Nevada
Environmental
Restoration
Project

DOE/NV--343-Rev. 2

Underground Test Area Project Waste Management Plan

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Environmental Restoration
Division

U.S. Department of Energy
National Nuclear Security Administration
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UNDERGROUND TEST AREA PROJECT
WASTE MANAGEMENT PLAN

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

Controlled Copy No.:____

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April 2002

UNDERGROUND TEST AREA PROJECT
WASTE MANAGEMENT PLAN

Approved by: Signature Approved Date: 04/25/2002

Robert M. Bangerter, Jr., Project Manager
Underground Test Area Project

Approved by: Signature Approved Date: 04/25/2002

Runore C. Wycoff, Division Director
Environmental Restoration Division

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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
ERD	Environmental Restoration Division
ESC	Environmental Services Contractor
ESHD	Environment, Safety and Health Division
FFACO	*Federal Facility Agreement and Consent Order*
FMP	Fluid Management Plan
LLW	Low-level radioactive waste
M&O	Management and Operations Contractor
MSDS	Material Safety Data Sheet
NDEP	Nevada Division of Environmental Protection
NEPA	*National Environmental Policy Act*
NNSA/NV	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NTSWAC	*Nevada Test Site Waste Acceptance Criteria*
NV ERP	Nevada Environmental Restoration Project
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
RCRA	*Resource Conservation and Recovery Act*
TRU	Transuranic
UGTA	Underground Test Area
WMD	Waste Management Division

Definitions

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

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

Hazardous Wastes - Those wastes that are designated hazardous by U.S. Environmental Protection Agency (EPA) regulations (Title 40 *Code of Federal Regulations* [CFR] Part 261). This term includes wastes listed by EPA or having the characteristic of ignitability, reactivity, corrosivity, or toxicity (CFR, 2000).

High-Level Waste - High-level waste is 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.

Low-Level Waste - Low-level radioactive waste is 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 [USC, 1996a]), 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 (USC, 1996a), as amended, and a hazardous component subject to the *Resource Conservation and Recovery Act* (USC, 1996b) (or state of generation hazardous waste regulations).

Radioactive Waste - Any garbage, refuse, sludges, and other discarded material, including solid, liquid, semisolid, or contained gaseous material that contains radionuclides regulated under the

Definitions *(Continued)*

Atomic Energy Act of 1954, as amended, and of negligible economic value considering the costs of recovery (USC, 1996a).

Transuranic Waste - Transuranic waste is 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 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.

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, and any absorbent 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.

1.0 Introduction

The U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office (NNSA/NV) initiated the Underground Test Area (UGTA) 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 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*. The CAUs under the UGTA Project include CAU 97 (Yucca Flat/Climax Mine), CAU 98 (Frenchman Flat), CAU 99 (Rainier/Shoshone), 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 program may involve the drilling and sampling of new wells; recompletion, monitoring, and sampling of existing wells; well development and hydrologic/aquifer testing; geophysical surveys; and subsidence crater recharge evaluation. The location, depth, and construction of an individual well or well cluster in support of the UGTA 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 Project activities. The objective of this waste management 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/NV waste minimization and pollution prevention objectives.

Section 1.0 of this plan provides an introduction to the UGTA Project. Section 2.0 describes the responsibilities of UGTA participants. Section 3.0 describes UGTA 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 Project Participants and Responsibilities

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

2.1 NNSA/NV Participants and Responsibilities

The primary NNSA/NV participants involved in UGTA waste management activities are the Waste Management Division (WMD) and Environmental Restoration Division (ERD).

2.1.1 NNSA/NV Waste Management Division

The NNSA/NV WMD functions and responsibilities related to UGTA waste management activities are:

- Support the Nevada Environmental Restoration Project (NV ERP) by managing accumulation and disposal facilities for program waste streams and managing centralized waste services for NTS-generated hydrocarbon, hazardous, radioactive, mixed, and sanitary wastes.

- Manage the low-level radioactive and mixed waste disposal operations at the NTS in compliance with applicable regulations and DOE requirements and policies. Develop and maintain waste acceptance criteria and operating requirements for NTS waste operations. Manage programs to assess the performance of waste management facilities and manage efforts to mitigate the environmental impact of operations.

- Manage programs for waste certification, acceptance, and verification at NNSA/NV disposal facilities. Manage programs required of disposal facility operators in accordance with applicable DOE Orders and Directives.

- Support NNSA/NV 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.

- Verify 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/NV Environmental Restoration Division

The NNSA/NV ERD functions and responsibilities related to UGTA waste management activities are:

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

- Develop and implement processes to ensure compliance with policies and standards as they relate to assigned activities.

2.1.3 NNSA/NV Environment Safety & Health Division

The NNSA/NV Environment, Safety & Health Division (ESHD) is responsible for providing advice and recommendations on environmental compliance issues and matters relating to radiological and nuclear safety. The ESHD develops and implements NNSA/NV-specific policies and procedures to ensure compliance with environmental and occupational health laws, regulations, and DOE Directives. The ESHD responsibilities include:

- Serves as the NNSA/NV interface with federal, state, and local regulatory agencies for obtaining and processing environmental permits, coordination of inspections, and establishing agreements for achieving compliance

- Conducts environmental audits, surveillances, and assessments of UGTA Project activities

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

- Provides technical advice to the UGTA Project on worker protection

2.2 Other UGTA Program Participants

The UGTA Project is administered by the NV ERP and involves the participation of several organizations. The NTS Management and Operations Contractor (M&O) 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. The

Environmental Services Contractor (ESC) typically 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 Project activities.

Historically, the M&O and ESC contractors have been responsible for the bulk 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 Project Activities and Waste Streams

This document discusses UGTA 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

UGTA activities that may involve the generation of wastes include the drilling and construction of new wells, recompletion of existing wells, sampling and monitoring of new and existing wells, well development, hydrologic/aquifer testing, geophysical surveys, and subsidence crater recharge evaluation.

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 Fluid Management Plan (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 or 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 prior to the start of well site activities. This examination will initially be conducted through a review of product specifications and Material Safety Data Sheets (MSDSs). MSDSs for all products must be reviewed prior to the product's use 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/NV UGTA Project Manager's written approval must be obtained prior to the product's use.

3.3 Waste Management

All wastes generated in support of an UGTA Project activity shall be managed in accordance with applicable DOE Orders, U.S. Department of Transportation regulations, *Resource Conservation and Recovery Act* (RCRA) regulations, Nevada laws and regulations, the FFACO, agreements between the State and NNSA/NV, relevant permits, and site-specific requirements. Other factors that may influence waste management practices include field-screening results, process knowledge, laboratory analysis results from investigation samples, and applicable State guidance.

The on-site management and ultimate disposition of waste may also be guided by several factors, including, but not limited to, 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 typically managed in on site, lined or unlined sumps or infiltration basins/areas, which are governed by Attachment 1, the FMP. 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 Waste Management 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 fluids will be characterized through process knowledge and/or sampling and analysis prior to use downhole. The drilling fluids will be examined to ensure that 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 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 the fluid management criteria and the requirements for sampling and analysis necessary to make decisions on the disposition of drilling fluids and groundwater. Specific analytical parameters are described in the QAPP and the FMP. The Well-Site Operation Strategy letter, required by the FMP, typically provides the site layout, specifies the number and kind of containment to be constructed to support fluid management, and dictates the initial monitoring requirements. This strategy letter also addresses any deviations or special requirements not included in the Fluid Management Plan or this Waste Management Plan.

Well-specific planning and implementation documents are also prepared for each UGTA 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 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.

3.3.1.3 Drill Cuttings and Drilling Mud

Drill cuttings and drilling mud are normally routed to a sump along with drilling fluids and groundwater. During site operations, if monitoring samples indicate the presence of hazardous constituents in excess of applicable regulatory criteria, operations shall be suspended in accordance with the FMP. 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 need to 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.

3.3.1.4 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 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 run-off/run-on and protect against the elements.

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 (sanitary), hydrocarbon, hazardous, low-level radioactive (LLW), or mixed waste. The following sections address the on-site 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

Nonhazardous wastes generated by UGTA activities may include office supplies, refuse, air filters from engines, drill-pipe plastic protective covers, sampling and monitoring supplies from noncontaminated zones, drill cuttings from noncontaminated intervals, and various types of construction debris. Nonhazardous solid waste will be disposed of in a permitted NTS sanitary landfill. These wastes will be handled and disposed of in accordance with all applicable federal, state, and local regulations.

Sampling and monitoring activities typically generate wastes in the form of sampling supplies and personnel protective equipment. Sampling supplies (e.g., gloves, buckets, and disposable sampling equipment) may be disposed in the sanitary trash, if characterized as nonhazardous and "nonradioactive." The mixing of hazardous and radioactive wastes with nonhazardous wastes will be minimized or eliminated through engineering or administrative controls (e.g., good housekeeping, waste segregation practices, and control of materials).

3.3.2.2 Hydrocarbon Wastes

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 waste consists 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. In the event that 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 occur, it shall be reported to the appropriate authority at the site of the incident. Spills or leaks of greater than 25 gallons of product or which impact three cubic yards or more of soil must be reported immediately to the NNSA/NV UGTA Project Manager, who shall notify the appropriate regulatory authorities, as appropriate.

Hydrocarbon wastes are considered nonhazardous waste, unless sampling and analysis reveals contamination of the hydrocarbon material with hazardous or radioactive constituents. Hydrocarbon wastes are managed separately from other nonhazardous waste since many hydrocarbon waste forms, such as used oil, oil/water, and antifreeze/water mixtures are amenable to recycling. Hydrocarbon waste that cannot be recycled shall be sent to the NTS Area 6 Hydrocarbon Landfill or an approved commercial vendor.

3.3.2.3 Hazardous Wastes

Drilling and sampling operations have the potential to generate hazardous waste 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 previously mentioned, all materials are reviewed and evaluated prior to 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 that a mixed waste is not generated.

Hazardous wastes shall be managed in accordance with the requirements of federal and state hazardous waste laws and regulations, NNSA/NV and contractor procedures, and the site-specific work documents. Typically, UGTA activities generate small volumes of hazardous waste which are usually identified prior to their generation. For example, the installation of some types of downhole casing packers (bridge plugs) in a well will generate a hazardous waste, as will the use of some types of field-screening kits.

Hazardous wastes will be characterized in accordance with the requirements of 40 CFR 261 (CFR, 2000) and this UGTA Waste Management Plan. Hazardous waste may be characterized based on knowledge of the process which generated the waste (process knowledge), sampling results from direct sampling of the waste, field-monitoring results, associated well sample results, or other relevant information. PPE and disposable sampling equipment may be characterized through visual inspection as it is generated in the field. PPE and disposable sampling equipment 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 WMP. For example, a waste stream may be visually free of staining, discoloration, or gross contamination, but may meet the criteria for being determined a LLW.

Hazardous wastes generated on the NTS are transferred to the M&O contractor for disposal; hazardous waste 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.

3.3.2.4 Low-Level Radioactive Wastes

Low-level wastes may be generated when a radioactively contaminated aquifer is encountered, after the use of equipment/supplies in a contaminated setting, or during the decontamination of 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 Waste Management Plan.

Low-level radioactive waste 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 current version of the *NV/YMP Radiological Control Manual* (DOE, 2000), may be used to determine if such waste may be declared “nonradioactive.” Direct sampling of the waste may be conducted to aid in determining if 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 Waste Management Plan. Waste deemed potentially

radioactive will be managed in accordance with this section and any other applicable section of this Waste Management Plan.

Waste suspected to be LLW will be characterized through field monitoring and laboratory analyses in accordance with the requirements of the most current version of the Nevada Test Site Waste Acceptance Criteria (NTSWAC). The waste must be adequately characterized to certify that all acceptance criteria have been met. Relevant documentation is submitted through the NV ERP for approval and the waste is certified prior to disposal. Waste identified as low-level may be disposed of on the NTS or at an approved commercial facility.

3.3.2.5 Mixed Wastes

Mixed wastes are not anticipated to be generated during UGTA 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, there exists the potential for a spill to occur involving hazardous and radioactive contaminants.

Suspect mixed waste will be characterized in accordance with the both NTSWAC and hazardous waste management requirements. Characterization may be accomplished using process knowledge, analytical results of direct or associated samples, radiological surveys, and/or swipe results. Waste acceptance criteria and the approval process for disposal are contained in the NTSWAC.

The generation of mixed wastes shall be reduced through waste minimization activities, if possible. However, if a mixed waste is generated, operations will be suspended until a disposal and compliance strategy is developed by the NV ERP for the specific mixed waste generated. Mixed wastes will be transported to the Area 5 TRU pad for storage or to an appropriate site for disposal.

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. Only NRC-licensed facilities should receive samples directly from the NTS because of liability issues and the potential for radioactive samples. Exceptions can be made if the samples have been properly screened and the

documentation verified by a qualified individual (e.g., radiochemist, health physicist). Specific laboratory capabilities and capacity must be adequately demonstrated to meet the minimum analytical requirements of the most current version of the UGTA QAPP and NNSA/NV quality criteria.

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, low-level radioactive, or mixed), as described in Section 3.3.2 of this document.

4.0 References

CFR, see *Code of Federal Regulations.*

Code of Federal Regulations. 2000. *Title 40* Parts 260-282, "Protection of Environment." Washington, DC: U.S. Government Printing Office.

United States Code. 1996a, as amended. Title 42 USC 2021 et seq., *Atomic Energy Act of 1954*. Washington, DC: U.S. Government Printing Office.

United States Code. 1996b, as amended. Title 42 USC 6901 et seq., *Resource Conservation and Recovery Act of 1976*. Washington, DC: U.S. Government Printing Office.

USC, see *United States Code*.

U.S. Department of Energy, Nevada Operations Office. 2000. *NV/YMP Radiological Control Manual*, DOE/NV/11718-079, Rev. 4. Prepared by Bechtel Nevada. Las Vegas, NV.

DOE/NV--370

ATTACHMENT 1

FLUID MANAGEMENT PLAN FOR THE UNDERGROUND TEST AREA PROJECT

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

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April 2002

ATTACHMENT 1

FLUID MANAGEMENT PLAN
FOR THE UNDERGROUND TEST AREA
PROJECT

Approved: Signature Approved Date: 04/25/2002

Robert M. Bangerter, Jr., Project Manager
Underground Test Area Project

Approved: Signature Approved Date: 04/25/2002

Runore C. Wycoff, Division Director
Environmental Restoration Division

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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
FFACO	*Federal Facility Agreement and Consent Order*
FMP	Fluid Management Plan
mg/L	Milligram per liter
NDEP	Nevada Division of Environmental Protection
NDWS	Nevada Drinking Water Standards
NNSA/NV	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office
NTS	Nevada Test Site
pCi/L	Picocurie per liter
RCRA	*Resource Conservation and Recovery Act*
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, infiltration basins, and tanks.

Discharge - The release of fluids for final disposition. Fluids discharged for disposal purposes must meet applicable fluid management criteria (e.g., 20 x NDWS for discharge to an infiltration basin/area or 5 x NDWS for discharge to the ground surface). Discharge also describes the physical process whereby fluids are released from the "flow line or discharge line" during drilling operations. Drilling discharges are typically routed to appropriate containment structures (e.g., lined sump, infiltration basin prior to final disposal).

Disposal - The act of discharging fluids with no intention of further management. On-site disposal options include discharge to an infiltration basin/area or the ground surface and evaporation in lined sumps.

Ground Surface - The natural relatively undisturbed condition of an area of soil or bedrock. Dry washes, intermittent stream beds, or other natural depressions identified by the NDEP as waters of the state are not included in this definition.

Infiltration Basin - An engineered, constructed earthen structure designed for the storage and infiltration of well fluids meeting applicable fluid management criteria.

Infiltration Area - An area of the ground surface with defined boundaries that has been designated for the purpose of discharge and infiltration of 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.

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

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 Operations Office (NNSA/NV), has initiated an Underground Test Area (UGTA) 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 Project investigation sites have been grouped into Corrective Action Units (CAUs) in accordance with the *Federal Facility Agreement and Consent Order* (FFACO, 1996). At the time of this writing, the CAUs under the UGTA Project are CAU 97 (Yucca Flat/Climax Mine), CAU 98 (Frenchman Flat), CAU 99 (Rainier/Shoshone), 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 Project objective is to gather data to characterize the aquifers beneath the NTS and adjacent lands. The investigations proposed under the UGTA program may involve the drilling, recompletion, testing, and/or sampling of 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.

Scope

This Fluid Management Plan (FMP) will be used in place of an individual discharge permit for each well or a general 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 Project. The Plan provides guidance for the management of fluids generated during UGTA investigation activities and provides the standards 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 of 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 Project shall be managed in accordance with this FMP.

The major elements of this FMP include: (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 in support of UGTA CAU investigations. For the purpose of this FMP, investigation activities are considered either (1) activities that advance the borehole or (2) other well site activities.

2.1 Drilling Activities

Drilling activities that advance the borehole involve only those which cut 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. Occasionally, well recompletion may involve cutting into new subsurface formations. Any activity that involves cutting 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 which encounter subsurface formations that were previously drilled through 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, circulation of the borehole, fishing and wash-over operations, well completion operations such as casing and stemming of annular materials, well development, testing, and periodic sampling events. Well completion designs and associated well construction activities will vary depending on well-specific objectives. The activities may include the setting of the immediate casing, the running of a completion string to a specified depth, and/or the isolation of productive zones with gravel, cement, packers, and sliding sleeves. Other activities may be conducted within a discrete time 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 Project may support long-term monitoring programs and may be sampled periodically. Sampling activities at UGTA Project well sites are also covered under this FMP. Typically, well sampling involves purging the well for a period of time during which fluids are produced. The volume of fluids produced will vary from well to well.

3.0 Well Site Operation Strategy

Figure 3-1, *Fluid Management Planning Process*, outlines the process to be followed in preparing for a fluid-producing investigation activity under this FMP. This process shall be completed prior to commencement of the investigation activity. The first step in the process is the establishment of the well location(s). The well site operation strategy is then determined. The well site operation strategy is site-specific and will vary based on the available historical knowledge of the site and on the scientific and technical objectives of the investigation. Such a strategy is designed with fluid production and the potential for encountering contamination in mind. The well site operation strategy dictates the type of containment required for the operation and the initial monitoring requirements.

There are two basic well site operation strategies employed under this FMP: near-field and far-field. The near- and far-field designations refer to the potential for encountering radioactive contamination in the well. A comprehensive assessment of historical information (or "process knowledge") which may be relevant to the site operation strategy must be conducted. Information to be used in support of 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

Upon determination of the initial well site operation strategy and subsequent identification of the nature of fluid containment (e.g., lined sumps, infiltration basins/areas) to be located at the site, the NNSA/NV shall notify NDEP, as indicated in Figure 3-1. Such notification shall indicate the well site operation strategy and supporting rationale as well as specifics pertaining to the nature and configuration of the fluid containment to be located at the site(s). This written notification shall be submitted to NDEP for approval at the address noted in Section 7.0 of this FMP.

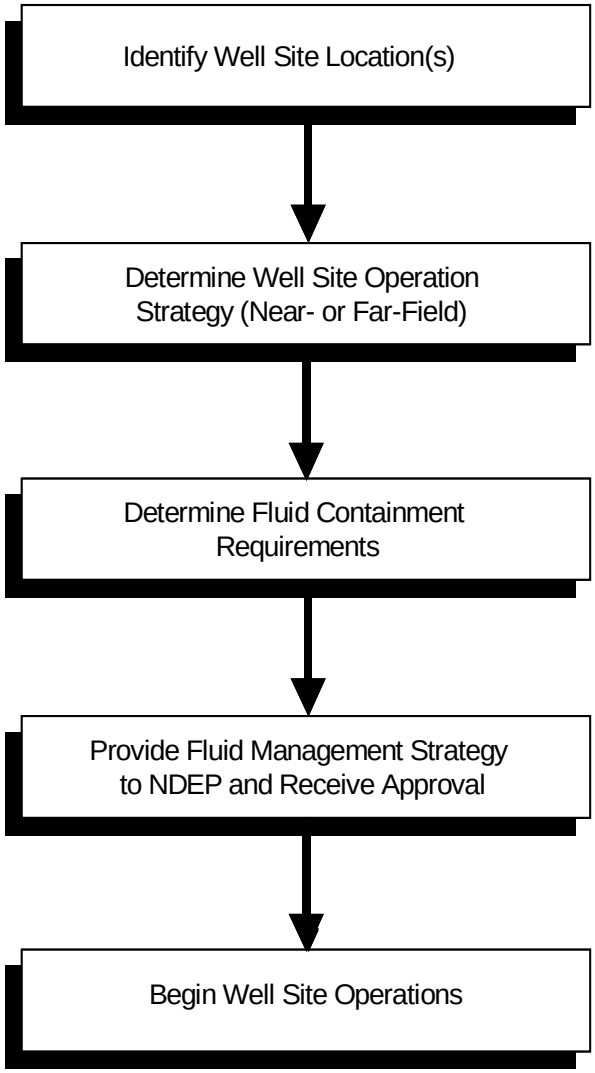

Figure 3-1
Fluid Management Planning Process

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

4.0 Near-Field Fluid Management Strategy

Because contaminated fluids are more likely to be encountered at a near-field well, the fluid management strategy must provide reasonable assurance that fluids produced at these wells will be managed in compliance with applicable state and federal regulations. The near-field strategy involves the use of analysis of contaminant indicators (tritium and lead) through monitoring and the containment of fluids in sumps.

For the purpose of operation strategy implementation, investigation activities are considered either (1) activities that advance the borehole as part of drilling operations or (2) other well site activities.

4.1 Well Drilling Activities

Drilling activities that advance the borehole involve only those which cut 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

Fluid containment under a near-field strategy will be identified in the Well-Site Operation Strategy Letter. Sump construction and use decisions will be based in part on predicted fluid volumes and the potential for radiological and/or chemical contamination in the well. Direct discharge of fluids to the ground surface or to an infiltration basin/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 NNSA/NV Well-Site Operation Strategy letter and approved by the NDEP.

Figure 4-1 provides a typical fluid containment configuration for a well site operating under a near-field strategy. Site-specific characteristics and restrictions will determine the actual site layout. An anticipated layout shall be provided in the Well-Site Operation Strategy letter.

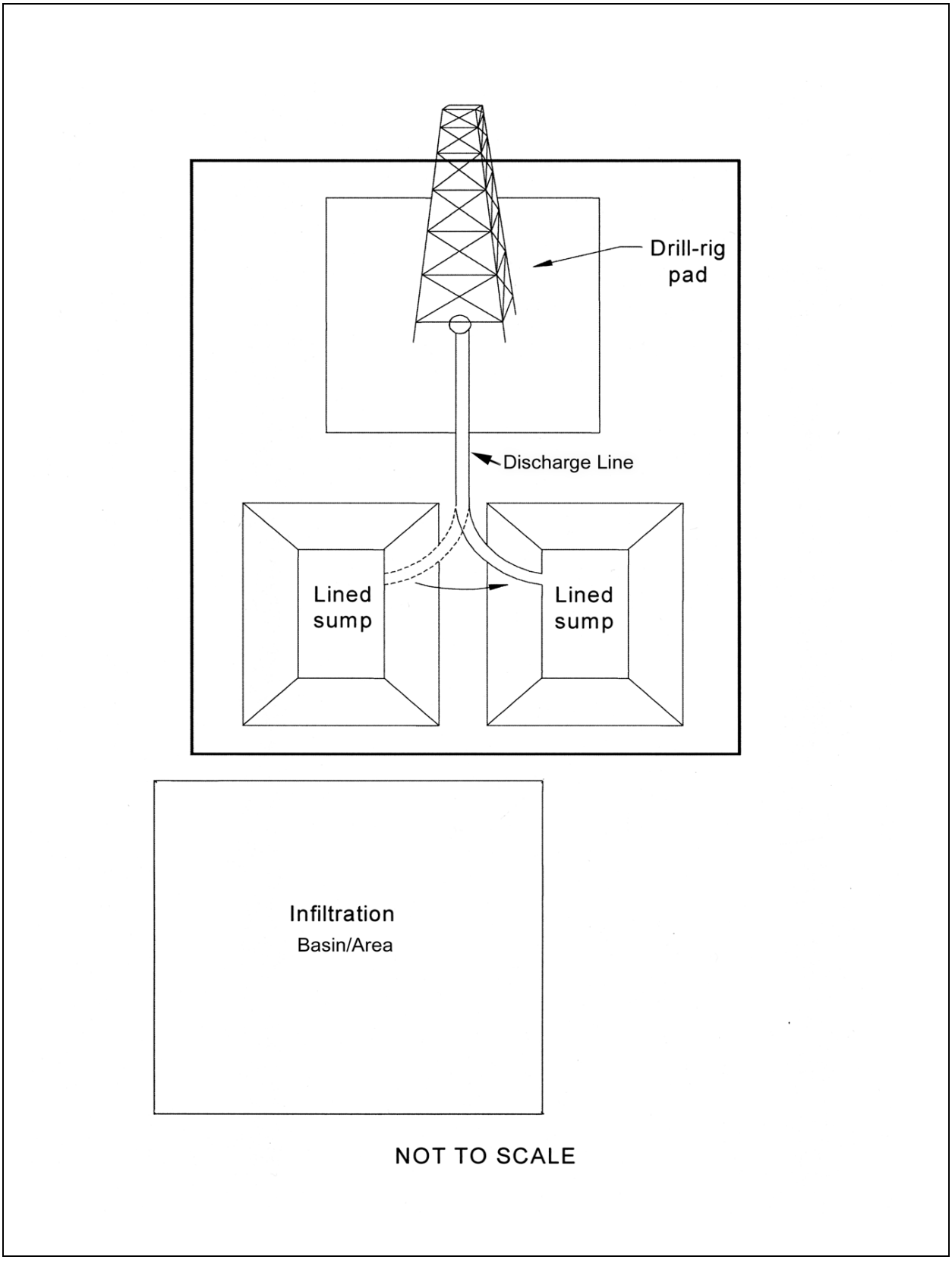

Figure 4-1
Near-Field Site Layout

Following is an example of 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, 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 if the fluids from the first sump may be discharged directly to an infiltration basin/area or to the ground surface. The fluid volume in the second sump when filled will undergo the same procedure.

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 the contamination indicators, tritium and/or lead, to make decisions regarding fluid containment and/or the progression of investigation operations. Such decisions are based on analysis that is performed 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.

Figure 4-2 outlines the decision points in the monitoring program for near-field well sites under this FMP. 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 picocuries per liter (pCi/L) (20 × *Nevada Drinking Water Standards* [NDWS]) 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) and may result in the suspension of drilling operations.

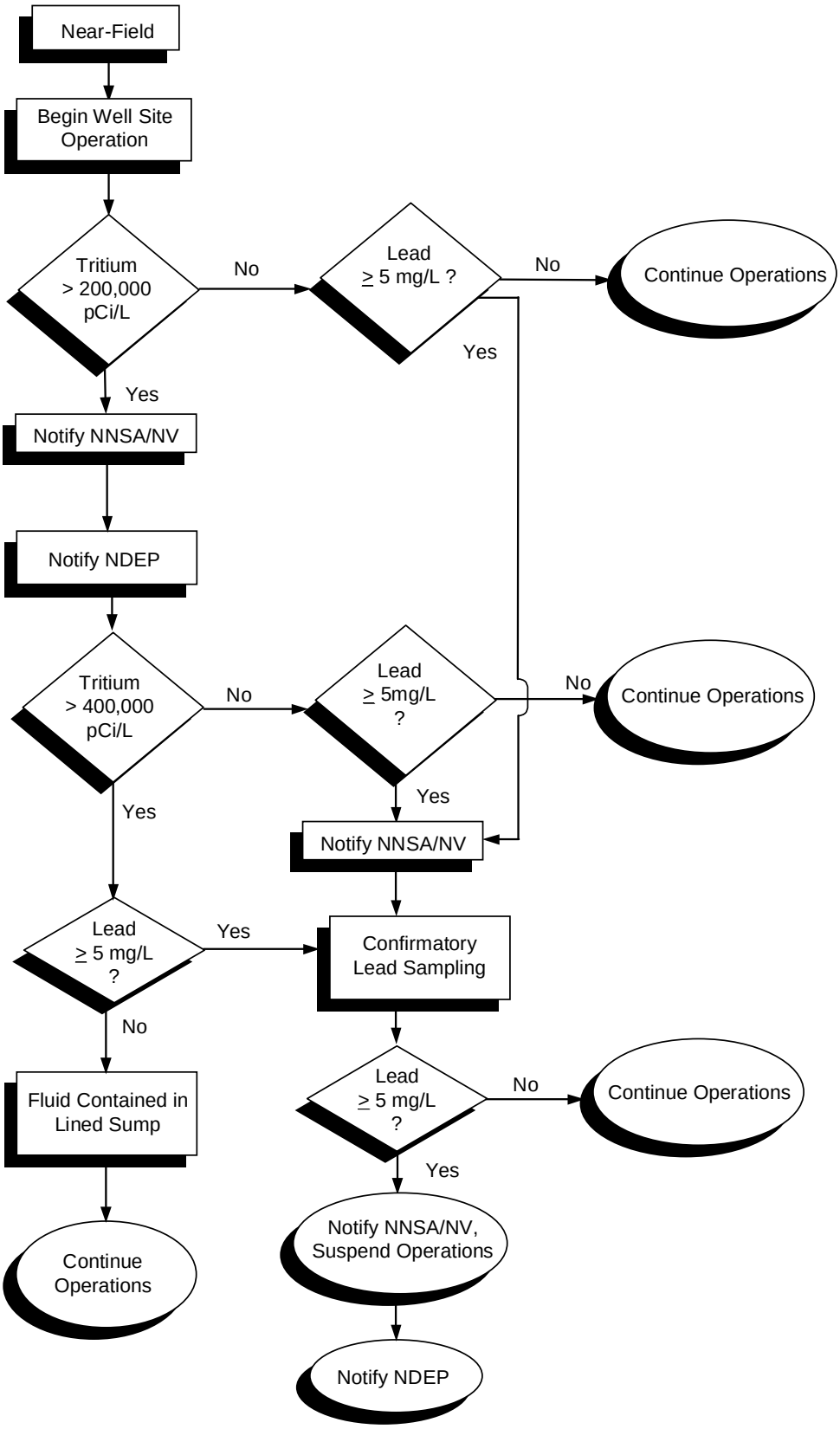

Figure 4-2
Near-Field Monitoring Decision Diagram

4.1.2.1 Monitoring

Fluids generated during near-field operations will be analyzed for lead and tritium while the borehole is being advanced. Such monitoring may be initiated in vadose zone drilling to account for possible prompt injection phenomenon encountered above the groundwater table. Tritium and lead monitoring samples will be collected from the discharge line. The NDEP will be notified via telephone, fax, or e-mail when tritium monitoring levels reach or exceed 200,000 pCi/L. This is a courtesy notification only and will not result in the suspension or alteration of operations. The NNSA/NV shall be notified immediately when monitoring of tritium and/or lead meets or exceeds the established action level. Notification of subsequent monitoring results to the NNSA/NV and NDEP shall follow established protocol. Monitoring results will be available to NDEP in accordance with Section 7.0 of this document.

4.1.2.2 Tritium Monitoring

During advancement of the borehole, a tritium sample will be collected hourly from the discharge line. Refer to Section 4.2.2 for monitoring requirements during other well site activities. Monitoring samples will, at a minimum, be analyzed daily during borehole advancement. The tritium action level under this FMP is 400,000 pCi/L (20 × NDWS). If this level is exceeded during borehole advancement activities, fluids will be discharged to a lined sump and the site will be considered "radiologically contaminated" from that point forward until proven otherwise.

4.1.2.3 Lead Monitoring

A lead sample shall be collected from the discharge line once every eight hours while the borehole is being advanced. Monitoring for other well-site activities is discussed in Section 4.2.2. Monitoring samples may be analyzed on site or off site but will, at a minimum, be analyzed daily. Lead may be monitored with a digital voltameter, colorimetric method, or other appropriate method.

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 5 mg/L or less. In order 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, as described below. 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 operation cease (see Figure 4-2).

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. Throughout the following discussion, the lead "action level" referred to is associated with the RCRA hazardous waste lead level. The process below 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.

4.1.3 Fluid Management Decision Criteria

The fluid management decision criteria in Table 4-1 are used to determine the options for final fluid disposition. These criteria are based on the NDWS. Using UGTA historical knowledge, the following parameters were selected for establishing fluid quality relative to the NDWS: 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 Table 4-2). Only the dissolved metals results will be compared with Table 4-1 limits when making fluid disposal decisions.

The 5 × NDWS 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 Table 4-1 are < 5 × NDWS, fluids may be discharged directly to the ground

Table 4-1
Fluid Management Decision Criteria Limits

FMP Parameters	RCRA Levels (mg/L)	NDWS Standard (mg/L)	5 × NDWS Limit[a] (mg/L)	20 × NDWS Limit[b] (mg/L)
Arsenic	5.0	0.010	0.050	0.2
Barium	100.0	2	10	40
Cadmium	1.0	0.005	0.025	0.1
Chromium	5.0	0.100	0.500	2
Lead	5.0	0.015	0.075	0.3
Selenium	1.0	0.050	0.250	1
Silver	5.0	0.100	0.500	2
Mercury	0.2	0.002	0.010	0.04
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
[b]Limit for discharge to an infiltration basin/area

surface. Similarly, if all parameters in Table 4-1 are < 20 × NDWS criteria limits, fluids may be discharged into an infiltration basin/area.

Note: The 5 x and 20 x NDWS criteria values in Table 4-1 are simply multipliers of the NDWS numeric values. That is, the drinking water standards are the basis for development of the 5 x and 20 x NDWS values. Only the 5 x and 20 x NDWS values from Table 4-1 will be used to make discharge/disposal decisions under this FMP. The drinking water standards themselves (NDWS) are included in Table 4-1 as a point of reference only, and will not be compared directly with fluid analytical results to make discharge/disposal decisions under this FMP.

Table 4-2
Analytical Laboratory Requirements for Fluid Management Samples
(Page 1 of 2)

Parameter	Analytical Method[a]	Container Type[b]	Preservative[c]	Maximum Holding Time[d]	Reporting Detection Limit (RDL)[e]	RCRA Levels	Nevada Drinking Water Standards[f]
Total Metals:							
Arsenic	SW-846 6010B	(1) 1-liter polyethylene or amber glass	HNO_3[g] to pH <2, Cool to 4°C ± 2 °C	180 Days	0.01mg/L	5.0 mg/L	0.01 mg/L
Barium	SW-846 6010B				0.2 mg/L	100 mg/L	2.0 mg/L
Cadmium	SW-846 6010B				0.005 mg/L	1.0 mg/L	0.005 mg/L
Chromium	SW-846 6010B				0.01 mg/L	5.0 mg/L	0.1 mg/L
Lead	SW-846 6010B				0.003 mg/L	5.0 mg/L	0.015 mg/L
Selenium	SW-846 6010B				0.005 mg/L	1.0 mg/L	0.05 mg/L
Silver	SW-846 6010B				0.01 mg/L	5.0 mg/L	0.1 mg/L
Mercury	SW-846 7470A			28 days	0.0002 mg/L	0.2 mg/L	0.002 mg/L
Dissolved Metals:							
Arsenic	SW-846 6010B	(1) 1-liter polyethylene or amber glass	Field Filtration[h] HNO_3 to pH < 2, Cool to 4°C ± 2 °C **OR** Lab Filtration, HNO_3 to pH < 2, Cool to 4°C ± 2 °C	180 Days	0.01mg/L	5.0 mg/L	0.01 mg/L
Barium	SW-846 6010B				0.2 mg/L	100 mg/L	2.0 mg/L
Cadmium	SW-846 6010B				0.005 mg/L	1.0 mg/L	0.005 mg/L
Chromium	SW-846 6010B				0.01 mg/L	5.0 mg/L	0.1 mg/L
Lead	SW-846 6010B				0.003 mg/L	5.0 mg/L	0.015 mg/L
Selenium	SW-846 6010B				0.005 mg/L	1.0 mg/L	0.05 mg/L
Silver	SW-846 6010B				0.01 mg/L	5.0 mg/L	0.1 mg/L
Mercury	SW-846 7470A			28 days	0.0002 mg/L	0.2 mg/L	0.002 mg/L
Gross Alpha	EPA 900.0 or equivalent	(1) 1-liter polyethylene	Field Filtration HNO_3 to pH < 2 **OR** Lab Filtration, HNO_3 to pH < 2	180 Days	10 pCi/L[i]	N/A	15 pCi/L
Gross Beta					<15 pCi/L	N/A	50 pCi/L

Table 4-2
Analytical Laboratory Requirements for Fluid Management Samples
(Page 2 of 2)

Parameter	Analytical Method[a]	Container Type[b]	Preservative[c]	Maximum Holding Time[d]	Reporting Detection Limit (RDL)[e]	RCRA Levels	Nevada Drinking Water Standards[f]
Tritium	EPA 906.0 or equivalent	(1) 500-mL amber glass	Field or Lab Filtration	180 Days	1,000 pCi/L	N/A	20,000 pCi/L

[a]Inorganic methods taken from *EPA Test Methods for Evaluating Solid Waste*, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996); radiochemical methods taken from *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA, 1980)
[b]Inorganic requirements taken from *EPA Test Methods for Evaluating Solid Waste*, 3rd Edition, Parts 1-4, SW-846 (EPA, 1996); radiochemical volume specifications are based on sample compositing requirements
[c]Inorganic requirements taken from *EPA Contract Laboratory Program Statement of Work for Inorganic Analysis* (EPA, 1994)
[d]Inorganic requirements taken from *EPA Contract Laboratory Program Statement of Work for Inorganic Analysis* (EPA, 1994)
[e]Inorganic requirements taken from *EPA Contract Laboratory Program Statement of Work for Inorganic Analysis* (EPA, 1994)
[f]Nevada Drinking Water Standards
[g]Nitric Acid
[h]Filtration and preservation, when required, should be performed in the field. If the matrix of the sample makes field filtration too difficult, the sample will be sent to the laboratory for subsequent filtering and preservation.
[i]Picocuries per liter

4.1.4 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 and infiltration basins. The analytical results received from the laboratory are compared to the limits in Table 4-1 in order to allow the discharge of fluids to either an infiltration basin/area or the ground surface.

If a sump or infiltration basin 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 or infiltration basins, 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 (e.g., discharging fluids from a lined sump to and from an infiltration basin or from an infiltration basin to the ground surface), a sample must be collected for laboratory analysis. The sample must be collected from the sump or infiltration basins to which fluids were discharged (active sump), and from all sumps or infiltration basin 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 which contains fluid at a site prior to vacating the site. Contained fluids will be analyzed for the parameters listed in Table 4-2.

4.1.5 Fluid Disposition

This section discusses fluid disposition options for fluids which are contained/stored in a lined sump. This FMP allows the discharge of investigation fluids on site when specific fluid criteria are met. The two options for on-site disposal of investigation fluids are (1) an infiltration basin or area and (2) the ground surface. An infiltration basin is a constructed unlined basin or pit. 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 Table 4-1 of this document are not met. The on-site disposal options for fluids stored in lined sumps are:

- ***Direct discharge to the ground surface.*** Fluids documented to be < 5 × NDWS 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 basin/area.*** Fluids documented to be < 20 × NDWS for all required FMP analytical parameters may be discharged to an infiltration basin/area.

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

- ***On-site containment in a lined sump.*** Fluids documented to contain RCRA metals below hazardous waste limits found in the most recent version of Title 40 *Code of Federal Regulations* (CFR) Part 261.24 (RCRA standards) [CFR, 2000] and radiological parameters > 20 × NDWS 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.

- ***Transportation to the NTS or a treatment, storage, and disposal facility.*** Fluids documented to contain any RCRA metal above its respective hazardous waste limit found in the most recent version of 40 CFR 261.24 (RCRA standards) [CFR, 2000] 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/NV and the 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 treatment, storage, or disposal facility.

Figure 4-3 illustrates the general decision flow process for the disposal of fluids under this FMP. 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 Table 4-1 shall not exceed 20 × NDWS if the fluids are to be discharged to an infiltration basin/area. Fluids intended for discharge to the ground surface must not exceed 5 × NDWS.

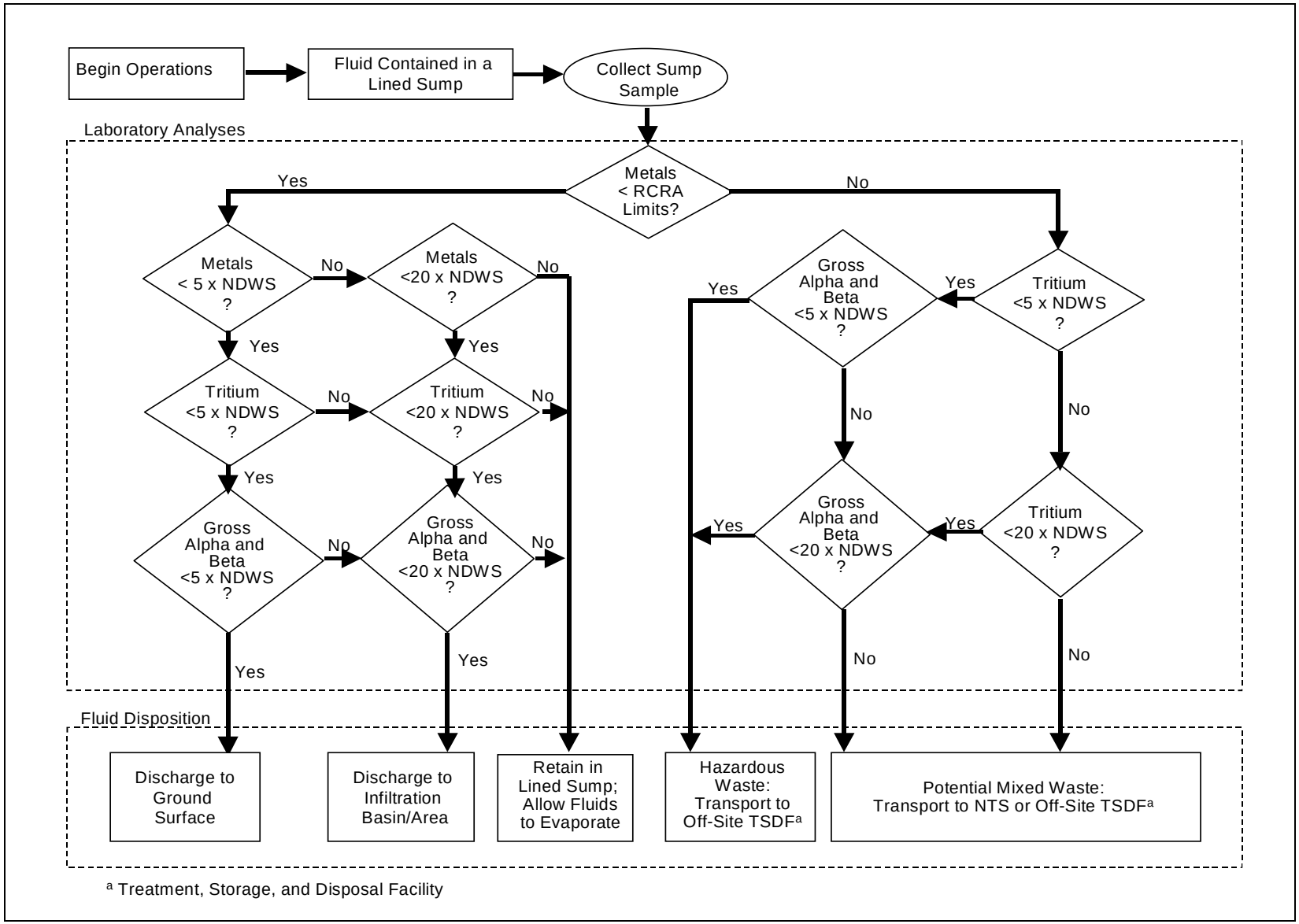

Figure 4-3
Decision Diagram for Fluid Disposal

4.2 Other Well Site Activities

Other well site activities include those which encounter subsurface formations that were previously drilled through 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, circulation of the borehole, fishing and wash-over operations, well completion operations such as casing and stemming of annular materials, well development, testing, and periodic sampling events. Well completion designs and associated well construction activities will vary depending on well-specific objectives and may include the setting of intermediate casing; the running of a completion string to a specified depth; and/or the isolation of productive zones with gravel, cement, packers, and sliding sleeves. Other activities may be conducted within a discrete time 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).

4.2.1 Fluid Containment

Fluid containment options during other well site activities operating under the near-field strategy will typically be the same as those described in Section 4.1.1. 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 basin/area or to the ground surface (see Section 6.0). The NNSA/NV will notify NDEP of any change in well site operation strategy.

4.2.2 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. Refer to Section 4.1.2 for detailed information on tritium and lead monitoring in a near-field scenario.

4.2.3 Fluid Management Decision Criteria

The fluid management decision criteria in Table 4-1 are to be used to determine the options for final disposition of fluids generated during other well site activities. Refer to Section 4.1.3 for further detail.

4.2.4 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 sump which contains fluid at a site prior to vacating the site. Sump fluids will be analyzed for the parameters listed in Table 4-2.

4.2.5 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. Refer to Section 4.1.5 for further detail.

5.0 Far-Field Fluid Management Strategy

At far-field wells, it is not expected that radioactive constituents or metals contamination from underground testing will be encountered in excess of 20 x NDWS (see Table 4-1). No far-field wells constructed to date have exceeded fluid quality parameters for discharging fluids to a constructed infiltration basin/area; in fact, most have met fluid quality parameters for discharging fluids directly to the ground surface.

5.1 Well Drilling Activities

Drilling activities that advance the borehole involve only those which cut 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, fluids may be discharged directly from the well to the ground surface, an unlined infiltration basin/area, a lined sump, or aboveground containment (e.g., Baker tank, drum). An infiltration basin is a constructed unlined basin or pit. An infiltration area is a predesignated bounded area within which fluids may be discharged.

The type of fluid containment required will be based on available process knowledge and identified in the Well-Site Operation Strategy Letter approved by the NDEP (see Section 3.0). In a typical far-field scenario, two infiltration basins may be 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 infiltration basins to allow for discharge to the ground surface. Figure 5-1 offers an example of a typical far-field fluid containment configuration. In some situations, one infiltration basin may be lined as a contingency in the event that monitoring identifies fluids which do not meet fluid management criteria (refer to Transition Strategy in Section 6.0).

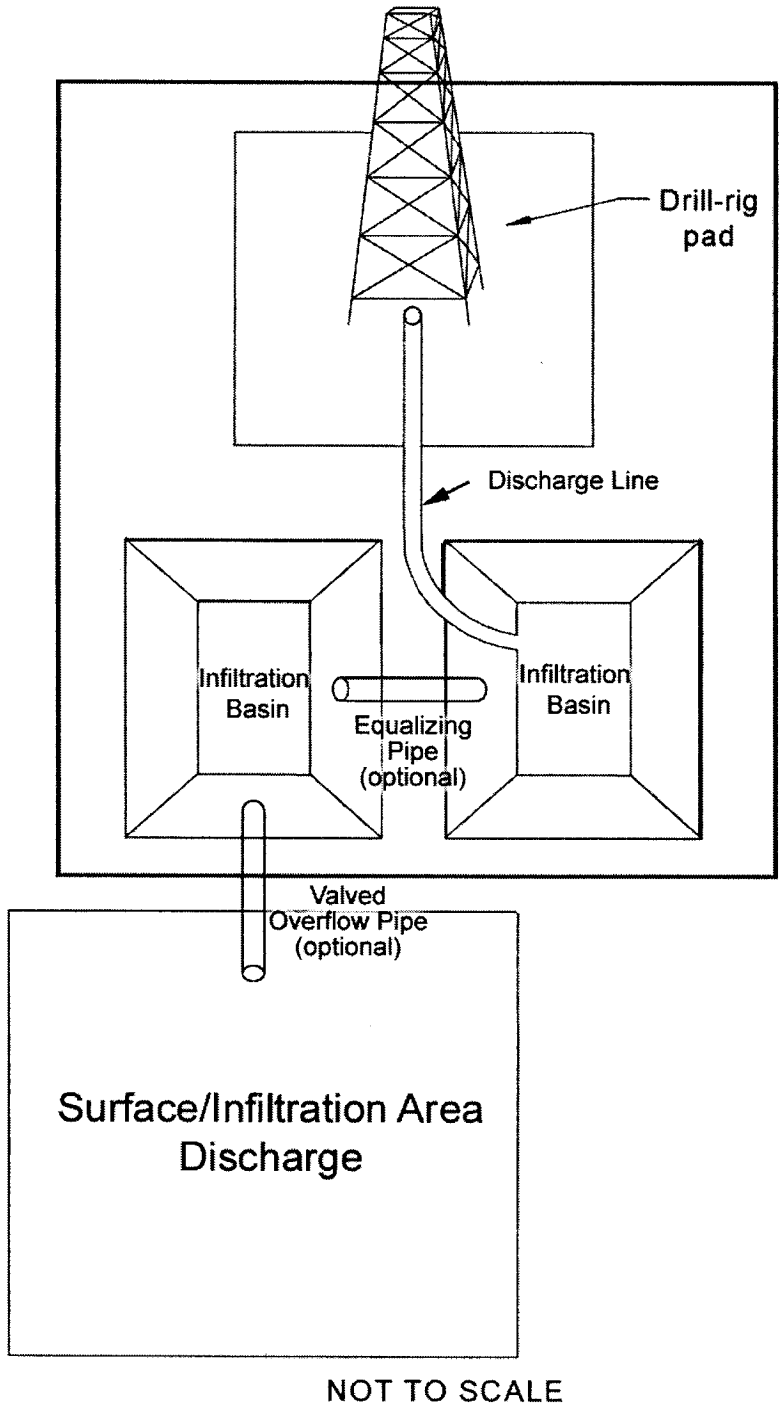

Figure 5-1
Far-Field Site Layout

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 5-2 outlines the decision points in the monitoring program for far-field well sites under this FMP. The NNSA/NV shall be notified immediately when monitoring of tritium meets or exceeds the established action level. Notification of subsequent monitoring results to the NNSA/NV and NDEP shall follow established protocol.

5.1.2.1 Monitoring

Based on previous wells drilled in support of the UGTA program, chemical and/or radiological contamination from underground testing in a well operating under a far-field strategy is not likely to be encountered. The potential for lead from underground testing to be present in drilling fluids in the far-field is remote. Lead is not monitored under a far-field strategy. However, due to the ability of tritium to move with groundwater, tritium is monitored under the far-field strategy. The NDEP will be notified via telephone, fax, or e-mail when tritium monitoring levels reach or exceed 200,000 pCi/L. This is a courtesy notification only and will not result in the suspension or alteration of operations.

5.1.2.2 Tritium Monitoring

While advancing the borehole at a far-field site, a tritium sample will be collected every hour at the discharge line. Tritium monitoring for other well site activities is discussed in Section 5.2.2. Monitoring samples will, at a minimum, be analyzed daily. Figure 5-2 outlines the decision points in the monitoring program for far-field well sites under this FMP. Further reduction or elimination of tritium monitoring shall be based on process knowledge and approval from NNSA/NV and NDEP.

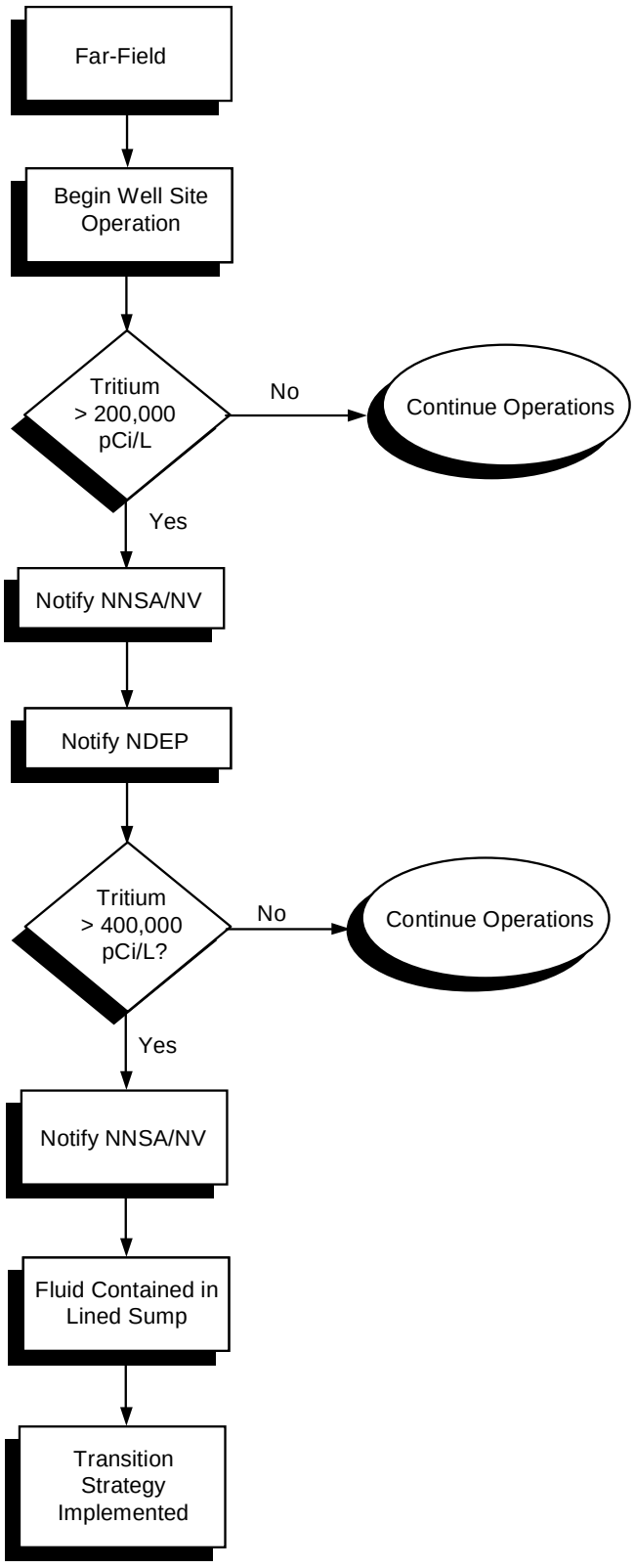

Figure 5-2
Far-Field Monitoring Decision Diagram

5.2 Other Well Site Activities

Other well site activities include those which encounter subsurface formations that were previously drilled through 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, circulation of the borehole, fishing and wash-over operations, well completion operations such as casing and stemming of annular materials, well development, testing, and periodic sampling events. Well completion designs and associated well construction activities will vary depending on well-specific objectives; and may include the setting of intermediate casing, the running of a completion string to a specified depth, and/or the isolation of productive zones with gravel, cement, packers, and sliding sleeves. Other activities may be conducted within a discrete time 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.

5.2.2 Monitoring

During other well site activities, a tritium sample will be collected once every day at the discharge line. Monitoring samples may be analyzed on site or off site but will, at a minimum, be analyzed weekly. Further reduction or elimination of tritium monitoring shall be based on process knowledge and approval from NNSA/NV and NDEP.

6.0 Transition Strategy

In the event that monitoring at a designated far-field well site reveals tritium concentrations that exceed the fluid management criteria for near-field wells (i.e., concentrations greater than 400,000 pCi/L), operations shall cease immediately and the NNSA/NV notified. The following transition strategy may be employed to transition well site operations from a far-field strategy to a near-field strategy.

In essence, the well site will change to a near-field site, with tritium being monitored hourly and lead being monitored every eight hours. A minimum of one single-lined sump may be constructed for the containment of 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. The NNSA/NV shall be notified immediately when monitoring of tritium and/or lead meets or exceeds the established action level. Notification of subsequent monitoring results to the NNSA/NV and NDEP shall follow established protocol.

7.0 Reporting Requirements

The NNSA/NV shall comply with the following reporting requirements for all investigation activities covered under this FMP, which are undertaken in support of the UGTA Project:

- ***Fluid Release Reporting.*** The NDEP shall be notified in the event that fluids in excess of 20 × NDWS limits, as defined by this FMP, are discharged into an infiltration basin, 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 prior to the end of the next business day following verification of the incident. Telephone notification shall be followed by a written report which includes elements described in spill reporting regulations within ten 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 a lined sump or infiltration basin. Nonemergency actions that constitute deviations to this FMP will be reported to the NDEP prior to implementation of the action. Emergency actions which are taken that constitute deviations to this FMP will be reported orally 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.

- ***Well-Site Operation Strategy Letter.*** NNSA/NV will submit to NDEP a Well-Site Operation Strategy Letter as defined in Section 3.1 for approval prior to the commencement of 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 the NDEP each day for all activities covered under this FMP. Fluid releases not reportable under "Fluid Release Reporting" above will be discussed in these morning reports.

All correspondence to the NDEP shall be addressed to:

Bureau Chief
Nevada Division of Environmental Protection
Bureau of Federal Facilities
333 West Nye Lane
Carson, City, NV 89706-0851

With a copy to the Las Vegas Office at:

BFF Supervisor
Bureau of Federal Facilities
1771 E. Flamingo Road, Suite 121-A
Las Vegas, NV 89119

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

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

8.0 References

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