Nevada
Environmental
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Project

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National Nuclear Security Administration

Underground Test Area Project Waste Management Plan

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Environmental Restoration
Project

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

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UNDERGROUND TEST AREA PROJECT WASTE MANAGEMENT PLAN

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

Controlled Copy No.: ___

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Approved for public release; further dissemination unlimited.

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Derivative Classifier: Joseph Johnston, SNJV Classification Officer
(Name/personal identifier and position title)
Signature: /s/Joseph Johnston
Date: 5/20/2009

UNDERGROUND TEST AREA PROJECT
WASTE MANAGEMENT PLAN

Approved by: /s/Wilhelm R. Wilborn Date: 5/20/2009

Wilhelm R. (Bill) Wilborn,
Federal Sub-Project Director
Underground Test Area Project

Approved by: /s/Robert F. Boehlecke Date: 5/20/2009

Robert F. Boehlecke
Federal Project Director
Environmental Restoration Project

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List of Acronyms and Abbreviations

CAIP	Corrective action investigation plan
CAU	Corrective action unit
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EPT	Environmental Protection Team
ERP	Environmental Restoration Project
FFACO	*Federal Facility Agreement and Consent Order*
FMP	Fluid Management Plan
IDW	Investigation-derived waste
LLW	Low-level radioactive waste
M&O	Management and operating
MSDS	Material Safety Data Sheet
NDEP	Nevada Division of Environmental Protection
NEPA	*National Environmental Policy Act*
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site
NTSWAC	*Nevada Test Site Waste Acceptance Criteria*
NV/YMP	Nevada Yucca Mountain Project
PPE	Personal protective equipment
QAPP	Quality Assurance Project Plan
RCRA	*Resource Conservation and Recovery Act*

List of Acronyms and Abbreviations *(Continued)*

TRU	Transuranic
TSDF	Treatment, storage, and disposal facility
UGTA	Underground Test Area
WM	Waste Management
WMP	Waste Management Project

Definitions

Decontamination - The removal of radioactive, hydrocarbon, and/or hazardous constituents from facilities, equipment, personnel, or soils by washing, heating, chemical means, or electrochemical action; mechanical cleaning; or other techniques.

Development - Pumping groundwater from a borehole or well to remove residual drilling fluids and drill cuttings from a water-bearing zone.

Hazardous Wastes - Those wastes designated hazardous by U.S. Environmental Protection Agency (EPA) regulations (Title 40 *Code of Federal Regulations* [CFR] Part 261 [CFR, 2008b]). This term includes wastes listed by EPA or having the characteristic of ignitability, reactivity, corrosivity, or toxicity.

High-Level Waste - The highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing laws, to require permanent isolation.

Investigation-Derived Waste - Waste generated during site activities that may be comprised of personal protective equipment, decontamination rinsate, disposable sampling equipment, manufactured items, soil, and other compactible trash-like materials.

Low-Level Waste - Radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, by-product material (as defined in Section 11e.(2) of the *Atomic Energy Act of 1954,* as amended [USC, 2006]), or naturally occurring radioactive material.

Mixed Waste - Waste that contains both source, special nuclear, or by-product material subject to the *Atomic Energy Act of 1954,* as amended (USC, 2006), and a hazardous component subject to the *Resource Conservation and Recovery Act* (CFR, 2008b) (or state of generation hazardous waste regulations).

Radioactive Waste - Any garbage, refuse, sludge, and other discarded material - including solid, liquid, semisolid, or contained gaseous material - that contains radionuclides regulated under the *Atomic Energy Act of 1954*, as amended (USC, 2006), and of negligible economic value considering the costs of recovery.

Transuranic Waste - Radioactive waste containing more than 100 nanocuries (3,700 becquerels) of alpha-emitting transuranic nuclides per gram of waste, with half-lives greater than 20 years, except for: 1) high-level radioactive waste; 2) waste that the Secretary of Energy, with the concurrence of the Administrator of the EPA, has determined does not need the degree of isolation required by the 40 CFR Part 191 (CFR, 2008a) disposal regulations; or 3) waste that the U.S. Nuclear Regulatory Commission has approved for disposal on a case by case basis in accordance with 10 CFR Part 61 (CFR, 2009).

Waste Management - The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance, auditing, and maintenance activities.

Waste Package - The waste, waste container, absorbent, and packing materials that are intended for disposal as a unit. In the case of surface-contaminated, damaged, leaking, or breached waste packages, any overpack shall be considered the waste container, and the original container shall be considered part of the waste.

Well-Specific Fluid Management Strategy Letter - The letter required by the Fluid Management Plan (Attachment 1) that describes information pertinent to the categorization of a specific well as "near-field" or "far-field" either on the NTS or outside the NTS. It provides well-specific information and fluid management, including background levels of contaminants of concern, fluid monitoring, containment, discharge action limits, well-site layout, posting requirements, and other information specific to the well site.

1.0 Introduction

The U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO) Environmental Restoration Project (ERP) initiated the Underground Test Area (UGTA) Sub-Project to characterize the risk posed to human health and the environment as a result of underground nuclear testing activities at the Nevada Test Site (NTS). The UGTA Sub-Project investigation sites have been grouped into corrective action units (CAUs) in accordance with the most current version of the *Federal Facility Agreement and Consent Order* (FFACO) (1996, as amended February 2008). The CAUs under the UGTA Sub-Project are CAU 97 (Yucca Flat/Climax Mine), CAU 98 (Frenchman Flat), CAU 99 (Rainier Mesa/Shoshone Mountain), CAU 101 (Central Pahute Mesa), and CAU 102 (Western Pahute Mesa). Site investigations are typically conducted in accordance with a Corrective Action Investigation Plan (CAIP), which defines the objectives and execution of a proposed CAU investigation. The primary UGTA objective is to gather data to characterize the groundwater aquifers beneath the NTS and adjacent lands. The investigations proposed under the UGTA Sub-Project may involve drilling and sampling new wells; recompleting, monitoring, and sampling existing wells; developing wells and performing hydrologic/aquifer testing; conducting geophysical surveys; and evaluating subsidence crater recharge. The location, depth, and construction of an individual well or well cluster in support of the UGTA Sub-Project will vary based on the scientific and technical objectives of the particular investigation.

This plan provides a general framework for all UGTA participants to follow for the characterization, storage/accumulation, treatment, and disposal of wastes generated by UGTA Sub-Project activities. The objective of this Waste Management (WM) Plan is to provide guidelines to minimize waste generation and to properly manage wastes that are produced. Those wastes generated will be managed in accordance with existing federal and state regulations, DOE Orders, and NNSA/NSO ERP waste minimization and pollution prevention objectives.

Section 1.0 of this plan provides an introduction to the UGTA Sub-Project. Section 2.0 describes the responsibilities of UGTA participants. Section 3.0 describes UGTA Sub-Project activities, wastes expected to be produced from these activities, characterization requirements and parameters, and proper management and minimization of wastes. Section 4.0 contains a list of references. Attachment 1 to this plan is the Fluid Management Plan (FMP) and details specific strategies for management of fluids produced under UGTA operations.

2.0 Underground Test Area Sub-Project Participants and Responsibilities

This section identifies the primary participants and describes each organization's functional responsibilities as related to UGTA Sub-Project waste management activities. The NNSA/NSO has responsibility for administration of the UGTA Sub-Project. A complete description of responsibilities of all UGTA Sub-Project participants may be found in the most current versions of the UGTA Project Management Plan (DOE/NV, 1999) and UGTA Quality Assurance Project Plan (QAPP) (NNSA/NSO, 2003).

2.1 NNSA/NSO Participants and Responsibilities

The primary NNSA/NSO participants involved in UGTA waste management activities are the Waste Management Project (WMP) and Environmental Restoration Project (ERP).

2.1.1 NNSA/NSO Waste Management Project

The NNSA/NSO WMP functions and responsibilities related to UGTA waste management activities are:

- Supporting NNSA/NSO Environmental Management by managing accumulation and disposal facilities for program waste streams and managing centralized waste services for NTS-generated hydrocarbon, hazardous, radioactive, mixed, industrial, and sanitary wastes.
- Managing the low-level radioactive waste (LLW) and mixed waste disposal operations at the NTS in compliance with applicable regulations and DOE requirements and policies. Developing and maintaining waste acceptance criteria and operating requirements for NTS waste operations. Managing programs to assess the performance of waste management facilities and managing efforts to mitigate the environmental impact of operations.
- Managing programs for waste certification, acceptance, and verification at NNSA/NSO disposal facilities. Managing programs required of disposal facility operators in accordance with applicable DOE Orders and Directives.
- Supporting NNSA/NSO ERP waste generating and waste minimization activities through the development of waste acceptance criteria, guidance documents, and implementation plans in accordance with applicable DOE Orders and Directives.

- Verifying that all waste management operations are conducted in accordance with applicable federal, state, and local laws; DOE Orders, standards, and guidelines; and DOE-prescribed environmental, safety, and health policies.

2.1.2 NNSA/NSO Environmental Restoration Project

The NNSA/NSO ERP functions and responsibilities related to UGTA waste management activities are:

- Ensuring all UGTA Sub-Project operations, including management of project wastes, are conducted in accordance with applicable federal and state laws and regulations; DOE Orders, standards, and guidelines; and DOE-prescribed environmental, safety, and health policies.

- Developing and implementing processes to ensure compliance with policies and standards as they relate to assigned activities.

2.1.3 NNSA/NSO Environmental Protection Team

The NNSA/NSO Environmental Protection Team (EPT) is responsible for providing advice and recommendations on environmental compliance issues and matters relating to radiological and nuclear safety. The EPT develops and implements NNSA/NSO-specific policies and procedures to ensure compliance with environmental and occupational health laws, regulations, and DOE Directives. The EPT responsibilities include:

- Serving as the NNSA/NSO interface with federal, state, and local regulatory agencies for obtaining and processing environmental permits, coordinating inspections, and establishing agreements for achieving compliance.

- Conducting environmental audits, surveillances, and assessments of the UGTA Sub-Project activities.

- Coordinating the preparation of *National Environmental Policy Act* (NEPA) documents.

- Providing technical advice to the UGTA Sub-Project on worker protection.

2.2 Other UGTA Sub-Project Participants

The UGTA Sub-Project is administered by NNSA/NSO Environmental Management and involves the participation of several organizations. The NTS Management and Operating (M&O) Contractor typically provides drilling, health and safety, and waste management support services including inspection services for drilling operations, oversight of geophysics, drilling support, and various engineering services. As a rule, the Environmental Services Contractor supports technical and scientific activities, including geologic and hydrologic interpretations, technical support to drilling, hydraulic testing and groundwater sampling activities, waste management, waste minimization, regulatory compliance, and records management. Other organizations – such as the U.S. Geological Survey, Desert Research Institute and national laboratories (including Lawrence Livermore National Laboratory and Los Alamos National Laboratory) – provide various types of scientific expertise to UGTA Sub-Project activities.

Historically, the M&O and Environmental Services Contractors have been responsible for the majority of wastes generated at UGTA sites. However, other contractors such as the national labs retain responsibility for wastes that are generated during activities within their respective scope of work.

3.0 Underground Test Area Sub-Project Activities and Waste Streams

This document discusses UGTA Sub-Project activities common to all well sites. Following are descriptions of UGTA activities, the wastes expected to be generated, and the strategy for the characterization and management of each waste stream.

3.1 Description of Activities

The UGTA Sub-Project activities that may involve the generation of wastes include drilling and constructing new wells, recompleting existing wells, sampling and monitoring new and existing wells, developing wells, performing hydrologic/aquifer testing, conducting geophysical surveys, and evaluating subsidence crater recharge.

Site-specific project planning documents will be developed for each activity, as required. These documents will detail the specific scientific objectives, locations, settings, drilling or sampling methods, and operating procedures for each activity. The planning documents also include detailed information regarding selection of materials and site-specific guidance for characterization and management of expected wastes. The FMP (Attachment 1) provides guidance for fluid management activities applicable to all UGTA activities. Additional fluid management guidance specific to a particular well site will be addressed in the Well-Specific Fluid Management Strategy Letter and in the site-specific drilling/recompletion or sampling field instructions.

3.2 Waste Minimization

All materials used at the well site such as drilling fluids, drilling fluid additives, lubricants, laboratory reagents, calibration solutions, and general use cleaners will be examined for hazardous components before starting well-site activities. This examination will initially be conducted through a review of product specifications and Material Safety Data Sheets (MSDSs). The MSDSs for all products must be reviewed before a product is used on site. If the MSDSs or product specifications are not adequate to fully characterize each material, a sample of the material may be collected and submitted for laboratory analysis for regulated components. If the material contains hazardous components that may create a regulated waste stream, a suitable nonhazardous material will be substituted, if practicable. If a nonhazardous substitute is not available, the NNSA/NSO UGTA Sub-Project Manager's written approval must be obtained before a product is used. Mixing hazardous, radioactive, and nonhazardous materials will be minimized or eliminated through engineering or administrative controls (e.g., good housekeeping, waste segregation practices, and control of materials).

3.3 Waste Management

All wastes generated in support of an UGTA Sub-Project activity shall be managed in accordance with applicable DOE Orders, U.S. Department of Transportation regulations, *Resource Conservation and Recovery Act* (RCRA) regulations (CFR, 2008b), Nevada laws and regulations, and the FFACO (1996, as amended February 2008). The onsite management and ultimate disposition of waste may also be guided by several factors including, but not limited to, federal and state requirements, agreements between the State of Nevada and NNSA/NSO, relevant permits, applicable state guidance, and site-specific requirements. Characterization is completed using the analytical results of samples either directly or indirectly associated with the waste, historical site knowledge, knowledge of the waste generation process, field observations, field-monitoring/screening results, and/or radiological survey/swipe results.

3.3.1 Potential Waste Streams

Wastes typically generated during UGTA activities may include one or more of the following:

- Environmental media (e.g., groundwater, drilling fluids and cuttings, soil)
- Decontamination rinsate
- Personal protective equipment (PPE) and disposable sampling equipment (e.g., plastic, paper, sample containers, spoons, bowls)
- Field-screening waste (e.g., groundwater, spent solvent, disposable sampling equipment, and PPE contaminated by field-screening activities)

Drilling fluids, groundwater, drill cuttings, and decontamination rinsate are managed on site in lined or unlined sumps or infiltration basins/areas, which are governed by the FMP (Attachment 1). Should these fluids meet the criteria for any of the waste types discussed in this plan (e.g., hydrocarbon, hazardous, radioactive waste), they shall be managed in accordance with the appropriate section of this WM Plan. Other wastes – such as PPE, disposable sampling equipment, field-screening wastes, and soil – are typically managed in containers or in bulk (e.g., soil piles) and shall be managed in accordance with this plan.

3.3.1.1 Drilling Fluids and Groundwater

For the purposes of this document, groundwater is defined as the water produced by the aquifer being studied, and makeup water is groundwater from another source used as a constituent of the drilling fluid. Drilling fluids are the solutions used to lift drill cuttings out of the borehole, maintain stability of the borehole, and clean and cool the drill bit. Drilling fluids – comprised of media such as air, air-water, air-foam, natural and synthetic polymers, and bentonite – may be used during drilling operations. All drilling products will be characterized through process knowledge and/or sampling and analysis before use downhole. The drilling fluids will be examined to ensure they do not contain metals or organic compounds that would degrade water quality, result in the generation of a RCRA-regulated waste, or affect future groundwater characterization sampling.

The FMP (Attachment 1) covers the management of UGTA drilling fluids and produced groundwater. The FMP is negotiated with the Nevada Division of Environmental Protection (NDEP). The FMP outlines information necessary to make decisions on the disposition of drilling fluids and groundwater, background contaminants of concern, the fluid management criteria, and requirements for sampling. Specific analytical parameters are detailed in the FMP and the UGTA QAPP (NNSA/NSO, 2003). The Well-Specific Fluid Management Strategy Letter is required by the FMP and approved by NDEP. Typically, it provides the site layout, specifies the number and kind of containment to be constructed to support fluid management, and dictates onsite monitoring requirements and transition contingencies. This strategy letter also addresses any deviations or special requirements not included in the FMP or this WM Plan.

Well-specific planning and implementation documents are also prepared for each UGTA Sub-Project well. Additional analytical parameters may be included in these site-specific planning and implementation documents to meet scientific objectives of a well.

3.3.1.2 Drill Cuttings and Drilling Fluids

Drill cuttings are normally routed to a unlined or lined sumps along with drilling fluids and groundwater. During site operations, if monitoring samples indicate the presence of radioactive and hazardous constituents in excess of applicable criteria as identified in the FMP and Well-Specific Fluid Management Strategy Letter, actions will be taken and site operations may be suspended. If warranted, representative samples of the drill cuttings may be collected and analyzed at that time. If the drill cuttings are characterized as hazardous waste, options will be evaluated and negotiated with NDEP for either removal or *in situ* treatment of the waste. When it is decided that a sump is to be permanently or temporarily closed, process knowledge, direct sampling, and/or associated sample results may be used to characterize the sump contents.

3.3.1.3 Decontamination Fluids

Equipment decontamination generally involves washing sampling tools and larger equipment until they are free of contaminants that may be found in the drilling fluids or groundwater. Decontamination solutions may include water; solutions of nitric acid, hydrochloric acid, isopropanol, and water; or solutions of nonhazardous detergents. If the decontamination fluids used do not contain RCRA-regulated wastes, fluids generated from the decontamination of equipment may be returned to the lined sump or infiltration basin. If the decontamination fluids contain RCRA-regulated wastes, the resulting fluids must be properly contained and managed as hazardous or mixed waste in accordance with this plan.

3.3.1.4 Soil

Generally, soil waste streams are generated from a spill or leak from drilling machinery or ancillary equipment, or as a result of a sump or basin overflow. Depending on the contaminants in the spill and the volume of soil waste generated, soil may be containerized in drums or temporarily stored in a soil pile. Plastic lining material shall be placed underneath a soil pile and on top of the pile to control precipitation runoff/run-on, protect against the elements and prevent migration of contaminants from the soil pile.

3.3.1.5 Investigation-Derived Waste

During site operations, investigation-derived waste (IDW) such as PPE, disposable sampling equipment, and field screening waste is generated. This waste stream may include, but is not limited to, gloves, protective overalls, disposable scoops, pipettes, test tubes, and field screening residuals. The IDW is managed, characterized, and disposed of according to the current requirements (federal and state regulations, DOE Orders and Agreements), using standard operating procedures.

3.3.2 Waste Types

Waste types will be assigned based on the data generated as a result of a project activity, historical knowledge of previous site activities, and/or process knowledge. In some cases, direct sampling of a particular waste stream may be required in order to properly characterize a waste. Any of the waste streams identified in Section 3.3.1 may be characterized as nonhazardous (industrial), hydrocarbon, hazardous, LLW, or mixed waste. The following sections address the onsite management and ultimate disposal of these different waste types. High-level radioactive and transuranic (TRU) wastes are not expected to be generated during UGTA activities and are not addressed in this document.

3.3.2.1 Nonhazardous Wastes

The UGTA nonhazardous wastes may include debris generated outside the work zone, such as office supplies and waste from lunches. Nonhazardous wastes that do not come in contact with the operations may be placed in an onsite storage container (e.g., dumpster, garbage can) as it is considered sanitary waste (not Industrial).

Work-related wastes such as air filters from engines and various types of construction debris may be disposed of as industrial waste. Waste streams generated from operations at noncontaminated intervals – such as drill-pipe, plastic protective covers, drill cuttings, sampling/monitoring supplies (e.g., gloves, buckets, and disposable sampling equipment), and PPE – may be disposed in the industrial landfill, if characterized as nonhazardous and "nonradioactive." Nonhazardous solid wastes will be disposed of in a permitted NTS industrial landfill. These wastes will be handled and disposed of in accordance with all applicable federal, state, and local regulations.

3.3.2.2 Hydrocarbon Wastes

The UGTA activities generate various types of hydrocarbon wastes, including used motor oil, transmission fluid, and antifreeze; oily rags and debris; and hydrocarbon-burdened soil. Hydrocarbon wastes consist of petroleum-based materials that may come in liquid form (e.g., used oil) or in solid form (e.g., contaminated debris or soil). These wastes are generally a result of routine equipment maintenance, but may also result from hydrocarbon spills or leaks. Spills and leaks shall be prevented from reaching the surrounding environment through the use of plastic liners and catch pans placed underneath equipment. If soil becomes contaminated with a hydrocarbon material, the adequacy of process knowledge will determine the need for soil sampling and analysis. If a spill or leak of hydrocarbons occurs, it shall be reported to the appropriate authority at the site of the incident. Documentation and additional reporting will be completed per established procedures. Spills or leaks greater than 25 gallons of product or that impact 3 cubic yards or more of soil must be reported immediately to the NNSA/NSO UGTA Sub-Project Manager, who shall notify the appropriate regulatory authorities, if necessary.

Hydrocarbon wastes shall be segregated based on the waste type (e.g., motor oil, synthetic oil, oil filters, oil/water mixture) and managed separately from other nonhazardous and radioactive waste streams. Most hydrocarbon waste forms – such as used oil, oil/water, and antifreeze/water mixtures – are amenable to recycling. Hydrocarbon wastes that are suspected of contamination with hazardous or radioactive constituents may be sampled for characterization. Hydrocarbon wastes that cannot be recycled shall be fully characterized and sent to an appropriate disposal facility.

3.3.2.3 Hazardous Wastes

Drilling and sampling operations have the potential to generate hazardous wastes by the nature of their activities. A variety of lubricants, fluids, drilling-specific products, and sampling test kits used during activities contain hazardous constituents. As detailed in Section 3.2, all materials are reviewed and evaluated before being brought or used on site. This review is performed, in part, to identify opportunities for nonhazardous material substitution in order to minimize the generation of a hazardous or mixed waste. When substitution is not feasible, appropriate controls shall be placed on the use of the hazardous product to ensure that hazardous waste generation is minimized and avoid the generation of a mixed waste.

Hazardous wastes shall be managed in accordance with the requirements of federal and state hazardous waste laws and regulations, NNSA/NSO and contractor procedures, and site-specific work documents. Typically, UGTA activities generate small volumes of hazardous waste that are usually identified before they are generated. For example, installing some types of downhole casing packers (bridge plugs) in a well may generate a hazardous waste, as will using some types of field-screening kits.

Hazardous wastes shall be characterized in accordance with the requirements of 40 CFR 261 (CFR, 2008b), operational procedures, and this UGTA WM Plan. Hazardous wastes may be characterized based on knowledge of the process that generated the waste (process knowledge), sampling results from direct sampling of the waste, field-monitoring results, associated well sample results, or other relevant information. Disposable sampling equipment and PPE may be characterized through visual inspection as it is generated in the field. Disposable sampling equipment and PPE suspected of coming into contact with chemical contamination (e.g., solvent) may be visually inspected for staining, discoloration, and gross contamination as the waste is generated. Waste with observable staining, discoloration, or gross contamination will be segregated and managed as suspect hazardous waste. Waste free of observable staining, discoloration, or gross contamination will not be considered hazardous waste and will be managed in accordance with the appropriate section of this WM Plan. For example, a waste stream may be visually free of staining, discoloration, or gross contamination, but may meet the criteria for being determined an LLW.

Hazardous wastes generated on the NTS are transferred to the M&O Contractor for disposal; hazardous wastes generated in areas outside the NTS may be transported for treatment, storage, and/or disposal by an approved hazardous waste transporter to an appropriate permitted treatment, storage, and disposal facility (TSDF).

3.3.2.4 Low-Level Radioactive Wastes

Low-level radioactive wastes may be generated when a radioactively contaminated aquifer is encountered, after using equipment or supplies in a contaminated setting, or while decontaminating equipment. Liquid LLW (such as decontamination fluids, drilling fluids, and groundwater) may be produced along with solid wastes (such as PPE, contaminated soil, and drill cuttings). The management of liquid wastes is governed by the FMP (Attachment 1) and applicable sections of this WM Plan.

Low-level radioactive wastes may be characterized by using process knowledge, analytical results of direct or associated samples, radiological surveys, and/or swipe results. Radiological swipe surveys and/or direct-scan surveys may be conducted on reusable sampling equipment, PPE, and disposable sampling equipment waste streams exiting a radiologically controlled area. This allows for the immediate segregation of radioactive waste from waste that may be unrestricted regarding radiological release (i.e., “nonradioactive” waste). Removable contamination limits, as defined in the most current version of the *NV/YMP Radiological Control Manual* (NNSA/NSO, 2004), may be used to determine whether such waste may be declared “nonradioactive.” Direct sampling of the waste may be conducted to aid in determining whether a particular waste unit (e.g., drum of soil) contains LLW, as necessary. Waste that is determined “nonradioactive” by either direct radiological survey/swipe results or through process knowledge will not be managed as potentially radioactive waste, but will be managed in accordance with the appropriate section of this WM Plan. Waste deemed potentially radioactive will be managed in accordance with this section and any other applicable section of this WM Plan.

Waste suspected to be LLW will be characterized in accordance with the requirements of the most current version of the *Nevada Test Site Waste Acceptance Criteria* (NTSWAC) (NNSA/NSO, 2008). The waste must be adequately characterized to certify that all acceptance criteria have been met. Relevant documentation is submitted through NNSA/NSO WMP for approval, and the waste is certified before disposal. Low-level waste meeting the acceptance criteria for NTS will be disposed of on site. Waste streams that do not meet the NTSWAC must be shipped to an approved TSDF.

3.3.2.5 Mixed Wastes

Mixed wastes are not anticipated to be generated during UGTA Sub-Project operations. However, there is the remote possibility that groundwater or cuttings may be encountered that contain both radioactive and hazardous contaminants in excess of applicable regulatory criteria. In addition, the potential exists for a spill to occur involving hazardous and radioactive contaminants.

Suspect mixed waste will be characterized in accordance with the both hazardous and radiological requirements. Characterization may be accomplished using process knowledge, analytical results of direct or associated samples, radiological surveys, and/or swipe results. Following characterization the waste will be disposed of per applicable requirements. The generation of mixed wastes shall be reduced through waste minimization activities, if possible. However, if an unanticipated mixed waste is generated, operations will be suspended until a disposal and NNSA/NSO WMP develops a compliance strategy for the mixed waste. Mixed wastes may be transported to the Area 5 TRU pad for storage and subsequently sent to an approved mixed waste TSDF.

3.4 Analytical Laboratories

Selection of analytical laboratories depends on several factors, including contractor-performed assessments, data quality objectives, regulatory requirements, turnaround time, laboratory capability and capacity, and U.S. Nuclear Regulatory Commission (NRC) licensing. Commercial laboratories used must be NRC-licensed with capability to receive samples directly from the NTS. Other facilities used for sample analysis of UGTA samples must meet the quality standards outlined in the UGTA QAPP (NNSA/NSO, 2003).

Before samples leave the NTS or well site, they must be radiologically screened and the documentation verified by a qualified individual (e.g., radiochemist, health physicist) to ensure they are shipped properly and meet the acceptance criteria for the receiving facility. Specific laboratory capabilities and capacity must be adequately demonstrated to meet the minimum analytical requirements of the most current version of the UGTA QAPP (NNSA/NSO, 2003).

Samples containing hazardous and radioactive constituents may be returned from the laboratory for proper disposition. Sample wastes will be managed in accordance with their waste type (i.e., nonhazardous, hazardous, LLW, or mixed), as described in this document.

4.0 References

CFR, see *Code of Federal Regulations.*

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ATTACHMENT 1

FLUID MANAGEMENT PLAN FOR THE UNDERGROUND TEST AREA PROJECT

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
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ATTACHMENT 1

FLUID MANAGEMENT PLAN FOR THE UNDERGROUND TEST AREA PROJECT

Approved by: /s/ K.C. Thompson (for) Date: 8/3/2009

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Federal Sub-Project Director
Underground Test Area Project

Approved by: /s/ Robert F. Boehlecke Date: 8/3/2009

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Environmental Restoration Project

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List of Acronyms and Abbreviations

BoFF	Bureau of Federal Facilities
CAIP	Corrective action investigation plan
CAU	Corrective action unit
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
ERP	Environmental Restoration Project
FFACO	*Federal Facility Agreement and Consent Order*
FMP	Fluid Management Plan
HNO_3	Nitric acid
L	Liter
MCL	Maximum contaminant level
mL	Milliliter
mg	Milligram
mg/L	Milligrams per liter
N/A	Not applicable
NDEP	Nevada Division of Environmental Protection
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NTS	Nevada Test Site
pCi	Picocurie
pCi/L	Picocuries per liter
RCRA	*Resource Conservation and Recovery Act*
TSDF	Treatment, storage, and disposal facility
UGTA	Underground Test Area

Definitions

Containment - A structure made of earthen materials or fabricated from metal or other suitable material that is designed to contain fluids generated from well-site activities. Typical containment structures identified in this plan are unlined sumps, lined sumps, and tanks.

Discharge - The physical process whereby fluids are released from the "flow line or discharge line" during drilling, well development, testing or sampling operations. Discharges are typically routed to appropriate containment structures (e.g., lined sump, unlined sump before final disposal). Fluids discharged for disposal purposes must meet applicable fluid management criteria.

Disposal - The act of discharging fluids with no intention of further management. Onsite disposal options include discharge to an infiltration area, unlined sump, or the ground surface and evaporation in lined sumps.

Fluid Management Plan (FMP) Criteria - An established standard or contaminant level used to make decisions for discharge within this plan. Different standards apply to different contaminants (e.g., Safe Drinking Water Standards, Maximum Contaminant Level, and Nevada Drinking Water Standards).

Fluid Transfer - The physical transfer of well-derived fluids from one appropriate fluid containment structure to another sump or area. Fluids may be conveyed using mechanical means or gravity means through appropriate piping or hoses.

Ground Surface - The natural relatively undisturbed condition of an area of soil or bedrock.

Infiltration Area - An area of the ground surface with defined boundaries that has been designated to discharge and infiltrate well fluids meeting applicable fluid management criteria.

Lined Sump - An engineered, constructed, earthen structure designed for the storage of well fluids that may exceed applicable fluid management criteria. Sump construction includes the placement of an appropriate liner material to ensure containment of the fluids and solids.

Unlined Sump - An engineered, constructed, earthen structure designed for the storage and infiltration of well fluids meeting applicable fluid management criteria. Sump construction may accommodate the introduction of a liner, if required, as part of the specific well-site operational strategy.

1.0 Introduction

The U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO) Environmental Restoration Project (ERP) Underground Test Area (UGTA) Sub-Project was formed to characterize the risk posed to human health and the environment as a result of underground nuclear testing activities at the Nevada Test Site (NTS). The UGTA Sub-Project investigation sites have been grouped into corrective action units (CAUs) in accordance with the *Federal Facility Agreement and Consent Order* (FFACO) (1996, as amended February 2008). At the time of this writing, the CAUs under the UGTA Sub-Project are CAU 97 (Yucca Flat/Climax Mine), CAU 98 (Frenchman Flat), CAU 99 (Rainier Mesa/Shoshone Mountain), CAU 101 (Central Pahute Mesa), and CAU 102 (Western Pahute Mesa). Site investigations are typically conducted in accordance with a Corrective Action Investigation Plan (CAIP), which defines the objectives and execution of a proposed CAU investigation. A primary UGTA Sub-Project objective is to gather data to characterize the aquifers beneath the NTS and adjacent lands. The investigations proposed under the UGTA Sub-Project may involve drilling new wells, recompleting existing wells, and testing and/or sampling wells. The location, depth, and construction of an individual well or well cluster by the UGTA Project will vary based on the scientific and technical objectives of the particular investigation.

1.1 Scope

This Fluid Management Plan (FMP) will be used in lieu of an NDEP-approved water pollution control permit for management of all fluids produced during the drilling, construction, development, testing, experimentation, and/or sampling of wells conducted by the UGTA Sub-Project. The FMP provides guidance for managing fluids generated during UGTA investigation activities and provides the criteria by which fluids may be discharged on site. Although the Nevada Division of Environmental Protection (NDEP), Bureau of Federal Facilities (BoFF), is not a signatory to this FMP, they are involved in the negotiation of the contents of this plan and approve the conditions contained within. The scope of this FMP includes well locations on and off the NTS that are associated with the UGTA CAUs. All fluids produced during the drilling, construction, development, testing, experimentation, and/or sampling of wells supporting the UGTA Sub-Project shall be managed in accordance with this FMP.

The major elements of this FMP are: 1) establishment of a well-site operations strategy, 2) site design/layout, 3) monitoring of contamination indicators (monitoring program), 4) sump characterization (sump sampling program), 5) fluid management decision criteria and fluid disposition, and 6) reporting requirements.

2.0 Proposed Investigation

This FMP serves as the governing document for all fluid-producing activities conducted to support UGTA CAU investigations. For this FMP, investigation activities are considered either 1) drilling activities or 2) other well-site activities.

2.1 Drilling Activities

Drilling activities that advance the borehole involve only those that disturb or penetrate new subsurface formation(s). Presumably, groundwater and rock cuttings generated as part of these operations are from geologic formations that are uncharacterized with regard to their chemical and radiological nature. Occasionally, well recompletion may involve advancing boreholes into new subsurface formations. Any activity that involves penetrating new subsurface formation(s) (e.g., advancing the hole) shall be considered a "drilling" activity for purposes of this FMP.

2.2 Other Well-Site Activities

Other well-site activities include those that encounter subsurface formations that were previously penetrated or contacted in some way. Examples of other well-site activities that typically occur without advancement of the borehole include cleaning and conditioning the borehole; performing circulation of the borehole; conducting fishing and wash-over operations; performing well completion operations, such as casing and stemming annular materials; developing wells; and testing and conducting periodic groundwater sampling events. Well completion designs and associated well construction activities will vary depending on well-specific objectives. The activities may include setting the immediate casing; running a completion string to a specified depth; and/or isolating productive zones with gravel, cement, packers, and sliding sleeves. Other activities may be conducted within a discrete period (e.g., a one-day well sampling event) or over a span of time (e.g., a series of well purging and testing activities that spans months). Many of the wells drilled or recompleted under the UGTA Sub-Project may support long-term monitoring programs and may be sampled periodically. Sampling activities at UGTA Sub-Project well sites are also covered under this FMP. Typically, well sampling involves purging the well while fluids are produced. The volume of fluids produced will vary from well to well.

3.0 Well-Site Operational Strategy

The well-site operational strategy is site-specific and will vary based on the available historical knowledge, background contamination, anticipated fluid production, potential for encountering contamination, and the scientific and technical objectives of the investigation.

The first step in the process is to establish the well location. Second, determine whether the well is inside or outside the NTS boundaries. Third, determine whether the well will follow a far-field or near-field well-site operational strategy.

The far- and near-field designations refer to the potential for encountering radioactive contamination in the well. A comprehensive assessment of historical information (or process knowledge) that may be relevant to the site operational strategy must be conducted. Information used to support this decision may include, but shall not be limited to, the following:

- Proximity of the proposed well(s) to the location of an underground nuclear detonation
- Hydrogeologic setting of the proposed well and surrounding areas
- The potential for chemical or radiological contamination in the groundwater due to underground testing
- Documentation or interviews pertaining to historical site operations
- Analytical and/or site monitoring data associated with the well or surrounding area wells
- Groundwater flow and transport modeling results
- Other applicable process/historical knowledge

Figure 3-1 outlines the process to follow in preparing for a fluid-producing investigation activity under this FMP. This process shall be completed before beginning the investigation activity. There are four basic well-site operational strategies identified in this FMP: Far-field at NTS (Section 4.0), Far-field outside NTS (Section 5.0), Near-field at NTS (Section 7.0), and Near-field outside NTS (Section 8.0).

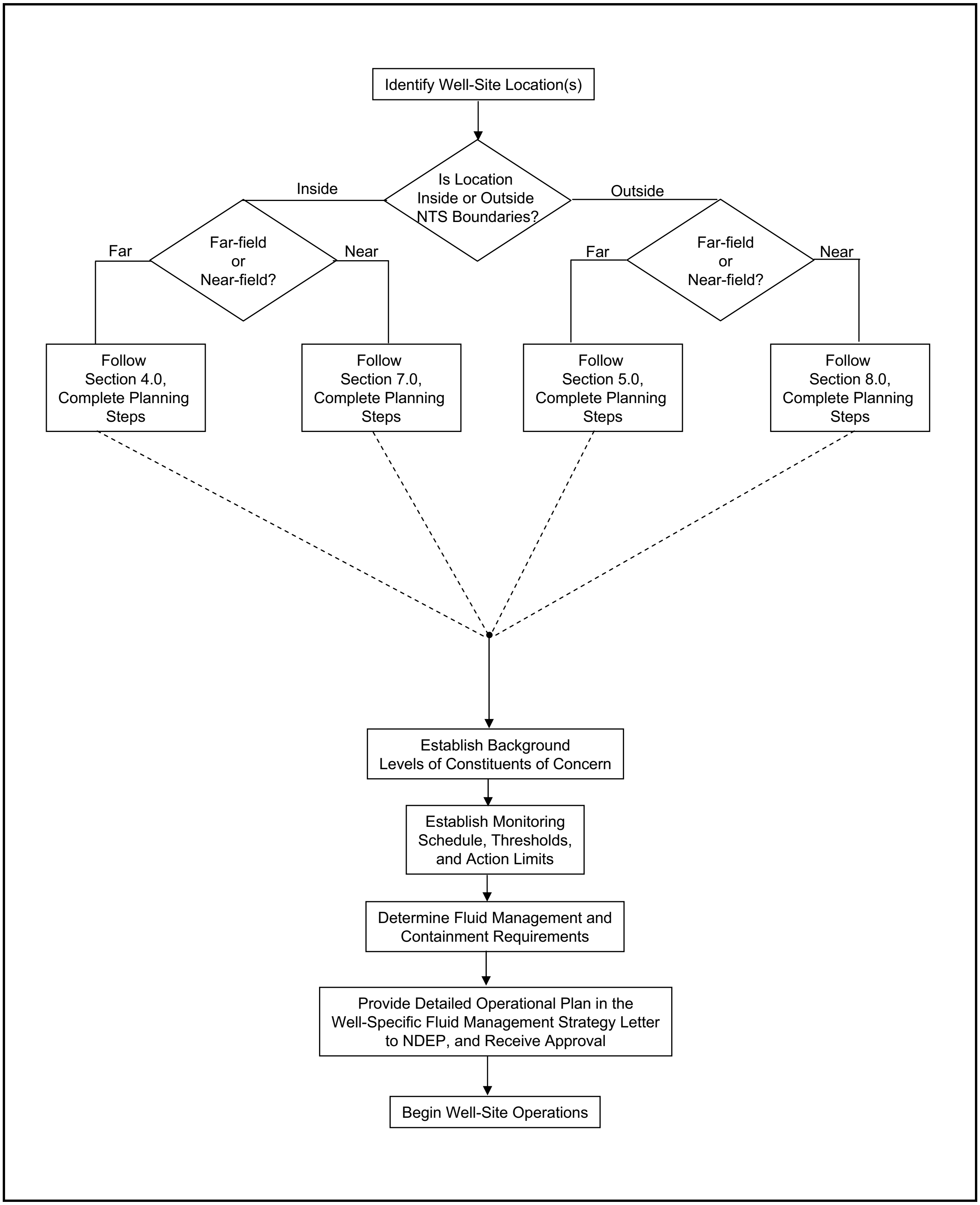

Figure 3-1
Fluid Management Planning Process

3.1 Well-Specific Fluid Management Strategy Letter

Develop a Well-Specific Fluid Management Strategy Letter for submittal to NDEP. The letter will identify the well-site operational strategy (e.g., Near-field at NTS) and discuss supporting rationale. Site-specific information, specifics pertaining to the nature and configuration of the planned fluid containment, and transition contingencies will be identified in the letter. Using the applicable section (as identified in Figure 3-1), develop the Well-Specific Fluid Management Strategy Letter. The following information may be incorporated into the letter:

- Establish expected levels of contaminants or constituents of concern in groundwater background, if applicable.

- Establish monitoring requirements (initial and operational). The monitoring program supports the daily management of fluids produced during an investigation activity. This monitoring program is based on the use of the contamination indicators (tritium and/or lead) to make decisions regarding fluid containment and/or the progression of investigation operations. Decisions are based on analysis that is performed on site while operations proceed. Based on its physical and chemical properties, tritium has been chosen as the indicator for radioactive contamination. Tritium is a radioactive isotope that is readily transported in groundwater. Tritium provides the earliest detection of groundwater contamination resulting from underground testing. Lead has been chosen as the indicator for chemical contamination in groundwater at UGTA near-field designated well sites. This is because lead-laden "racks" were commonly used in the design and construction of underground nuclear tests, and lead was also used as shielding in the design of some underground nuclear devices. Either of these sources may have contributed to lead contamination in groundwater.

- Determine on site monitoring frequency, contamination thresholds, and action levels.

- Establish configuration of site discharge areas (e.g., unlined sump, lined sump, boundaries of infiltration area) and site-specific fluid containment requirements. Figure 3-2 depicts a typical well-site layout detailing the drill-rig pad, discharge lines, lined or unlined sumps, and surface area discharge. The configuration may be modified based on the site-specific information and identified in the strategy letter.

- Identify potential access points to infiltration area (roads), and designate posting requirements.

- Establish notification requirements.

- Field operations will not generate discharge fluids until NDEP approves the strategy letter.

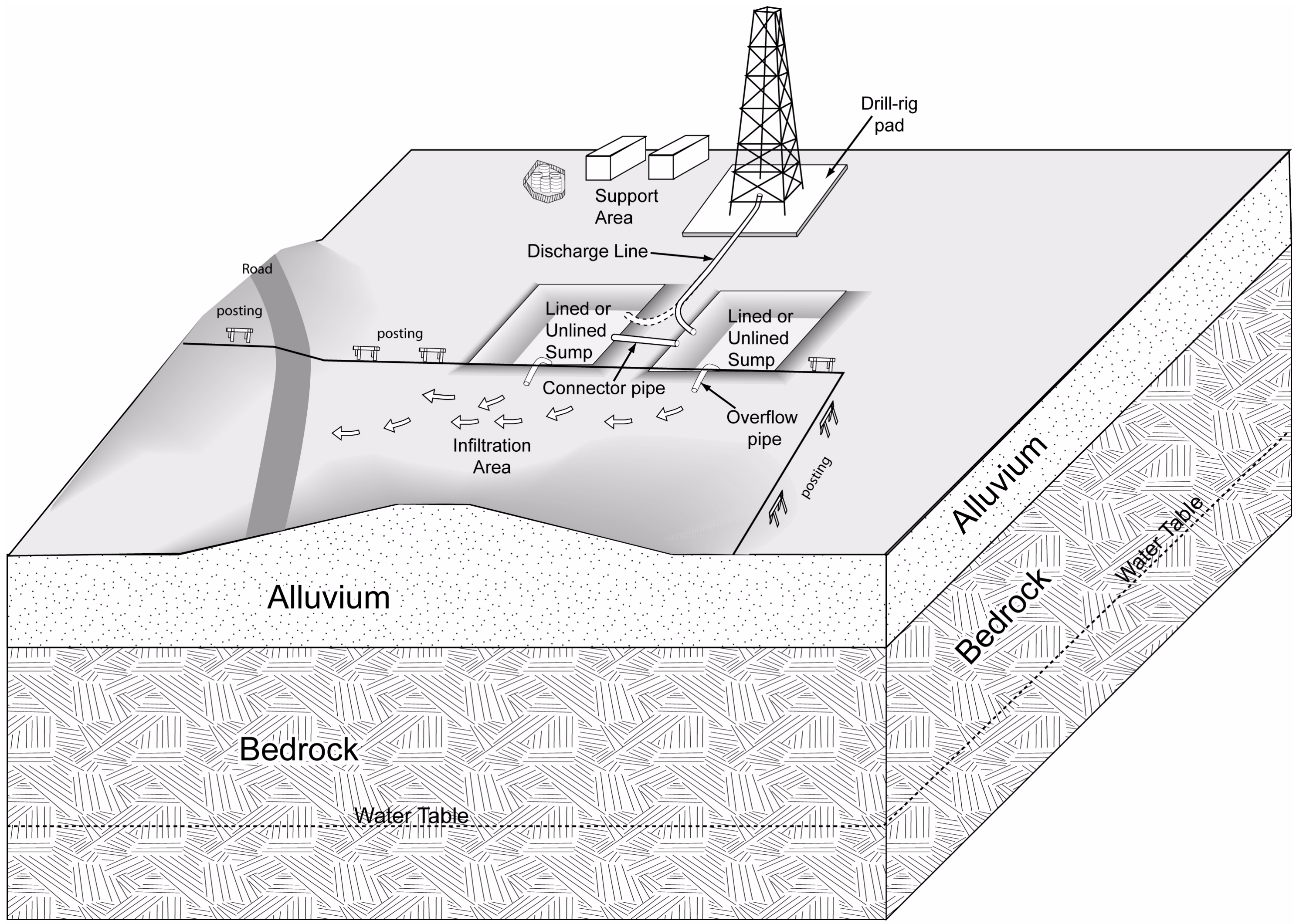

Figure 3-2
Well-Site Layout Example

The initial operational strategy for a particular well site will be applied to all subsequent well-site activities, such as aquifer tests or routine sampling, unless site process knowledge or other site factors change. For example, if a well was drilled under a near-field strategy and site conditions continue to support this determination, subsequent investigation activities must proceed under a near-field strategy, unless an alternate strategy can be justified.

If NNSA/NSO ERP plans to operate a particular investigation activity using a different strategy than that initially determined for the well site, NNSA/NSO ERP shall notify NDEP. Such notification may be provided via telephone, fax, or email and will be followed by a formal letter describing any NDEP approved operational changes.

4.0 Fluid Management Strategy for Far-field at NTS

At far-field wells on the NTS, radioactive constituents or metals contamination from underground testing are not expected to be encountered in excess of 20 × FMP Criteria (see Appendix A). Historically, far-field wells constructed do not exceed fluid quality parameters for discharging fluids to a constructed unlined sump or unrestricted ground discharge to an infiltration area. The far-field strategy involves analyzing contaminant indicators (tritium and lead, if necessary) through monitoring and containing fluids in sumps. For this operational strategy, investigation activities are considered either activities that advance the borehole (Section 4.1) as part of drilling operations or other well-site activities (Section 4.2).

4.1 Well Drilling Activities

Drilling activities that advance the borehole involve only those that penetrate or disturb new subsurface formation(s). Presumably, groundwater and rock cuttings generated as part of these operations are from geologic formations that are uncharacterized with regard to their chemical and radiological nature.

4.1.1 Fluid Containment

Under a far-field strategy at NTS, fluids may be discharged directly from the well to the ground surface, an unlined sump, a lined sump, or aboveground containment (e.g., Baker tank). The type of fluid management is based on available process knowledge and is identified in the Well-Specific Fluid Management Strategy Letter approved by NDEP.

In a typical far-field scenario, two sumps (or infiltration basins) are constructed. An equalizing pipe may be constructed between the basins to allow for the transfer of fluids from one basin to the other. An overflow pipe may be constructed in one of the sumps to allow for discharge to the infiltration area (ground surface). To avoid human contact with discharge fluids, access to the sumps and infiltration area will be controlled and posted while drilling/field operations are underway. Figure 3-2 offers an example of a typical fluid containment configuration. In some situations, one sump may be lined as a contingency if monitoring identifies fluids that do not meet far-field fluid management criteria.

4.1.2 Monitoring Program

The monitoring program supports the daily management of fluids produced during an investigation activity. This program is based on the use of tritium as a contamination indicator to make decisions regarding fluid containment and/or the progression of investigation operations.

Monitoring results are not used to support final fluid disposition decisions; rather, monitoring results prompt daily operational decisions. Figure 4-1 outlines the FMP decision points within the monitoring program for far-field well sites at NTS. The NNSA/NSO ERP shall be notified immediately when tritium monitoring meets or exceeds the established action level. Notification of subsequent monitoring results to NNSA/NSO ERP and NDEP shall follow established protocol. Monitoring results will be available to NDEP in accordance with Section 9.0 of this FMP.

4.1.2.1 Lead Monitoring

The potential for metals from underground testing to be present in drilling fluids in a far-field well is remote. Monitoring for lead is not required unless it was identified in the Well-Specific Fluid Management Strategy Letter.

4.1.2.2 Tritium Monitoring

While advancing the borehole at a far-field site, a tritium screening sample will be collected every hour at the discharge line. Any reduction or elimination of tritium monitoring shall be based on process knowledge and approval from NNSA/NSO ERP and NDEP. Because tritium can move with groundwater, tritium is the indicator used during operations of the far-field strategy. The NDEP will be notified via telephone, fax, or email when tritium monitoring levels reach or exceed 200,000 picocuries per liter (pCi/L); this is a courtesy notification only and will not result in operations being altered or suspended. If tritium monitoring levels exceed 400,000 pCi/L, NNSA/NSO ERP will be notified; subsequently, NNSA/NSO will notify NDEP. Discharge will be routed to a lined sump, and the transition strategy will be implemented as identified in Section 6.0 of this FMP.

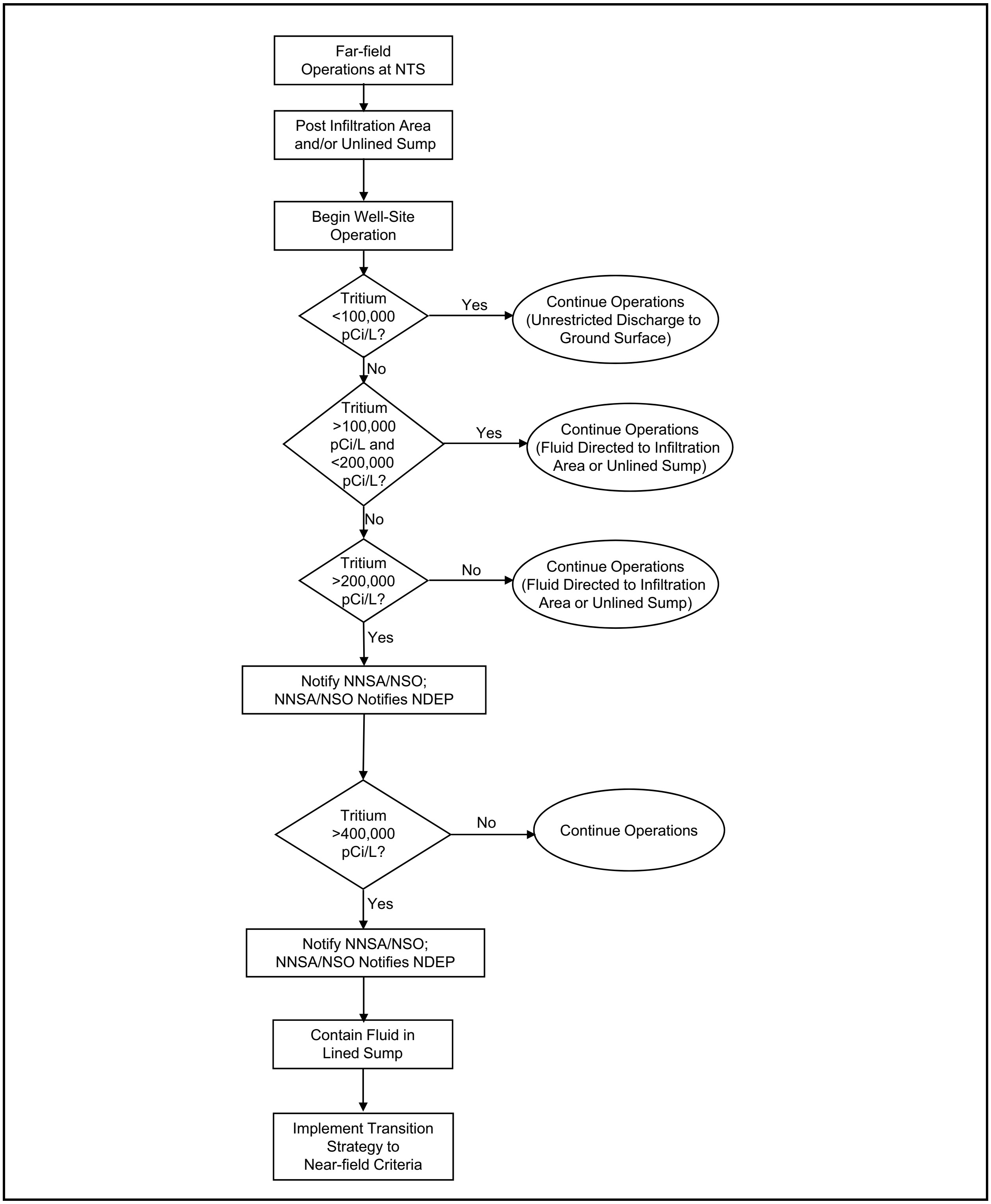

Figure 4-1
Far-field at NTS Monitoring Decision Diagram

4.2 Other Well-Site Activities

Other well-site activities include those that encounter subsurface formations that were previously penetrated or contacted in some way. Examples of other well-site activities that typically occur without advancement of the borehole include cleaning and conditioning the borehole; performing circulation of the borehole; conducting fishing and wash-over operations; performing well completion operations, such as casing and stemming annular materials; developing wells; and testing and conducting periodic sampling events. Well completion designs and associated well construction activities will vary depending on well-specific objectives and may include setting intermediate casing; running a completion string to a specified depth; and/or isolating productive zones with gravel, cement, packers, and sliding sleeves. Other activities may be conducted within a discrete period (e.g., a one-day well sampling event) or over a span of time (e.g., a series of well purging and testing activities that spans months).

4.2.1 Fluid Containment

Fluid containment options during other well-site activities operating under the far-field strategy will typically be the same as those described in Section 4.1. The infiltration area and/or unlined sump area will be posted while in use to control access. Previously constructed sumps will be visually inspected before use. The inspection will be recorded in the site-specific well logbook.

4.2.2 Monitoring

During other well-site activities, a tritium sample will be collected once daily at the discharge line. Monitoring samples may be analyzed on or off site but will, at a minimum, be analyzed weekly. Additional samples may be taken, as needed. Further reduction or elimination of tritium monitoring shall be based on process knowledge and approval from NNSA/NSO ERP and NDEP.

5.0 Fluid Management Strategy for Far-field outside NTS

At far-field wells, radioactive constituents or metals contamination from underground testing are not expected to be encountered in excess of 20 × FMP Criteria (see Appendix A). Historically, far-field wells constructed do not exceed fluid quality parameters for discharging fluids to a constructed unlined sump or unrestricted ground discharge to an infiltration area. The far-field strategy involves analyzing contaminant indicators (tritium and lead, if necessary) through monitoring and containing fluids in sumps. For this operational strategy, investigation activities are considered either activities that advance the borehole as part of drilling operations or other well-site activities.

5.1 Well Drilling Activities

Drilling activities that advance the borehole involve only those that penetrate or disturb new subsurface formation(s). Presumably, groundwater and rock cuttings generated as part of these operations are from geologic formations that are uncharacterized with regard to their chemical and radiological nature.

5.1.1 Fluid Containment

Under a far-field strategy outside the NTS, fluids may be discharged directly from the well to the ground surface, an unlined sump, a lined sump, or aboveground containment (e.g., Baker tank). The type of fluid containment required is based on available process knowledge and is identified in the Well-Specific Fluid Management Strategy Letter approved by NDEP.

In a typical far-field scenario, two sumps may be constructed. An equalizing pipe may be constructed between the basins to allow transfer of fluids from one basin to the other. An overflow pipe may be constructed in one of the sumps to allow for discharge to the ground surface or infiltration area. To avoid human contact with discharge fluids, access to the sump and/or infiltration area will be controlled and posted when evaporation/infiltration is operational. Figure 3-2 offers an example of a typical fluid containment configuration. In some situations, one sump may be lined as a contingency if monitoring identifies fluids that do not meet fluid management criteria.

5.1.2 Monitoring Program

The monitoring program supports the daily management of fluids produced during an investigation activity. This program is based on the use of tritium as a contamination indicator to make decisions regarding fluid containment and/or the progression of investigation operations. Based on its physical and chemical properties, tritium has been chosen as the indicator for radioactive contamination. Tritium is a radioactive isotope that is readily transported in groundwater and provides the earliest detection of groundwater contamination resulting from underground testing.

Monitoring results are not used to support final fluid disposition decisions; rather, monitoring results prompt daily operational decisions. Figure 5-1 outlines decision points within monitoring program for far-field well sites outside the NTS. The NNSA/NSO ERP shall be notified immediately when tritium monitoring meets or exceeds the established action level. Notification of subsequent monitoring results to NNSA/NSO ERP and NDEP shall follow established protocol.

5.1.2.1 Lead Monitoring

The potential for metals from underground testing to be present in drilling fluids in a Far-field well is remote. Monitoring for lead is not required unless it was identified in the Well-Specific Fluid Management Strategy Letter.

5.1.2.2 Tritium Monitoring

Background levels for radioisotopes found in nearby wells may be established during planning.
If fluid samples from other nearby wells naturally exceed 15 pCi/L gross alpha and/or 50 pCi/L gross beta, then the background level can supersede the 15 pCi/L gross alpha and 50 pCi/L gross beta limits for fluid discharge to ground surface. The expected background levels for gross alpha and beta and alternative action levels at a particular well site will be described in the Well-Specific Fluid Management Strategy Letter and approved by NDEP.

While advancing the borehole at a far-field site, a tritium screening sample will be collected every hour at the discharge line. Reduction or elimination of tritium monitoring shall be based on process knowledge and approval from NNSA/NSO ERP and NDEP. Discharge fluids with tritium levels less than 20,000 pCi/L are unrestricted for discharge. Fluids containing greater than or equal to

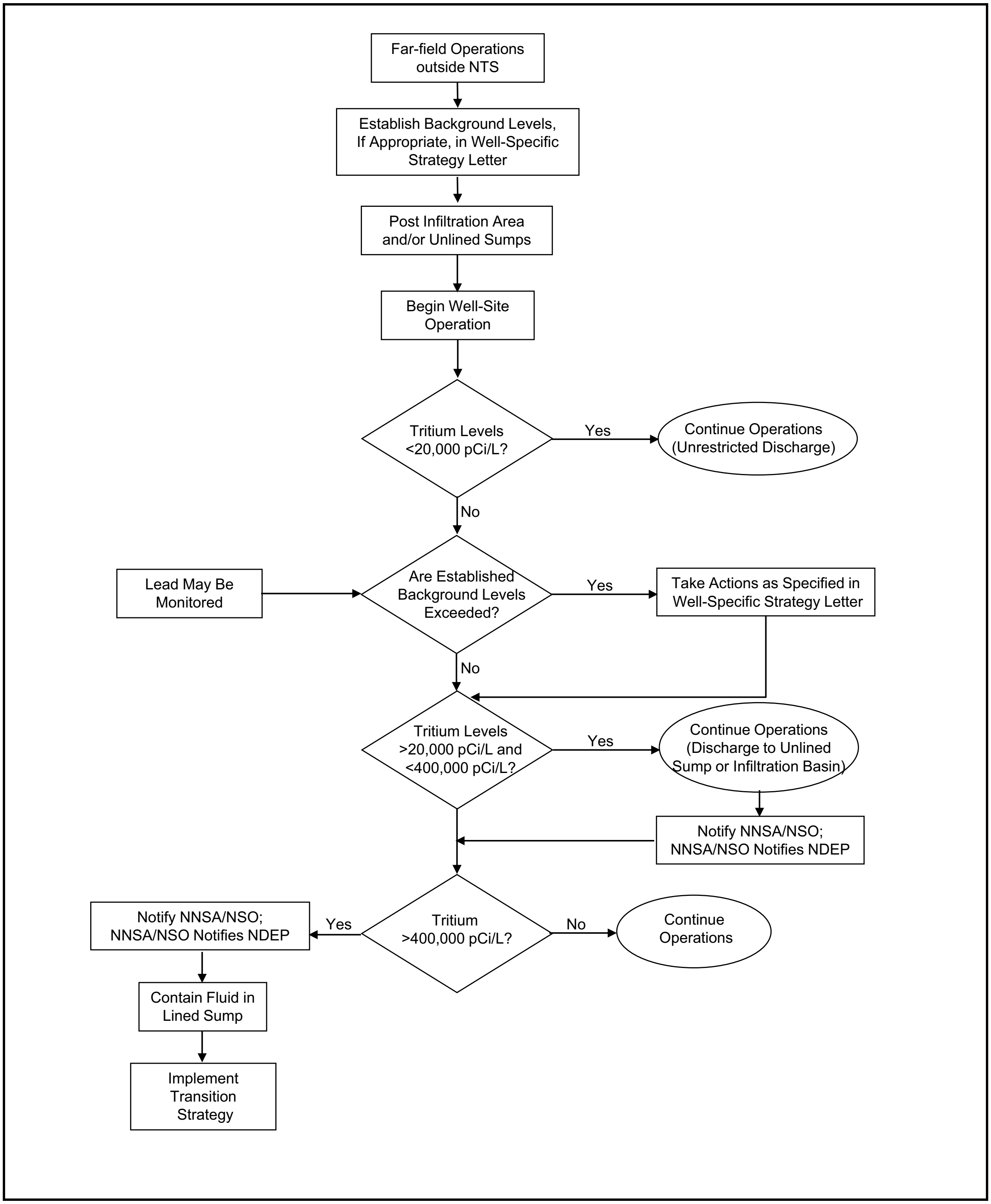

Figure 5-1
Far-field outside NTS Monitoring Decision Diagram

20,000 pCi/L to less than 400,000 pCi/L of tritium, greater than or equal to 15 pCi/L to less than 300 pCi/L gross alpha, or greater than or equal to 50 pCi/L to less than 1,000 pCi/L gross beta shall be discharged to a fenced or posted unlined sump, or to a fenced or posted infiltration area with controlled access until such time that the discharge fluid has infiltrated into the soil or evaporated.

Natural background levels of radioisotopes (as established and approved during planning) may modify the decision criteria. The NDEP will be notified via telephone, fax, or email when tritium monitoring levels reach or exceed 20,000 pCi/L; this is a courtesy notification only and will not result in operations being altered or suspended. Figure 5-1 outlines the decision points in the monitoring program for far-field well sites outside the NTS. If tritium monitoring levels exceed 400,000 pCi/L, NNSA/NSO ERP will be notified; subsequently, NNSA/NSO will notify NDEP. Discharge will be routed to a lined sump, and the transition strategy will be implemented as identified in Section 6.0 of this FMP. Monitoring results will be available to NDEP in accordance with Section 9.0.

5.2 Other Well-Site Activities

Other well-site activities include those that encounter subsurface formations that were previously penetrated or contacted in some way. Examples of other well-site activities that typically occur without advancement of the borehole include cleaning and conditioning the borehole; performing circulation of the borehole; conducting fishing and wash-over operations; performing well completion operations, such as casing and stemming annular materials; developing wells; and testing and conducting periodic sampling events. Well completion designs and associated well construction activities will vary depending on well-specific objectives and may include setting intermediate casing; running a completion string to a specified depth; and/or isolating productive zones with gravel, cement, packers, and sliding sleeves. Other activities may be conducted within a discrete period (e.g., a one-day well sampling event) or over a span of time (e.g., a series of well purging and testing activities that span months).

5.2.1 Fluid Containment

Fluid containment options during other well-site activities operating under the far-field strategy will typically be the same as those described in Section 5.1.1. To avoid human contact with discharge fluids, access to the unlined sump and infiltration area will be controlled and posted during evaporation/infiltration operations. Previously constructed sumps will be visually inspected before use. The inspection will be recorded in the site-specific well logbook.

5.2.2 Monitoring

During other well-site activities, a tritium sample will be collected once daily at the discharge line. Monitoring samples may be analyzed on or off site but will, at a minimum, be analyzed weekly or as stated in the Well-Specific Fluid Management Strategy Letter. Further reduction or elimination of tritium monitoring shall be based on process knowledge and approval from NNSA/NSO ERP and NDEP.

6.0 Transition Strategy

A transition to near-field well strategy is required if monitoring at a designated far-field well site (at NTS or off site) reveals tritium concentrations that exceed the fluid management criteria (i.e., concentrations greater than 400,000 pCi/L) or decision criteria identified in the Well-Specific Fluid Management Strategy Letter. If the well location does not have the appropriate fluid containment available (i.e., lined sump or portable tank), NNSA/NSO ERP will be notified; subsequently, NNSA/NSO will notify NDEP. Discharge will be routed to a lined sump, and the transition strategy will be implemented.

The following transition strategy may be employed to transition well-site operations from a far-field strategy to a near-field strategy.

- The well site will change to a near-field site, with tritium being monitored hourly and lead monitored every eight hours.
- A minimum of one single-lined sump may be constructed to contain fluids that exceed the tritium action level.
- The action levels and subsequent actions taken when these levels are exceeded remain the same as in the near-field strategy.
- When the monitoring of tritium and/or lead meets or exceeds the established action level, NNSA/NSO ERP shall be notified immediately, subsequently NNSA/NSO will notify NDEP.

Notification of subsequent monitoring results to NNSA/NSO ERP and NDEP shall follow established protocol.

7.0 Fluid Management Strategy for Near-field at NTS

Contaminated fluids are more likely to be encountered at near-field well locations. The near-field fluid management strategy provides reasonable assurance that fluids produced at these wells will be managed in compliance with applicable state and federal regulations. The near-field strategy involves analyzing (tritium and lead) regularly and containing fluids in lined sumps. For this operational strategy, investigation activities are considered either drilling operations, activities that advance the borehole, or other well-site activities.

7.1 Well Drilling Activities

Drilling activities that advance the borehole involve only those that penetrate or disturb new subsurface formation(s). Presumably, groundwater and rock cuttings generated as part of these operations are from geologic formations that are uncharacterized with regard to their chemical and radiological nature.

7.1.1 Fluid Containment

Sump construction and use decisions will be based in part on predicted fluid volumes, background constituents, and the potential for radiological and/or chemical contamination in the well. Once near-field discharge criteria is exceeded, the discharge of fluids to the ground surface or to an infiltration area or unlined sump at a near-field well site is generally not anticipated; however, this practice may be approved on a case-by-case basis as identified in the Well-Specific Fluid Management Strategy Letter and approved by NDEP. Figure 3-2 provides a typical fluid containment configuration. Site-specific characteristics and restrictions will determine the actual site layouts that are described in the letter. To avoid human contact with discharge fluids, access to the sump and infiltration area will be controlled and posted while evaporation/infiltration is operational.

The following example describes a near-field sump construction and use scenario. This scenario may be considered generally applicable to the given site conditions; however, actual sump construction and use may vary among well sites.

In a near-field scenario, two lined sumps may be constructed, with drilling fluids discharged to the first sump until that point when radiological or chemical contamination is encountered in the well. Once monitored fluids exceed applicable FMP criteria, fluid discharge is routed to the second lined sump. A sample is collected from the first sump and analyzed at a laboratory for FMP analytical parameters (Appendix B). The comparison of sample results with FMP criteria will dictate whether the fluids from the first sump may be discharged directly to an infiltration area, unlined sump, or to the ground surface. The fluid volume in the second sump when filled will undergo the same procedure. If fluids fail to meet the criteria for discharge to a unlined sump, infiltration area or ground surface, the fluids will remain in the lined sump to allow for evaporation.

7.1.2 Monitoring Program

The monitoring program supports the daily management of fluids produced during an investigation activity. This program is based on the use of the contamination indicators (tritium and/or lead) to make decisions regarding fluid containment and/or the progression of investigation operations. Decisions are based on analyses that are performed while operations proceed.

Figure 7-1 outlines the decision points in the monitoring program for near-field well sites at NTS. Monitoring results are not typically used to support final fluid disposition decisions; rather, monitoring results prompt daily operational decisions. For example, in a near-field scenario, the tritium action level of 400,000 pCi/L (20 × FMP Criteria) would prompt the diversion of fluids to a lined sump. Similarly, the lead action level of 3 milligrams per liter (mg/L) indicates when fluid lead concentrations are approaching the *Resource Conservation and Recovery Act* (RCRA) hazardous waste concentration (5 mg/L).

Fluids generated during near-field operations will be analyzed for lead and tritium while the borehole is being advanced. Monitoring may be initiated in vadose zone drilling to account for possible prompt injection phenomenon encountered above the groundwater table.

The NNSA/NSO ERP shall be notified immediately when monitoring of tritium and/or lead meets or exceed the established action level; subsequently, NNSA/NSO will notify NDEP. Notification of subsequent monitoring results to NNSA/NSO ERP and NDEP shall follow established protocol. Monitoring results will be made available to NDEP in accordance with Section 9.0 of this FMP.

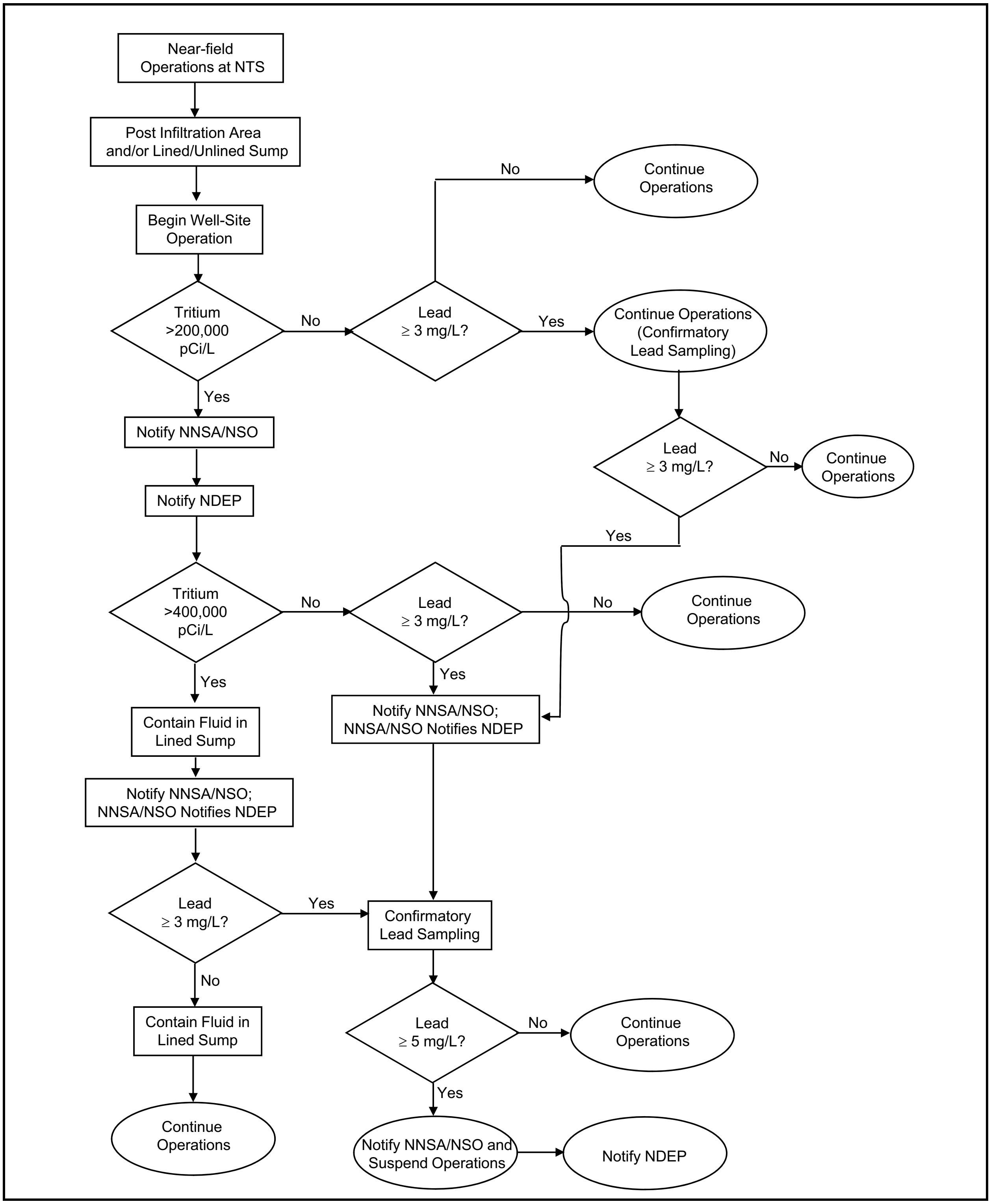

Figure 7-1
Near-field at NTS Monitoring Decision Diagram

7.1.2.1 Tritium Monitoring

During advancement of the borehole, a tritium screening sample will be collected and analyzed hourly from the return discharge line. The NNSA/NSO will notify NDEP via telephone, fax, or email when tritium monitoring levels reach or exceed 200,000 pCi/L; this is a courtesy notification only and will not result in operations being altered or suspended. The action level for tritium is 400,000 pCi/L (see Appendix A). If this level is exceeded during borehole advancement activities, NNSA/NSO ERP will be notified, and NNSA/NSO will subsequently notify NDEP that fluids will be discharged to a lined sump, and the well site will be considered and managed as "radiologically contaminated" from that point forward, unless proven otherwise.

7.1.2.2 Lead Monitoring

A sample for lead screening/analysis shall be collected from the return discharge line once every eight hours while the borehole is being advanced. Monitoring samples may be analyzed on or off site but will, at a minimum, be analyzed daily. Lead may be monitored with a digital voltammeter, colorimetric method, or other appropriate method.

Background levels for metals may be identified in the Well-Specific Fluid Management Strategy Letter that is submitted to NDEP for approval. Any site-specific changes to the sampling protocols detailed below will be identified in the strategy letter.

Lead is monitored primarily to ensure that the RCRA level for lead (5 mg/L) is not exceeded. Exceeding the RCRA level for lead may result in the generation of a hazardous or mixed waste in the sump(s). Therefore, the lead monitoring method must be capable of indicating lead at concentrations of less than 5 mg/L. To provide early warning of lead levels approaching the RCRA standard, the level of 3 mg/L was chosen as the initial decision point for lead monitoring under this FMP. That is, if lead concentrations detected are 3 mg/L or greater, the confirmatory sampling protocol will be initiated. The detection of lead at any concentration less than 5 mg/L will not prompt the shutdown of operations; only a confirmed lead concentration of 5 mg/L mandates that fluid generating operations cease.

If a quantitative method is used to monitor lead, the action level for lead is 3 mg/L. If a semiquantitative method is employed, any indication of the presence of lead shall serve as the action level and prompt confirmatory sampling. In the following example, the lead “action level” referred to is associated with the RCRA hazardous waste lead level. The example describes confirmatory sampling to be initiated when the lead action level is exceeded.

If a monitoring sample yields lead concentrations at or above the action level, an additional discharge line sample shall be collected immediately and analyzed. If this confirmatory sample yields lead concentrations less than the action level, the regular eight-hour monitoring schedule shall resume. If the confirmatory sample results in lead concentrations at or above the action level, a composite sample shall be collected immediately from the active sump. The first sump sample shall be analyzed for lead. If the sump sample results fall below the action level, regular eight-hour discharge monitoring shall resume. If the sump sample yields lead levels at or above the action level, drilling operations shall cease and a composite sump sample shall be obtained for laboratory analysis (see Appendix B).

7.1.3 Fluid Management Decision Criteria

The fluid management decision criteria used to determine the options for final fluid disposition are identified in Appendix A. These criteria are based on the Nevada Drinking Water Standards, federal standards, and NDEP guidance. Using UGTA historical knowledge, the following parameters were selected for establishing fluid quality for arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, tritium, gross alpha, and gross beta. Fluid management decision criteria indicate the thresholds at which fluid disposal decisions are made. The decision criteria are based on the concentration of dissolved constituents. Samples collected in accordance with the sump sampling program will be analyzed for total and dissolved RCRA metals, gross alpha, gross beta, and tritium (see Appendix B). Only the dissolved metals results will be compared with Appendix A limits when making fluid disposal decisions.

In Appendix A, the 5 × FMP Criteria limits represent the maximum constituent concentrations below which fluids may be discharged to the ground surface. That is, if all radiological parameters and dissolved metals in Appendix A are less than 5 × FMP Criteria, fluids may be discharged directly to the ground surface. Similarly, if all parameters in Appendix A are less than 20 × FMP Criteria limits, fluids may be discharged into an infiltration area or unlined sump.

Note: The 5 × and 20 × FMP Criteria values in Appendix A are simply multipliers of the identified values. That is, the drinking water standards are the basis for development of the 5 × and 20 × FMP Criteria values.

Only the 5 × and 20 × FMP Criteria values in Appendix A will be used to make discharge/disposal decisions at near-field wells at NTS. The drinking water standards themselves are included in Appendix A as a point of reference only and will not be compared directly with fluid analytical results to make discharge/disposal decisions.

7.1.4 Sump Sampling Program

The primary purpose of this sampling program is to determine final fluid disposition. The collection of samples for laboratory analysis (Appendix B) applies to fluids contained or stored in sumps. The analytical results received from the laboratory are compared to the limits in Appendix A to allow the discharge of fluids to an unlined sump, infiltration area, or the ground surface.

If a sump is used to contain drilling fluids from an investigation activity, a sump sample shall be collected and analyzed to determine proper fluid disposition of the fluids. The primary purpose of these samples is to characterize the contained fluids. While fluids are being added to the sumps, as during borehole advancement or well completion, a sample does not need to be collected. However, once operations that affect containment volume have ceased or a change in fluid containment is to occur, a sample must be collected for laboratory analysis. The sample must be collected from the sump where fluids were discharged (active sump), and from all sumps to which fluids may have been transferred in the course of the immediate investigation activity. Samples shall be collected, or appropriate analytical data available, for each containment that holds fluid at a site before discharging or the project vacating the site. Contained fluids will be analyzed for the parameters listed in Appendix B.

7.1.5 Fluid Disposition

This section discusses fluid disposition options for fluids that are contained/stored in a lined sump. Appendix C illustrates the general decision flow process for the disposal of fluids. This FMP allows the discharge of investigation fluids on site when specific fluid criteria are met. The options for onsite disposal of investigation fluids are an unlined sump, infiltration area, and the ground surface. An infiltration area is a predestinated bounded area on the ground surface within which fluids may be discharged. The "ground surface" refers to the natural or relatively undisturbed condition of an area of surface soil or rock. Access to the infiltration area or sump will be controlled and posted when active.

Decisions on fluid disposition are based on laboratory sample results, as compared to fluid decision criteria. In no event will fluids be discharged to an infiltration area or the ground surface from a lined sump if fluid decision criteria (as provided in Appendix A) are not met. The onsite disposal options for fluids stored in lined sumps are:

- **Direct discharge to the ground surface**. Fluids documented to be less than 5 × FMP Criteria for all required FMP analytical parameters may be discharged to the ground surface. Caution shall be taken to ensure that erosion is controlled.
- **Discharge to an infiltration area or unlined sump**. Fluids documented to be less than 20 × FMP Criteria for all required FMP analytical parameters may be discharged to an infiltration area or unlined sump.

If fluids do not meet the fluid decision criteria for discharge/disposal on site, then fluid disposal options include 1) onsite containment in lined sumps or 2) transport for disposal off site. The criteria for these options are as follows:

- **Onsite containment in a lined sump.** Fluids documented to contain RCRA metals below hazardous waste limits found in the RCRA standards in the most recent version of Title 40 *Code of Federal Regulations* (CFR) Part 261.24 (CFR, 2009) and radiological parameters greater than 20 × FMP Criteria will be allowed to evaporate in lined sumps on site. Alternatively, these fluids may be transported off site via portable tanks to another lined sump for storage or transported to a NTS or a permitted commercial treatment, storage, and disposal facility (TSDF).
- **Transportation to NTS or offsite TSDF**. Fluids documented to contain any RCRA metal above its respective hazardous waste limit found in the RCRA standards in the most recent version of 40 CFR 261.24 (CFR, 2009) would result in the suspension of operations. These fluids would be managed as hazardous (or mixed) waste in accordance with the most current version of the State of Nevada hazardous waste regulations and applicable DOE Orders. The NNSA/NSO ERP and NDEP will be notified immediately if fluids are documented to be hazardous or mixed waste. The fluids may be pumped from the lined sumps and transported to an appropriate storage area on the NTS, or may be transported directly to a permitted commercial TSDF.

The appropriate fluid disposal option will be chosen based on a comparison of the appropriate laboratory analytical data with the fluid management decision criteria specific to each option. As indicated, the concentrations of fluid management parameters outlined in Appendix A shall not exceed 20 × FMP Criteria if the fluids are to be discharged to an infiltration area or unlined sump. Fluids intended for discharge to the ground surface must not exceed 5 × FMP Criteria.

7.2 Other Well-Site Activities

Other well-site activities include those that encounter subsurface formations that were previously penetrated or contacted in some way. Examples of other well-site activities that typically occur without advancement of the borehole include cleaning and conditioning the borehole; performing circulation of the borehole; conducting fishing and wash-over operations; performing well completion operations, such as casing and stemming annular materials; developing wells; and testing and conducting periodic sampling events. Well completion designs and associated well construction activities will vary depending on well-specific objectives and may include setting intermediate casing; running a completion string to a specified depth; and/or isolating productive zones with gravel, cement, packers, and sliding sleeves. Other activities may be conducted within a discrete period (e.g., a one-day well sampling event) or over a span of time (e.g., a series of well purging and testing activities that span months).

7.2.1 Fluid Containment

Fluid containment options during other well-site activities in the NTS operating under the near-field strategy will typically be the same as those described in Section 7.1.1. Lined sumps used during borehole advancement may be used for fluid containment during well development, testing, and periodic sampling activities. Previously constructed sumps will be visually inspected before use. The inspection will be recorded in the site-specific well logbook.

If well-site conditions have changed from near-field to far-field, alternate fluid containment options will be available during other well-site activities, to include discharge to an unlined sump, infiltration area, or to the ground surface. The NNSA/NSO ERP will notify NDEP of any change in well-site operation strategy or any deviations from the Well-Specific Fluid Management Strategy Letter.

7.2.2 Monitoring

The primary difference between monitoring during borehole advancement and during other well-site activities is the frequency of monitoring sample collection. In a near-field scenario during other well-site activities, a minimum of one tritium sample and one lead sample will be collected daily from the discharge line and, at a minimum, analyzed weekly. The results of each sample will be used to make decisions regarding fluid containment and/or the progression of investigation operations. See Section 7.1.2 for detailed information on tritium and lead monitoring in a near-field scenario.

7.2.3 Fluid Management Decision Criteria

The fluid management decision criteria in Appendix A are to be used to determine the options for final disposition of fluids generated during other well-site activities. See Section 7.1.3 for further detail.

7.2.4 Sump Sampling Program

The sump sampling program for other well-site activities is the same as that during borehole advancement. A sump sample shall be collected once fluid-producing operations have ceased. For example, in a near-field situation, if a well is being purged in preparation for periodic sampling, fluids may be discharged to a lined sump. A sump sample will be collected from the sump to which fluids were discharged (active sump) and from all sumps to which fluids may have been transferred in the course of the activity. Sump samples shall be collected, or appropriate analytical data available, for each containment that holds fluid at a site before discharging or the project vacating the site. Sump fluids will be analyzed for the parameters listed in Appendix B.

7.2.5 Fluid Disposition

The same decision process for fluid disposition of near-field drilling fluids is to be implemented for fluids generated during other well-site activities. See Section 7.1.5 for further detail.

8.0 Fluid Management Strategy for Near-field outside NTS

Contaminated fluids are less likely to be encountered at well locations outside the NTS. The fluid management strategy provides reasonable assurance that fluids produced at these wells will be managed in compliance with applicable state and federal regulations. The near-field strategy involves analyzing monitoring results (tritium and lead) regularly and containing fluids in sumps.

For this operational strategy, investigation activities are considered either drilling operations, activities that advance the borehole, or other well-site activities.

8.1 Well Drilling Activities

Drilling activities that advance the borehole involve only those that penetrate or disturb new subsurface formation(s). Presumably, groundwater and rock cuttings generated as part of these operations are from geologic formations that are uncharacterized with regard to their chemical and radiological nature.

8.1.1 Fluid Containment

Fluid containment under a near-field strategy outside the NTS will be identified in the Well-Specific Fluid Management Strategy Letter. Sump construction and use decisions will be based in part on predicted fluid volumes, background contaminants, and the potential for radiological and/or chemical contamination in the well. Once near-field discharge criteria are met, the discharge of fluids to the ground surface, unlined sump, or to an infiltration area at a near-field well site is generally not anticipated; however, this practice may be approved on a case-by-case basis as identified in the Well-Specific Fluid Management Strategy Letter and approved by NDEP.

Figure 3-2 provides a typical fluid containment configuration. Site-specific characteristics and restrictions will determine the actual site layouts that are described in the letter. To avoid human contact with discharge fluids, access to the infiltration area and sumps will be controlled and posted during evaporation/infiltration is operational.

The following example describes a near-field sump construction and use scenario. This scenario may be considered generally applicable to the given site conditions; however, actual sump construction and use may vary among well sites.

> In a near-field scenario, two lined sumps may be constructed, with drilling fluids discharged to the first sump until that point when radiological or chemical contamination is encountered in the well. Once fluids exceed applicable FMP criteria, discharge fluids are diverted to the second lined sump. A sample is then collected from the first sump and analyzed at a laboratory for FMP parameters. The comparison of sample results with FMP criteria will dictate whether the fluids from the first sump may be discharged directly to an unlined sump, infiltration area, or to the ground surface. The fluid volume in the second sump when filled will undergo the same procedure.

8.1.2 Monitoring Program

The monitoring program supports the daily management of fluids produced during an investigation activity. This program is based on the use of the contamination indicators, tritium and/or lead, to make decisions regarding fluid containment and/or the progression of investigation operations. Decisions are based on analyses that are performed while operations proceed.

Figure 8-1 outlines the decision points in the monitoring program for near-field well sites outside the NTS. Monitoring results are not typically used to support final fluid disposition decisions; rather, monitoring results prompt daily operational decisions.

Fluids generated during near-field operations will be analyzed for lead and tritium while the borehole is being advanced. Monitoring may be initiated in vadose zone drilling to account for possible prompt injection phenomenon encountered above the groundwater table. For example, in a near-field scenario, the tritium action level of 400,000 pCi/L (20 × FMP Criteria) would prompt the diversion of fluids to a lined sump. Similarly, the lead action level of 3 mg/L indicates when fluid lead concentrations are approaching the RCRA hazardous waste concentration (5 mg/L).

The NNSA/NSO ERP shall be notified immediately when monitoring of tritium and/or lead meets or exceeds the established action level; subsequently, NNSA/NSO will notify NDEP. Notification of subsequent monitoring results to NNSA/NSO ERP and NDEP shall follow established protocol. Monitoring results will be available to NDEP in accordance with Section 9.0 of this FMP.

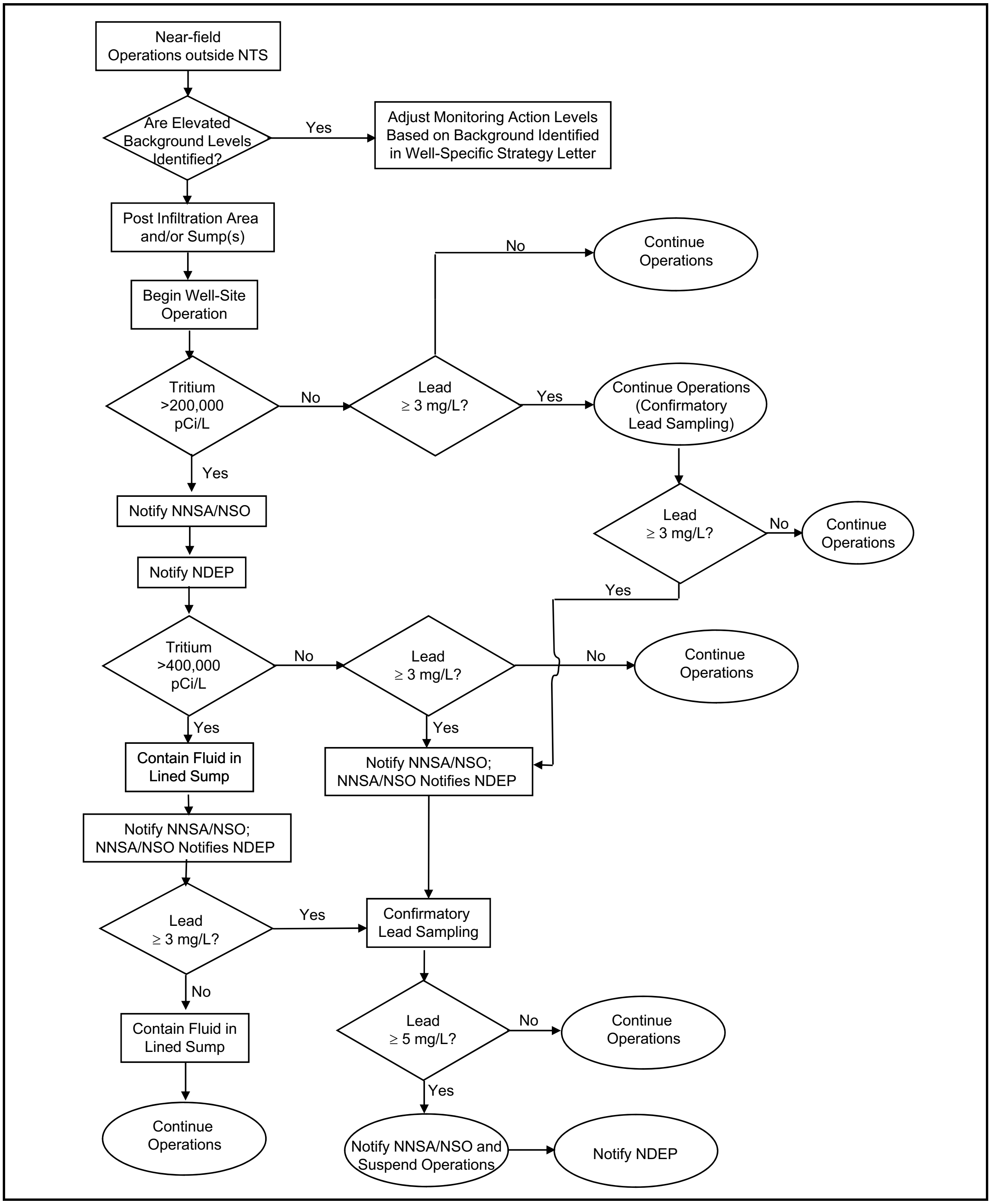

Figure 8-1
Near-field outside NTS Monitoring Decision Diagram

8.1.2.1 Tritium Monitoring

During advancement of the borehole, a tritium screening sample will be collected hourly and analyzed from the discharge line. The NDEP will be notified via telephone, fax, or email when tritium monitoring levels reach or exceed 200,000 pCi/L; this is a courtesy notification only and will not result in operations being altered or suspended. The action level for tritium is 400,000 pCi/L (see Appendix A). If this level is exceeded during borehole advancement activities, NNSA/NSO ERP will be notified, and NNSA/NSO will subsequently notify the NDEP that fluids will be discharged to a lined sump, and the well site will be considered and managed as "radiologically contaminated" from that point forward, unless proven otherwise.

8.1.2.2 Lead Monitoring

A lead sample shall be collected from the return discharge line once every eight hours while the borehole is being advanced. Monitoring samples may be analyzed on or off site but will, at a minimum, be analyzed daily. Lead may be monitored with a digital voltammeter, colorimetric method, or other appropriate method.

Background levels for metals may be identified in the Well-Specific Fluid Management Strategy Letter that is submitted to NDEP for approval. Any site-specific changes to the sampling protocols detailed below will be identified in the strategy letter. Lead is monitored primarily to ensure that the RCRA level for lead (5 mg/L) is not exceeded. Exceeding the RCRA level for lead may result in the generation of a hazardous or mixed waste in the sump(s). Therefore, the lead monitoring method must be capable of indicating lead at concentrations of less than 5 mg/L. To provide early warning of lead levels approaching the RCRA standard, the level of 3 mg/L was chosen as the initial decision point for lead monitoring under this FMP. That is, if lead concentrations detected are 3 mg/L or greater, the confirmatory sampling protocol will be initiated. The detection of lead at any concentration less than 5 mg/L will not prompt the shutdown of operations; only a confirmed lead concentration of 5 mg/L mandates that fluid generating operations cease.

If a quantitative method is used to monitor lead, the action level for lead is 3 mg/L. If a semiquantitative method is employed, any indication of the presence of lead shall serve as the action level and prompt confirmatory sampling. In the following example, the lead "action level" referred to is associated with the RCRA hazardous waste lead level. The example describes confirmatory sampling to be initiated when the lead action level is exceeded.

> If a monitoring sample yields lead concentrations at or above the action level, an additional discharge line sample shall be collected immediately and analyzed. If this confirmatory sample yields lead concentrations less than the action level, the regular eight-hour monitoring schedule shall resume. If the confirmatory sample results in lead concentrations at or above the action level, a composite sample shall be collected immediately from the active sump. The first sump sample shall be analyzed for lead. If the sump sample results fall below the action level, regular eight-hour discharge monitoring shall resume. If the sump sample yields lead levels at or above the action level, drilling operations shall cease and a composite sump sample shall be obtained for laboratory analysis (see Appendix B).

8.1.3 Fluid Management Decision Criteria

The fluid management decision criteria used to determine the options for final fluid disposition are identified in Appendix A. These criteria are based on the Nevada Drinking Water Standards, federal standards, and NDEP guidance. Using UGTA historical knowledge, the following parameters were selected for establishing fluid quality for arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, tritium, gross alpha, and gross beta. Fluid management decision criteria indicate the thresholds at which fluid disposal decisions are made. The decision criteria are based on the concentration of dissolved constituents. Samples collected in accordance with the sump sampling program will be analyzed for total and dissolved RCRA metals, gross alpha, gross beta, and tritium (see Appendix B). Only the dissolved metals results will be compared with Appendix A limits when making fluid disposal decisions.

In Appendix A, the 5 × FMP Criteria limits represent the maximum constituent concentrations below which fluids may be discharged to the ground surface. That is, if all radiological parameters and dissolved metals in Appendix A are less than 5 × FMP Criteria, fluids may be discharged directly to the ground surface. Similarly, if all parameters in Appendix A are less than 20 × FMP Criteria limits, fluids may be discharged into an unlined sump or infiltration area.

Note: The 5 × and 20 × FMP Criteria values in Appendix A are simply multipliers of the identified values. That is, the drinking water standards and other standards are the basis for development of the 5 × and 20 × FMP Criteria values.

Only the 5 × and 20 × FMP Criteria values in Appendix A will be used to make discharge/disposal decisions at near-field wells outside NTS. The standards themselves are included in Appendix A as a point of reference only and will not be compared directly with fluid analytical results to make discharge/disposal decisions.

8.1.4 Sump Sampling Program

The primary purpose of this sampling program is to determine final fluid disposition. The collection of samples for laboratory analysis applies to fluids contained or stored in sumps. The analytical results received from the laboratory are compared to the limits in Appendix A to allow the discharge of fluids to an unlined sump, infiltration area, or the ground surface.

Background readings for metals can be used to raise the discharge criteria to ground surface limits, but fluids above background or FMP Criteria up to 20 × FMP Criteria must be discharged to at least a fenced or posted unlined sump or infiltration area. Fluids containing greater than or equal to 20 × FMP Criteria levels shall be discharged to a fenced and lined sump or containment vessel.

If a sump is used to contain drilling fluids from an investigation activity, a sump sample shall be collected and analyzed to determine proper fluid disposition of the sump fluids. The primary purpose of these samples is to characterize the contained fluids. While fluids are being added to the sumps, as during borehole advancement or well completion, a sample does not need to be collected. However, once operations that affect containment volume have ceased or a change in fluid containment is to occur, a sample must be collected for laboratory analysis. The sample must be collected from the sump to which fluids were discharged (active sump), and from all sumps to which fluids may have been transferred in the course of the immediate investigation activity. Samples shall be collected, or appropriate analytical data available, for each containment that holds fluid at a site before discharging or the project vacating the site. Contained fluids will be analyzed for the parameters listed in Appendix B.

8.1.5 Fluid Disposition

This section discusses fluid disposition options for fluids that are contained/stored in a lined sump. This FMP allows the discharge of investigation fluids on site when specific fluid criteria are met. The options for onsite disposal of investigation fluids are an infiltration area, unlined sump, and the ground surface. An infiltration area is a predesignated bounded area on the ground surface within which fluids may be discharged. The "ground surface" refers to the natural or relatively undisturbed condition of an area of surface soil or rock. Decisions on fluid disposition are based on laboratory sample results, as compared to fluid decision criteria. In no event will fluids be discharged to an infiltration area or the ground surface from a lined sump if fluid decision criteria as provided in Appendix A of this document are not met. The onsite disposal options for fluids stored in lined sumps are:

- **Direct discharge to the ground surface**. Fluids documented to be less than FMP Criteria for all required FMP analytical parameters may be discharged to the ground surface. Caution shall be taken to ensure that erosion is controlled.
- **Discharge to an infiltration area or unlined sump**. Fluids documented to be less than 20 × FMP Criteria for all required FMP analytical parameters may be discharged to an infiltration area or unlined sump.

If fluids do not meet the fluid decision criteria for discharge/disposal on site, then fluid disposal options include 1) onsite containment in lined sumps or 2) transport for disposal off site. The criteria for these options are as follows:

- **Onsite containment in a lined sump.** Fluids documented to contain RCRA metals below hazardous waste limits found in the RCRA standards in the most recent version of Title 40 CFR Part 261.24 (CFR, 2009) and radiological parameters greater than 20 × FMP Criteria will be allowed to evaporate in lined sumps on site. Alternatively, these fluids may be transported off site via portable tanks to another lined sump for storage, or transported to a NTS or a permitted commercial TSDF.
- **Transportation to NTS or offsite TSDF**. Fluids documented to contain any RCRA metal above its respective hazardous waste limit found in the RCRA standards in the most recent version of Title 40 CFR Part 261.24 (CFR, 2009) would result in the suspension of operations. These fluids would be managed as hazardous (or mixed) waste in accordance with the most current version of the State of Nevada hazardous waste regulations and applicable DOE Orders. The NNSA/NSO ERP and NDEP will be notified immediately if fluids are documented to be hazardous or mixed waste. The fluids may be pumped from the lined sumps and transported to an appropriate storage area on the NTS, or may be transported directly to a permitted commercial TSDF.

Appendix C illustrates the general decision flow process for the disposal of fluids. The appropriate fluid disposal option will be chosen based on a comparison of the appropriate laboratory analytical data with the fluid management decision criteria specific to each option. As indicated, the concentrations of fluid management parameters outlined in Appendix A shall not exceed 20 × FMP Criteria if the fluids are to be discharged to an infiltration area or unlined sump. Fluids intended for discharge to the ground surface must not exceed FMP Criteria or the background levels identified in the Well-Specific Fluid Management Strategy Letter.

8.2 Other Well-Site Activities

Other well-site activities include those that encounter subsurface formations that were previously penetrated or contacted in some way. Examples of other well-site activities that typically occur without advancement of the borehole include cleaning and conditioning the borehole; performing circulation of the borehole; conducting fishing and wash-over operations; performing well completion operations, such as casing and stemming annular materials; developing wells; and testing and conducting periodic sampling events. Well completion designs and associated well construction activities will vary depending on well-specific objectives and may include setting intermediate casing; running a completion string to a specified depth; and/or isolating productive zones with gravel, cement, packers, and sliding sleeves. Other activities may be conducted within a discrete period (e.g., a one-day well sampling event) or over a span of time (e.g., a series of well purging and testing activities that span months).

8.2.1 Fluid Containment

Fluid containment options during other well-site activities outside the NTS operating under the near-field strategy will typically be the same as those described in Section 8.1.1. Lined sumps used during borehole advancement may be used for fluid containment during well development, testing, and periodic sampling activities.

If well-site conditions have changed from near-field to far-field, alternate fluid containment options will be available during other well-site activities, to include discharge to an infiltration area, unlined sump, or to the ground surface. The NNSA/NSO ERP will notify NDEP of any change in well-site operation strategy or any deviations from the Well-Specific Fluid Management Strategy Letter.

8.2.2 Monitoring

The primary difference between monitoring during borehole advancement and during other well-site activities is the frequency of monitoring sample collection. In a near-field scenario during other well-site activities, a minimum of one tritium sample and one lead sample will be collected daily from the discharge line and, at a minimum, analyzed weekly. The results of each sample will be used to make decisions regarding fluid containment and/or the progression of investigation operations. See Section 8.1.2 for detailed information on tritium and lead monitoring in a near-field scenario.

8.2.3 Fluid Management Decision Criteria

The fluid management decision criteria in Appendix A are to be used to determine the options for final disposition of fluids generated during other well-site activities. See Section 8.1.3 for further detail.

8.2.4 Sump Sampling Program

The sump sampling program for other well-site activities is the same as that during borehole advancement. A sump sample shall be collected once fluid-producing operations have ceased. For example, in a near-field situation, if a well is being purged in preparation for periodic sampling, fluids may be discharged to a lined sump. A sump sample will be collected from the sump to which fluids were discharged (active sump) and from all sumps to which fluids may have been transferred in the course of the activity. Sump samples shall be collected, or appropriate analytical data available, for each containment that holds fluid at a site before discharging or the project vacating the site. Sump fluids will be analyzed for the parameters listed in Appendix B.

8.2.5 Fluid Disposition

The same decision process for fluid disposition of near-field drilling fluids is to be implemented for fluids generated during other well-site activities. See Section 8.1.5 for further detail.

9.0 Reporting Requirements

The NNSA/NSO ERP shall comply with the following reporting requirements for all investigation activities covered under this FMP that are undertaken to support the UGTA Sub-Project:

- **Fluid Release Reporting**. The NDEP shall be notified if fluids in excess of 20 × FMP Criteria limits, as defined by this FMP, are discharged into an unlined sump, infiltration area, or beyond the confines of a lined sump in volumes greater than 1 cubic meter (264 gallons). Such notification must be provided by telephone before the end of the next business day following verification of the incident. Telephone notification shall be followed by a written report that includes elements described in spill reporting regulations within 10 calendar days.

- **Hazardous or Mixed Waste Generation**. The NDEP will be notified immediately if laboratory results indicate that mixed or hazardous waste has been generated in an unlined or lined sump. Non-emergency actions that constitute deviations to this FMP will be reported to NDEP before implementing the action. Emergency actions that are taken that constitute deviations to this FMP will be reported verbally to NDEP within 24 hours of implementation of the action, and a written report will be provided to NDEP within 10 working days of the action.

- **Strategy Letter**. The NNSA/NSO ERP will submit to NDEP a Well-Specific Fluid Management Strategy Letter as defined in Section 3.0 for approval before beginning well-site activities.

- **Well-Site Activity Reporting (Morning Reports)**. The synopsis of well-site activities occurring within a 24-hour period (i.e., the morning report) shall be transmitted (fax or electronic mail) to NDEP each day for all activities covered under this FMP. Fluid releases not reportable under “Fluid Release Reporting” above will be discussed in the morning reports.

All correspondence to NDEP shall be addressed to:

NDEP
Chief
Bureau of Federal Facilities
2030 E. Flamingo Road, Suite 230
Las Vegas, NV 89119

All field and laboratory data generated to support UGTA Sub-Project well construction activities will be archived and made available for inspection by NDEP upon request. The following data will be generated and retained on file. These data shall be made available to the appropriate NDEP staff for inspection upon request:

- Legible copies of daily drilling progress reports and daily well-site activities
- Volumetric measurements of fluids generated during each stage of well construction
- Makeup water delivery and usage during each stage of well construction
- Onsite fluid monitoring data
- Laboratory analytical data with supplemental quality assurance/quality control and chain of custody records
- Process materials (e.g., cement, grout, casing, screens, packing, drilling fluids) and drilling additive usage, and equipment decontamination

10.0 References

CFR, see *Code of Federal Regulations.*

Code of Federal Regulations. 2009. Title 40 CFR Part 261.24, "Toxicity Characteristic." Washington, DC: U.S. Government Printing Office.

FFACO, see *Federal Facility Agreement and Consent Order.*

Federal Facility Agreement and Consent Order. 1996 (as amended February 2008). Agreed to by the State of Nevada; U.S. Department of Energy, Environmental Management; U.S. Department of Defense; and U.S. Department of Energy, Legacy Management.

Appendix A

Fluid Management Decision Criteria Limits

Table A.1-1
Fluid Management Decision Criteria Limits

FMP Parameters	RCRA Levels	FMP Criteria[a]	5 × FMP Criteria[b]	20 × FMP Criteria[c]
Arsenic	5.0 mg/L	0.010 mg/L	0.050 mg/L	0.2 mg/L
Barium	100.0 mg/L	2 mg/L	10 mg/L	40 mg/L
Cadmium	1.0 mg/L	0.005 mg/L	0.025 mg/L	0.1 mg/L
Chromium	5.0 mg/L	0.100 mg/L	0.500 mg/L	2 mg/L
Lead	5.0 mg/L	0.015 mg/L	0.075 mg/L	0.3 mg/L
Selenium	1.0 mg/L	0.050 mg/L	0.250 mg/L	1 mg/L
Silver	5.0 mg/L	0.100 mg/L	0.500 mg/L	2 mg/L
Mercury	0.2 mg/L	0.002 mg/L	0.010 mg/L	0.04 mg/L
Gross Alpha	N/A	15 pCi/L	75 pCi/L	300 pCi/L
Gross Beta	N/A	50 pCi/L	250 pCi/L	1,000 pCi/L
Tritium	N/A	20,000 pCi/L	100,000 pCi/L	400,000 pCi/L

[a]Limit for discharge to the ground surface for far-field wells outside NTS or as designated in the Well-Specific Fluid Management Strategy Letter
[b]Limit for discharge to the ground surface
[c]Limit for discharge to an unlined sump or infiltration area

N/A = Not applicable

Appendix B

Analytical Laboratory Requirements for Fluid Management Samples

Table B.1-1
Analytical Laboratory Requirements for Fluid Management Samples

Parameter	Reporting Detection Limit	RCRA Levels[a]	SDWA Drinking Water Standards (MCLs)[b,c,d]	Units	Analytical Method[e, f]	Maximum Holding Time[g]	Preservative[g]	Container Type[g]
Total:								
Arsenic	0.01	5.0	0.01	mg/L	SW-846 6010/6020	6 months	HNO_3 to pH <2	(1) 1-L polyethylene or glass
Barium	0.1	100	2.0					
Cadmium	0.005	1.0	0.005					
Chromium	0.01	5.0	0.1					
Lead	0.003	5.0	0.015					
Selenium	0.005	1.0	0.05					
Silver	0.01	5.0	0.1[h]					
Mercury	0.0002	0.2	0.002	mg/L	SW-846 7470	28 days	HNO_3 to pH <2	(1) 1-L polyethylene or glass
Dissolved:								
Arsenic	0.01	5.0	0.01	mg/L	SW-846 6010/6020	6 months	Field/Lab Filtration HNO_3 to pH < 2	(1) 1-L polyethylene or glass
Barium	0.1	100	2.0					
Cadmium	0.005	1.0	0.005					
Chromium	0.01	5.0	0.1					
Lead	0.003	5.0	0.015					
Selenium	0.005	1.0	0.05					
Silver	0.01	5.0	0.1[h]					
Mercury	0.0002	0.2	0.002	mg/L	SW-846 7470	28 days	Field/Lab Filtration HNO_3 to pH < 2	(1) 1-L polyethylene or glass
Gross Alpha	10	N/A	15	pCi/L	EPA 900.0 or equivalent	6 months	Field/Lab Filtration HNO_3 to pH < 2	(1) 1-L polyethylene
Gross Beta	<15	N/A	50[d]	pCi/L	EPA 900.0 or equivalent	6 months	Field/Lab Filtration HNO_3 to pH < 2	(1) 1-L polyethylene
Tritium	1,000	N/A	20,000	pCi/L	EPA 906.0 or equivalent	6 months	Field or Lab Filtration	(1) 125-mL amber glass

[a] 40 CFR Part 261.24, Table 1 (CFR, 2009d)
[b] 40 CFR Parts 141.23 and 141.62 (CFR, 2009b)
[c] 40 CFR Part 141.66 (c), Table A and 141.26 (i) (CFR, 2009b)
[d] The MCL for gross beta is calculated and referenced in the *Federal Register,* Vol. 65, No. 236 (EPA, 2000).
[e] *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA, 1980).
[f] SW-846-Online (EPA, 2008)
[g] 40 CFR Part 136.3 (e), Table II (CFR, 2009a)
[h] The MCL for silver is a secondary drinking water MCL found in 40 CFR Part 143.3 (CFR, 2009c).

HNO_3 = Nitric acid
L = Liter
mg = Milligram
pCi = Picocurie

Notes:
1. Filtration and preservation should be performed in the field; if field filtration is not feasible, samples will be sent to the laboratory for subsequent filtering and preservation.
2. Maximum contaminant level (MCL) = The highest level of a contaminant that is allowed in drinking water. The MCLs are set as close to MCL goals as feasible using the best available treatment technology and taking cost into consideration.

References

CFR, see *Code of Federal Regulations.*

Code of Federal Regulations. 2009a. Title 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants." Washington, DC: U.S. Government Printing Office.

Code of Federal Regulations. 2009b. Title 40 CFR Part 141, "National Primary Drinking Water Regulations." Washington, DC: U.S. Government Printing Office.

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U.S. Environmental Protection Agency. 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA 600/4-80-032. Cincinnati, OH: Environmental Monitoring and Support Laboratory Office of Research and Development.

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Appendix C

Decision Diagrams for Fluid Disposal

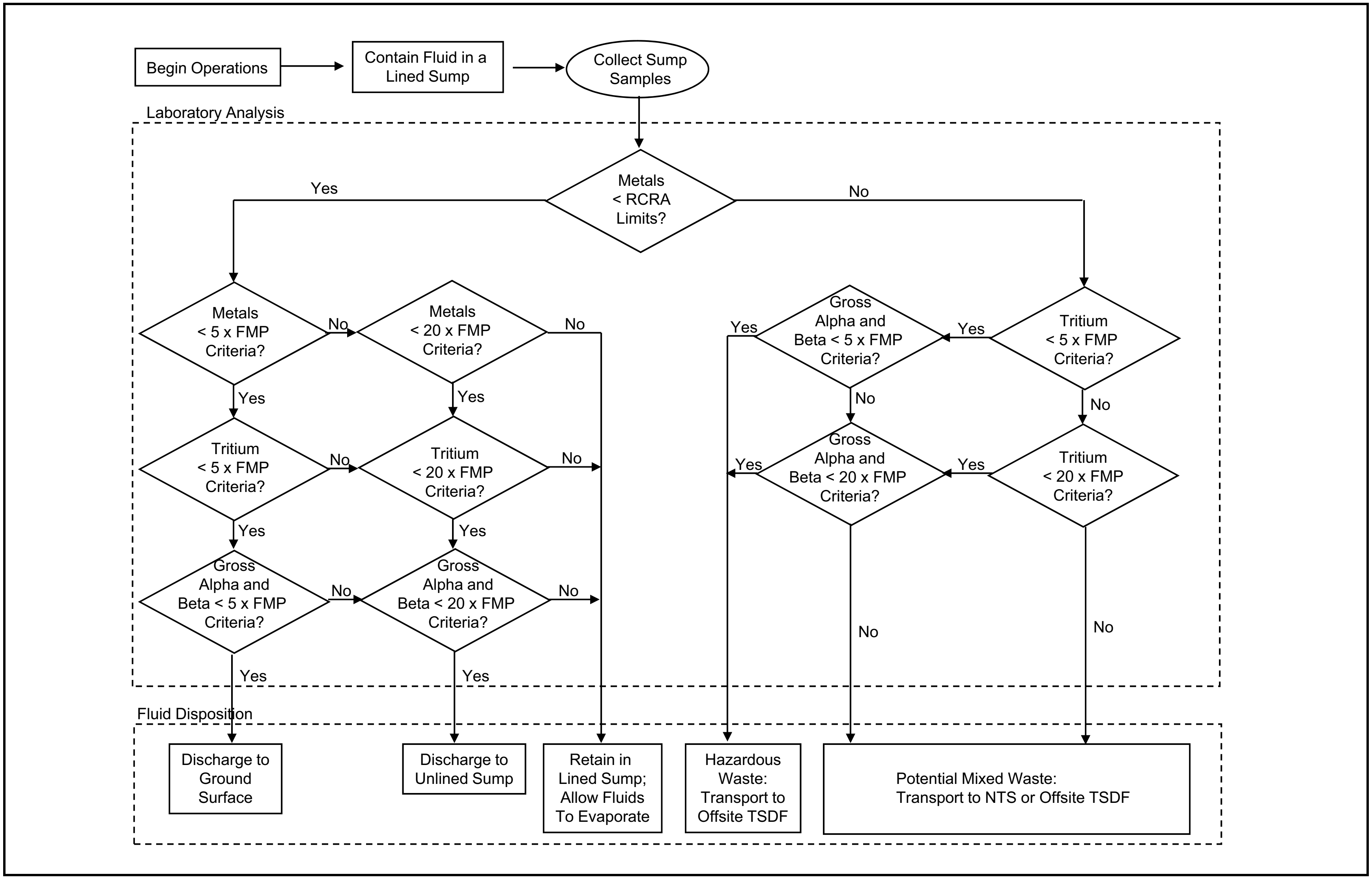

Figure C.1-1
NTS Near-field Decision Diagram for Fluid Disposal

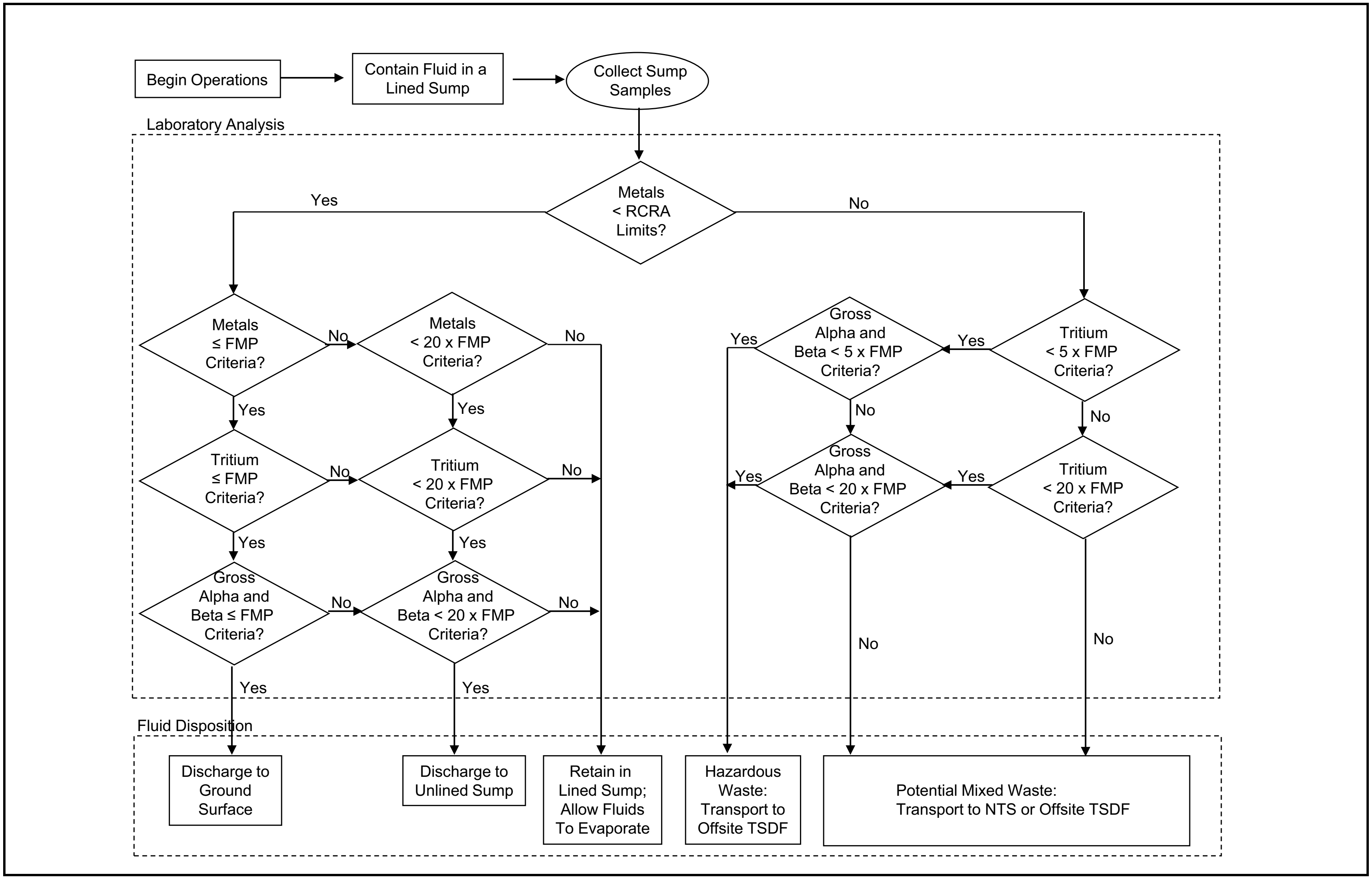

Figure C.1-2
Off NTS Near-field Decision Diagram for Fluid Disposal

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