 80 percent of the sample results for each measured contaminant are not qualified for accuracy." Re-write; as it stands, this does not make any sense. One can only infer its meaning and QA principles require clear and concise language.	Added following sentence to Section 1.5.5, Data Quality Indicators: Sample and/or TLD results identified as rejected or estimated values during the data validation process are considered qualified data. The label “qualified” is used in this document to identify those results. Changed text in Section 1.5.5.1 Precision to include: The performance criteria for precision is that no more than 20 percent of sample or TLD results for each measured COPC are qualified due to duplicate results with a … (see Section 4.2.1). Changed text in Section 1.5.5.2 Accuracy/Bias to: The performance criteria for accuracy is that no more than 20 percent of sample of TLD results for each measured COPC are qualified for accuracy (see Section 4.2.2). Changed first sentence in Section 4.2.1 Precision to:Precision is used to qualify individual…..	
5.) Section 1.5.5.6, Page 10 of 42, 1st Paragraph, 1st Sentence	Mandatory	"...corresponding FALs." Up to this point, there has been no discussion of FALs, when or how they are determined.	Section 1.1 was revised to include a discussion of the regulatory and operational basis for FALs to include how they are determined and used.	

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6.) Section 1.6, Page 11 of 42, Bulleted Report Names/Acronyms	Mandatory	Section 1.6 bulleted report names/acronyms are inconsistently presented - Suggest replacing current bulleted list with the following: • Corrective Action Investigation Plan (CAIP) • Streamlined Approach for Environmental Restoration (SAFER) Plan • Corrective Action Decision Document (CADD) • Corrective Action Decision Document/Closure Report (CADD/CR) • Corrective Action Plan (CAP) • Corrective Action Decision Document/Corrective Action Plan (CADD/CAP) • Closure Report (CR)	Replaced list of documents with the suggested list and updated the acronym list. .	
7.) Section 1.7, Page 13 of 42, 3rd Bullet this Page	Mandatory	Is there a necessity for a supervisor to sign/witness the work?	This question was discussed in the comment review meeting with NDEP. Representatives agreed that not all records (or blank pages) need a supervisory signature. No changes were made.	
8.) Section 1.8.2, Page 15 of 42, 3rd Bullet this Page	Mandatory	"...the status of an entity." Using an for "an entity" is vague, reference it using "the entity"?to which changes are made.	This change was incorporated as requested.	

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9.) Section 1.11.1, Page 18 of 42		While this section does prescribe verifying the instrument for accuracy and function on an ongoing basis, there should be a statement in this section or Section 1.11.2 requiring this be placed in the planning documents or field instructions.	Added the following text in Section 1.11.1: Calibrations must be performed on M&TE before work begins and at intervals prescribed by participant organization procedures.	
10.) Section 2.5.2.2, Page 24 of 42, 1st Paragraph	Mandatory	There should be a statement as to the archiving of the COC form and shipping transfer papers.?	The following text was added to the end of Section 2.5.2.2: The chain of custody forms and shipping papers must be maintained in accordance with Section 1.7.	
11.) Section 2.6.3, Page 26 of 42	Mandatory	"...When published data are used, a determination must be made as to reasonableness and correlation with other radiological data (i.e., land area surveys)." Who does this, (a GIS analyst?), what are the acceptance criteria, what kind of documentation results from this, and where is it archived? Also, does this relate to Section 4.2.2 bullet number 4? If so, it must be cited.	Section 2.6.3 was replaced with the following text: Aerial radiological surveys are conducted periodically on the NNSS and NTTR by multiple organizations. When these data are used as decision-supporting data in an FFACO report, the author must document the limitations of the data and appropriateness for use, and address data quality (including considerations of data accuracy per Section 4.2.2 of this document) in accordance with Section 2.6.	
12.) Section 4.1, Page 35 of 42, 3rd Sentence	Mandatory	"...Laboratory results should be checked..." Re-write to read "must be checked..."	This change was incorporated as requested.	
13.) Section 4.2.1, Page 36 of 42, 1st Sentence	Mandatory	"Precision is used to "flag" (qualify) individual parameter results..." The term qualify used to represent flagged data is first described here but used earlier in the document, (cf. Comment above for Page 9 of 42). Internal vernacular is not always known to all. Insert this definition where the first time usage occurs.	We agree that the terms and definitions were confusing. Sections 1.5.5, 1.5.5.1, 1.5.5.2, and 4.2.1 were revised to simplify and provide more clarity as presented in the response to Comment #4.	

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14.) In reference to Comment 4	Mandatory	A similar comment was presented on the Preliminary Draft but not addressed in this Draft: "The performance metric for accuracy/bias is that at least 80 percent of the sample results for each measured contaminant are not qualified for accuracy(unclear. Please restate in the affirmative)." This needs to be rewritten for clarity.	The performance metrics described in Sections 1.5.5.1 and 1.5.5.2 were revised to state the requirements in the affirmative and to provide more clarity as presented in the response to Comment #4.	
15.) In Reference to Comment 5	Mandatory	There is a fleeting reference in 1.1 and a brief reference in 1.5.4, but it should be expanded, probably in 1.5.4; suggest use explanatory material from Soils RBCA from Secs. 1.0, 2.0., etc. to provide a QAP-appropriate level of regulatory and technical detail.	Section 1.1 was revised to include a discussion of the regulatory and operational basis for FALs using material from Sections 1.0 and 2.0 of the Soils RBCA process document. Section 1.5.4 was revised to include additional explanatory text.	
16.) General	Mandatory	We still don't have concise, non-circular definitions of PALs and FALs in the Soils QAP. A similar comment was presented on the Prelim Draft but not addressed in this Draft. The definitions need not have a definitive regulatory meaning but should clarify their meanings as used in this QAP and in relation to the Soils RBCA.	Section 1.1 was revised to include discussions what the PALs and FALs are and how they are used. This discussion includes material from Sections 1.0 and 2.0 of the Soils RBCA process document. Sections 1.5.2, 1.5.3, and 1.5.4 were revised to include additional explanatory text.	
17.) General	Mandatory	Throughout the draft QAP document, reference is made to the Soils Sub-Project in personnel titles as well as in other descriptions. It is our understanding that DOE is moving away from the use of the term 'Project' and replacing it with 'Activity'. Please ensure that the final QAP document reflects this change.	We implemented new policy and protocol from DOE concerning titles of EM personnel and operations. What was referred to as Projects or Sub-Projects was changed to Activities, Environmental Restoration was changed to Environmental Management, Sub-Project Director was changed to Activity Lead, and Federal Project Director was changed to Environmental Management Operations Activity Manager. These changes were made in the appropriate locations througout the document.	

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