NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WHITE SANDS TEST FACILITY

Resource Conservation and Recovery Act
Permit
EPA ID # NM8800019434

New Mexico Environment Department – Hazardous Waste Bureau

April 27, 2023 (modified on July 1, 2026)

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PART 1: GENERAL PERMIT CONDITIONS

1.1 Authority

This permit is issued pursuant to the authority of the New Mexico Environment Department (NMED) under the New Mexico Hazardous Waste Act (HWA), NMSA 1978, §§ 74-4-1 to 74-4-14, in accordance with the New Mexico Hazardous Waste Management Regulations (HWMR), 20.4.1 New Mexico Administrative Code (NMAC).

Pursuant to the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901 to 6992k, and 40 CFR § 272.1601 (2019), the State of New Mexico, through the NMED, is authorized to administer and enforce the state hazardous waste management program under the HWA in lieu of the federal program.

The Permit contains terms and conditions that the NMED has determined are necessary to protect human health and the environment in accordance with 20.4.1.900 NMAC including incorporating 40 Code of Federal Regulations (CFR) § 270.32(b)(2) and 20.4.1.500 NMAC including incorporating 40 CFR § 264.101.

1.2 Permittee

The New Mexico Environment Department (NMED) issues this Permit to the United States National Aeronautics and Space Administration (NASA) White Sands Test Facility (WSTF) (Permittee), the owner and operator of NASA WSTF (the Facility), located in Doña Ana County, New Mexico. The Facility EPA ID number is NM8800019434.

1.3 Permitted Activity

This Permit requires the Permittee to conduct corrective action activities and to conduct tasks in accordance with a schedule of compliance for all solid waste management units (SWMUs) and areas of concern (AOCs), and five closed hazardous waste management units (HWMUs) under post-closure care. This Permit establishes the general and specific standards for these activities, as required pursuant to the Hazardous Waste Act (HWA), as amended, NMSA 1978 74-4-1 et seq., and the HWMR, 20.4.1 NMAC.

This Permit also establishes the standards of post-closure care for the five closed HWMUs at WSTF in accordance with applicable 40 CFR 264 Subpart G regulations, the HWA, and HWMR. These standards are outlined in Permit Part 7, Hazardous Waste Management Unit Post-Closure Care.

1.4 Citations

Whenever the Permit cites a provision of 20.4.1 NMAC or 40 CFR, the Permit shall be deemed to incorporate the citation by reference, including all subordinate provisions of the cited provision, and make binding the full text of the cited provision.

Hazardous waste management regulations are frequently cited throughout this Permit. The federal Hazardous Waste Management Regulations, 40 CFR Parts 260 through 273, are generally cited rather than the New Mexico Hazardous Waste Management Regulations, 20.4.1.100 through 20.4.1.1000 NMAC. The federal regulations are cited because only the federal regulations set forth the detailed regulatory requirements; the State regulations incorporate by reference, with certain exceptions, the federal regulations in their entirety. Citing only the federal regulations also serves to avoid encumbering each citation with reference to two sets of regulations. However, it is the State regulations that are legally applicable and enforceable. Therefore, for the purpose of this Permit and enforcement of its terms and conditions, all references to provisions of federal regulations that have been incorporated into the State regulations shall be deemed to include the State incorporation of those provisions.

1.5 Effect of Permit

Compliance with this Permit during its term shall constitute compliance, for purposes of enforcement, with Subtitle C of RCRA and the HWA, and the implementing regulations at 40 CFR Parts 264, 266, and 268 except for those requirements that become effective by statute after the Permit has been issued as specified in 40 CFR § 270.4. The Permittee must also comply with all applicable self-implementing provisions imposed by statute or rule, including 40 CFR Parts 260, 261, 262, 263, 264, 266, and 268.

Compliance with this Permit shall not constitute a defense to any order issued or any action brought under: §§ 74-4-10, 74-4-10.1, or 74-4-13 of the HWA; 3008(a), 3008(h), 3013, 7002(a)(1)(B), or 7003 of RCRA; 104, 106(a), or 107, of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601 to 9675; or any other federal, state, or local law providing for protection of public health or the environment.

This Permit does not convey any property rights of any sort or any exclusive privilege, nor authorize any injury to persons or property, any invasion of other private rights, or any infringement of state or local laws or regulations. Compliance with this Permit does not relieve Permittees from the responsibility of complying with all applicable state or federal laws and regulations (40 CFR § 270.4, § 270.30(g) and § 270.32(b)(1), 20.4.1.901(A)(11) and 20.4.1.1100 NMAC).

1.6 Effect of Inaccuracies in Permit Application

This Permit is based on the information submitted by the Permittee in the Permit Application dated June 5, 2019 (Application). Any inaccuracies found in the Application may be grounds for the termination, revocation and reissuance, or modification of this Permit pursuant to 40 CFR § 270.43(a)(2). Where the Permittee becomes aware that it failed to submit any relevant facts in the Application or submitted incorrect information in the Application or in any report to the NMED, it shall promptly submit such facts or information pursuant to 40 CFR § 270.30(l)(11).

1.7 Enforcement

Any violation of a condition of this Permit may subject the Permittee, and its officers, employees, successors, and assigns to:

1. a compliance order under § 74-4-10 of the HWA or § 3008(a) of RCRA (42 U.S.C § 6928(a));

2. a civil enforcement action under § 74-4-10 of the HWA or § 3008(a) of RCRA (42 U.S.C § 6928(a));

3. an injunction under § 74-4-10 of the HWA or § 3008(a) of RCRA (42 U.S.C § 6928 (a)), or § 7002(a) of RCRA (42 U.S.C. § 6972(a));

4. civil penalties under § 74-4-10 of the HWA or § 3008(a) and (g) of RCRA (42 U.S.C. § 6928(a) and (g)), or § 7002(a) of RCRA (42 U.S.C § 6972(a));

5. criminal penalties under § 74-4-11 of the HWA or § 3008(d), (e), and (f) of RCRA (42 U.S.C. § 6928(d), (e), and (f)); or

6. some combination of the foregoing.

The list of authorities in this paragraph is not exhaustive and the NMED reserves the right to take any action authorized by law to enforce the requirements of this Permit.

1.8 Permit Components

This Permit consists of the regulations incorporated by reference into this Permit, Permit Sections in Parts 1 through 7, and Permit Attachments 1 through 5.

1.9 Permit Actions

1.9.1 Duration of Permit

This Permit shall be effective for a period of ten years from the effective date in accordance with 40 CFR § 270.50(a), except as provided by 40 CFR § 270.51. The effective date of this Permit shall be 30 calendar days after notice of the NMED's decision has been served on the Permittee, or such later time as the NMED may specify. (20.4.1.901.A(10) NMAC)

1.9.2 Permit Modification

This Permit may be modified for both routine and significant changes as specified in 40 CFR § 270.41 and § 270.42, and any modification shall conform to the requirements specified in those regulations. The filing of a permit modification request by the Permittee, or the notification by the Permittee of planned changes or anticipated noncompliance, does not stay the applicability or enforceability of any permit condition (40 CFR § 270.30(f)).

1. If at any time, for any of the reasons specified in 40 CFR § 270.41, the NMED determines that modification of this Permit is necessary, the NMED may initiate a Permit modification.

2. The Permittee may request a permit modification in accordance with 40 CFR § 270.42.

3. Modifications to the Permit only reopen the permit conditions subject to the modification and do not constitute a reissuance of the Permit.

1.9.3 Unclassified Permit Modifications

Unless a permit modification is explicitly listed in Appendix I of 40 CFR § 270.42 as a Class 1 or 2 permit modification, the Permittee shall not submit the proposed permit modification as a Class 1 or 2 permit modification. The Permittee may only make such permit modification as a Class 3 modification or may request a determination from the NMED as to whether the proposed permit modification should be reviewed as a Class 1 or 2 modification in accordance with the requirements of 40 CFR § 270.42(d)(1).

1.9.4 Permit Modification, Suspension, Revocation, and Reissuance, or Termination

This Permit may be modified, suspended, revoked and reissued, or terminated for cause in accordance with provisions of the HWA, NMSA 1978, 74-4-4.2 and 40 CFR § 270.41 and § 270.43.

1.9.5 Permit Renewal Application

The Permittee shall submit an application for a new permit at least one hundred eighty (180) calendar days before the expiration date of this Permit, unless permission for a later date has been granted by the NMED, pursuant to 40 CFR § 270.10(h)(1) and § 270.30(b). When reviewing the renewal application, NMED will consider improvements in the state of control and measurement technology and changes in applicable laws and regulations.

1.9.6 Continuation of Expired Permit

Pursuant to 40 CFR § 270.51(a), the conditions in this Permit shall continue in force and effect until the effective date of a new permit if:

1. the Permittee has submitted a timely application for renewal of this Permit in compliance with 40 CFR § 270.13 and § 270.14, and the applicable sections in 40 CFR § 270.15 through § 270.28, which is a complete application under 40 CFR § 270.10(c) for a new permit in accordance with 40 CFR § 270.51(a)(1); and

2. the NMED, through no fault of the Permittee, does not issue a new permit with an effective date on or before the expiration date of the previous permit (40 CFR § 270.51(a)(2)).

1.10 Permit Construction

1.10.1 Severability

The provisions of this Permit are severable, and if any provision of this Permit, or any application of any provision of this Permit, due to any circumstance is held invalid, then the application of such provision to other circumstances and the remainder of this Permit shall not be affected thereby.

1.11 Conflict in Language

If there is a conflict between the language of a Permit Condition and the language of a Permit Attachment, where the Attachment includes text provided by the Permittee that is not expressly written by NMED, then the language of the Permit Condition shall control the language in the Permit Attachment. This Permit and 40 CFR 264, 266, and 268 establish the minimum requirements for the design, construction, operation, and maintenance of the Facility. Any language in an attachment, which states or implies discretion to not comply with the minimum requirements of this Permit or 40 CFR § 270.32(b)(1) and (2), is not effective and the requirements of this Permit and 40 CFR § 270.32(b)(1) and (2) shall control.

1.12 Definitions

For the purposes of this Permit, terms used herein shall have the same meanings as those in the Hazardous Waste Act, the Resource Conservation and Recovery Act, and their implementing regulations, unless this Permit specifically provides otherwise. Where a term is not defined in the Hazardous Waste Act, RCRA, or pursuant to regulations, EPA guidelines or publications, or this Permit, the meaning associated with such a term shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term.

Administrative Record means the administrative record supporting and otherwise relating to the requirements of this Permit, compiled as of the effective date of this Permit, which forms the basis for the terms of this Permit. The Administrative Record includes the full record and those documents submitted in writing by the NMED, the Permittee, EPA or the public, as of the effective date of the Permit for inclusion in the Administrative Record.

Area of Concern (AOC) means any area having a known or suspected release of hazardous waste, hazardous constituents or other contaminant that is not from a solid waste management unit and that NMED has determined may pose a current or potential threat to human health or the environment. An AOC may include buildings, structures, and other locations at which releases of hazardous waste or constituents have not been remediated, including releases resulting from one-time or accidental events.

Contaminant means any substance in environmental media that is not otherwise a “hazardous waste” or a “hazardous constituent,” for which investigation or cleanup is required under this Permit because it:

1) Exceeds a state or federal numeric standard (e.g., 20.6.2.3103 NMAC, MCLs at 40 CFR parts 141 and 143), or
2) Is identified by NMED under 40 CFR § 264.1 (b)(2) as posing a threat to human health or the environment

Examples include, but are not limited to:

a) Perchlorate, which is regulated by WQCC groundwater standards, but is not a hazardous waste or hazardous constituent; and,
b) total petroleum hydrocarbons, which is addressed in NMED Risk Assessment Guidance, but is not a listed hazardous constituent

Corrective Action means all corrective action, as defined in 20.4.2.7(C)(3) NMAC, necessary to protect human health and the environment for all releases of hazardous waste or hazardous constituents, or other contaminants defined by this Permit Section (1.12), to the environment as required under HWA § 74-4-4.2 (B), 40 CFR § 264.101 and 40 CFR § 270.32(b)(2). Corrective action may address releases to air, soil, sediment, surface water, or groundwater.

Corrective Action Complete means the requirements for corrective action have been satisfied by the Permittee as determined by the NMED.

Discharge means the accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of solid waste or hazardous waste into or onto any land or water.

Disposal means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwater.

Emerging Contaminant means any substance, chemical, or compound that is not currently listed as a hazardous waste or constituent under 40 CFR Part 261 or 264 but is identified by EPA, NMED, or other authoritative source as posing a potential risk to human health or the environment. This includes substances for which regulatory standards or guidance are under development or anticipated, and for which corrective action may be required under this Permit.

Examples include, but are not limited to:

- Per-and polyfluoroalkyl substances (PFAS) not yet listed under the New Mexico Hazardous Waste Act or RCRA;
- Novel industrial chemicals;
- Pharmaceuticals and personal care products;
- Other contaminants identified through scientific research or regulatory action.

EPA means the United States Environmental Protection Agency and any successor or predecessor agencies.

Extent of Contamination means the horizontal and vertical area in which the concentrations of hazardous waste or constituents in the environmental media being investigated are above

detection limits or background concentrations indicative of the region, whichever is appropriate, as determined by the NMED.

Facility means National Aeronautics and Space Administration (NASA) White Sands Test Facility (WSTF), EPA ID Number NM8800019434, owned by the United States, located in Doña Ana County, New Mexico, approximately 18 miles northeast of Las Cruces, New Mexico and 65 miles north of El Paso, Texas, including all contiguous land, structures, other appurtenances, and improvements on the land used for storage or disposal of hazardous waste. For the purpose of implementing corrective action under 40 CFR § 264.101, or RCRA Section 3008(h), or the HWA, NMSA 1978, § 74-4-10(E), "Facility" means all contiguous property under the control of the owner or operator.

Groundwater means interstitial water, which occurs in saturated earth material.

Hazardous Constituent or ***Hazardous Waste Constituent*** means: 1) any constituent identified in 40 CFR Part 261 Appendix VII that causes EPA to list a hazardous waste in 40 CFR Part 261 Subpart D; or 2) any constituent identified in 40 CFR Part 261, Appendix VIII and any constituent identified in 40 CFR Part 264 Appendix IX.

Hazardous Waste, for the purposes of corrective action for solid waste management units and areas of concern conducted pursuant to § 74-4-4.2(B) of the HWA, 40 CFR Part 264, Subpart F, or 40 CFR § 270.32(b)(2), means a hazardous waste as defined in § 74-4-3(K) of the HWA. Hazardous waste, for the purposes of corrective action, includes, without limitation, any hazardous waste as defined in 40 CFR § 261.3, any groundwater contaminant listed in the WQCC Regulations in 20.6.2.3103 NMAC, any toxic pollutant listed in 20.6.2.7.T(2) NMAC, and any substance identified as a hazardous constituent or as a contaminant under Section 1.12 of this Permit for corrective action purposes, or for which the EPA has promulgated a maximum contaminant level (MCL) at 40 CFR parts 141 and 143, perchlorate, total petroleum hydrocarbons, methyl tertiary butyl ether, polychlorinated biphenyls (PCBs), dioxins, furans, per- and polyfluoroalkyl substances (PFAS), rocket fuel constituents, waste military munitions, and munitions constituents as defined in 10 U.S.C. § 2710(e)(3). Pursuant to § 74-4-3(K)(2)(a), hazardous waste includes discarded aqueous film-forming foam containing intentionally added PFAS.

> This definition is consistent with EPA's February 8, 2024 proposed rule clarifying that the statutory definition of hazardous waste applies to corrective action for releases from solid waste management units (SWMUs), and with the RCRA Omnibus provision at 40 CFR § 264.1(b)(2), which authorizes regulatory agencies to require corrective action for any substance that may pose a threat to human health or the environment.

References

U.S. EPA. *Hazardous Waste Definition Applicable to Corrective Action for Solid Waste Management Units (SWMUs)*, Proposed Rule, 89 FR 8520 (Feb. 8, 2024)

U.S. EPA. *Listing of Nine Per- and Polyfluoroalkyl Substances (PFAS) as RCRA Hazardous Constituents*, Proposed Rule, 89 FR 8606 (Feb 8, 2024)

40 CFR § 264.1(b)(2) RCRA Omnibus Provision.

Hazardous Waste for all other purposes of this Permit, means a hazardous waste as defined in 40 CFR § 261.3.

HWA means the New Mexico Hazardous Waste Act, NMSA 1978, §§ 74-4-1 to 74-4-14.

Hazardous Waste Management Regulations (HWMR) means the New Mexico Hazardous Waste Management Regulations, 20.4.1 NMAC and all provisions of 40 CFR Parts 260 through 273 incorporated therein.

Maximum Contaminant Level (MCL) means a maximum contaminant level under the Federal Safe Drinking Water Act, 42 U.S.C. §§ 300f to 300j-26, and the drinking water regulations promulgated thereunder.

NASA means the National Aeronautics and Space Administration.

NMED means the New Mexico Environment Department.

Operator means the person responsible for the overall operation of the Facility. NASA is the operator of White Sands Test Facility.

Owner means the person who owns the Facility or part of a Facility. The United States is the owner of NASA White Sands Test Facility.

Per- and Polyfluoroalkyl substances (PFAS) are a large class of synthetic organic chemicals characterized by the presence of one or more fully fluorinated carbon atoms (e.g., $-CF_3$, $-CF_2$ - groups). The carbon-fluorine bond is among the strongest in organic chemistry, resulting in extreme resistance to heat, chemical degradation, and environmental breakdown. PFAS vary widely in structure and function and have been used in numerous industrial, commercial, and firefighting applications.

PFAS includes both:

- **perfluoroalkyl substances** in which all hydrogens on the carbon chain are replaced with fluorine (fully fluorinated), and
- **polyfluoroalkyl substances** in which only some hydrogens are replaced with fluorine (partially fluorinated).

PFAS are commonly categorized by carbon-chain length:

- **Long-chain PFAS** include perfluorocarboxylic acids (PFCAs) with eight or more carbons (e.g., PFOA) and perfluorosulfonic acids (PFSAs) with six or more carbons (e.g. PFOS). These compounds are known to bioaccumulate and persist in humans and the environment.
- **Short-chain PFAS** include PFCAs with seven or fewer carbons and PFSAs with five or fewer carbons. These compounds are less bioaccumulative but remain highly persistent and mobile in the environment.

PFAS also include **precursor compounds**, which contain partially fluorinated carbon chains and can transform into terminal PFAS – such as PFOA, PFOS, PFH_xA, and related perfluoroalkyl acids (PFAAs) through environmental or biological processes. PFAAs are the terminal degradation products of many PFAS and include two major families:

- **Perfluorocarboxylic acids (PFCAs)**
- **Perfluorosulfonic acids (PFSAs)**

PFAS precursors are a significant component of many PFAS-related formulations, including fluorotelomer-based Aqueous Film Forming Foam AFFF. As a result, both terminal PFAS and PFAS precursors contribute to long-term environmental PFAS loading and are considered PFAS for the purposes of this Permit.

(PFAS definitions and precursor behavior derived from Interstate Technology & Regulatory Council (ITRC). PFAS Technical and Regulatory Guidance Document (PFAS-1). Updated January 2026. https://itrcweb.org PFAS)

Permittee means the National Aeronautics and Space Administration, the operator of White Sands Test Facility.

PFAS-Containing Class B Foams mean synthetic firefighting foams used to suppress flammable liquid fires. These include various formulations that contain PFAS such as AFFF, AR-AFFF, FFFP, AR-FFFP, FP, and AR-FP (defined below). All are considered fluorinated foams and may pose environmental and health risks due to PFAS persistence and mobility.

- ***Aqueous Film-Forming Foam (AFFF)*** means a fluorinated foam that contains per- and polyfluoroalkyl substances (PFAS). AFFF is a firefighting product intended for fighting high-hazard flammable liquid fires. AFFF products are synthesized by combining hydrocarbon foaming agents with fluorinated surfactants. There are three types of AFFF:
    - Legacy PFOS AFFF (manufactured in the US from the late 1960s through 2002)
    - Legacy fluorotelomer AFFF, which contains some long-chain PFAS (manufactured in the US from the 1970s until 2016)
    - Modern fluorotelomer AFFF (short-chain PFAS became the predominant fluorochemicals used in manufacturing in response to USEPA 2010/2015 voluntary PFOA Stewardship Program)

- ***Film-Forming Fluoroprotein Foam (FFFP)*** is a synthetic firefighting foam that contains PFAS and combines protein-based components with fluorinated surfactants to form a film over flammable liquids. It was widely used prior to the adoption of AFFF and remains a concern in legacy contamination scenarios.
- ***Alcohol-Resistant Film-Forming Fluoroprotein Foam (AR-FFFP)*** is a variant of FFFP formulated to suppress fires involving polar solvents. It contains PFAS and includes additional polymers to resist alcohol breakdown while maintaining film-forming properties.

- ***Fluoroprotein Foam (FP)*** is a protein-based foam enhanced with fluorination surfactants to improve performance against hydrocarbon fires. Though it is less common today, it contains PFAS and may be present at legacy sites.
- ***Alcohol-Resistant Fluoroprotein Foam (AR-FP or FPAR)*** is a fluoroprotein foam modified to combat polar solvent fires. It contains PFAS and may appear in older inventories or historical use records.
- ***Alcohol-Resistant Aqueous Film-Forming Foam (AR-AFFF)*** is a formulation of AFFF designed to suppress fires involving polar solvents. It contains PFAS and includes polymers that enhance resistance to alcohol degradation.

(AFFF-specific information from ITRC. Aqueous Film-Forming Foam (AFFF) Fact Sheet. September 2023. https://itrcweb.org PFAS)

Post-Closure Care Unit means any hazardous waste management unit subject to post-closure care requirements of 40 CFR Part 264, Subpart G.

RCRA means the Federal Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 to 6992k, also known as the Solid Waste Disposal Act.

Release, for the purposes of this Permit, means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of any solid waste, hazardous waste, or hazardous constituent into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing solid waste, hazardous waste, or hazardous constituents).

Solid Waste Management Unit (SWMU) means any discernable unit or area at the Facility at which solid waste has been placed at any time, and from which NMED determines there may be a risk of a release of hazardous waste or hazardous constituents, or other contaminants as defined in Section 1.12, irrespective of whether the unit was intended for the management of solid waste. Such units include any area in which solid waste has been routinely or systematically placed.

Target Analyte List (TAL) Metals means the list of 23 inorganic target analytes defined by the EPA Contract Laboratory Program Statement of Work. The list consists of the following: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Unexploded Ordinance (UXO) means military munitions that have been primed, fused, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation properties, personnel, or material and remain unexploded either by malfunction, design, or any other cause (10 U.S.C. § 101(e) (5) (A) through (C)).

Waste Military Munitions (WMM) includes military munitions as defined in 40 CFR § 260.10, which are solid waste as described in 40 CFR § 266.202.

Watercourse shall have the meaning defined in 20.6.2.7 NMAC.

Water Quality Control Commission (WQCC) means the New Mexico Water Quality Control Commission, and any successor agencies, boards, or commissions.

Water Quality Control Commission Regulations means the regulations at 20.6.2 NMAC promulgated by the New Mexico Water Quality Control Commission governing the Quality of Ground Water and Surface Water in New Mexico.

1.13 Duties and Requirements

1.13.1 Duty to Comply

The Permittee shall comply with all sections in this Permit, except to the extent and for the duration such noncompliance is authorized in an emergency permit, in accordance with the requirements of 40 CFR § 270.61. Any permit noncompliance, except under the terms of an emergency permit, constitutes a violation of the HWA and RCRA and may subject the Permittee, its successors and assigns, officers, directors, employees, parents, or subsidiaries to an administrative or civil enforcement action (40 CFR § 270.30(a)), including civil penalties and injunctive relief, as provided in Permit Section 1.7, or permit modification, suspension, revocation, reissuance, or termination under § 74-4-4.2 of the HWA and 40 CFR § 270.41 and § 270.43. No delegation or assignment of the Permittee's responsibilities under this permit can be made to any person or entity, including a separately organized agency, without the written permission of the NMED; this prohibition does not preclude the Permittee's use of contractors for remediation.

The Permittee shall not allow any person or entity which currently exists or may be created, including a separately organized agency, to interfere with the performance of its obligations or responsibilities under this Permit.

1.13.2 Duty to Reapply

If the Permittee wishes or is required to continue an activity regulated by this permit after the expiration date of this permit, then the Permittee shall apply for and obtain a new permit at least one hundred eighty (180) calendar days before the expiration date of this permit, unless permission for a later date has been granted by the NMED, pursuant to 40 CFR § 270.10(h)(1) and § 270.30(b).

1.13.3 Transfer of Permit

The Permittee shall not transfer this permit to any person except after prior written notice and receipt of approval from the NMED in accordance with 40 CFR § 270.40(b).

This Permit may be transferred by the Permittee to a new owner or operator only if the Permit has been modified or revoked and reissued, in accordance with the requirements of 40 CFR § 270.40(b) or § 270.41(b)(2), to identify the new Permittee and incorporate such other requirements as may be necessary under the HWA and RCRA (40 CFR § 270.30(l)(3) and § 270.40(a)).

The Permittee may make changes in ownership or operational control of the Facility as a Class 1 modification after obtaining prior written approval from the NMED in accordance with 40 CFR § 270.42(a)(2). The new owner or operator must submit a revised permit application no later than ninety (90) calendar days prior to the scheduled change including a written agreement containing a specific date for transfer of permit responsibility between the current and new Permittee.

If the new owner is not the United States, the new owner or operator shall demonstrate compliance with 40 CFR 264, Subpart H (Financial Requirements) within six months of the date of the change of ownership or operational control of the Facility in accordance with 40 CFR § 270.40(b).

1.13.4 Need to Halt or Reduce Activity Not a Defense

The Permittee shall not use as a defense to an enforcement action that it would have been necessary for the Permittee to halt or reduce the permitted activities in order to maintain compliance with the conditions of this Permit (40 CFR § 270.30(c)).

1.13.5 Duty to Mitigate

In the event of noncompliance with this Permit, the Permittee shall take all reasonable steps to minimize releases to the environment and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment (40 CFR § 270.30(d)).

1.13.6 Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment, control, and related appurtenances which are installed or used by the Permittee to achieve compliance with this Permit. Proper operation and maintenance include effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance and quality control procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit (40 CFR § 270.30(e)).

1.13.7 Duty to Provide Information

The Permittee shall furnish to NMED, within a reasonable time as specified by NMED, any relevant information, which the NMED may request to determine whether cause exists for modifying, revoking, and reissuing, or terminating this Permit, or to determine compliance with this Permit.

The Permittee shall also furnish to NMED, upon request, copies of records required to be kept in accordance with conditions in this Permit. Information and records requested by NMED pursuant to this condition shall be provided in paper form or in an electronic format acceptable to NMED or both as NMED may specify (40 CFR § 264.74(a) and 40 CFR § 270.30(h)).

This Permit condition shall not be construed to limit in any manner NMED's authority under § 74-4-4.3 of HWA, § 3007(a) of RCRA, or any other applicable law or regulation.

1.13.8 Inspection and Entry

Pursuant to 40 CFR § 270.30(i) and NMSA 1978, § 74-4-4.3(A) the Permittee shall allow authorized representatives of the NMED, upon the presentation of credentials and at reasonable times, and under the conditions of this Permit, to:

1. enter at reasonable times into the Permittee's premises, including where a regulated facility, unit, or activity is located or conducted, or where records must be kept in accordance with this Permit;

2. have access to and copy, at reasonable times, any records that must be kept in accordance with this Permit;

3. have access to and photograph any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required;

4. inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and

5. sample, monitor, or measure at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by RCRA and the HWA, any substances or parameters at any location.

1.13.9 Monitoring Records

1.13.9.1 Representative Sampling

For purposes of monitoring, the Permittee shall take samples and measurements representative of the monitored activity in accordance with the minimum required procedures included in Permit Part 4, Investigation and Sampling Methods and Procedures. Laboratory methods must be those specified in the current edition of Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846) or an equivalent NMED-approved method (40 CFR § 270.30(j)(1)).

The most current EPA-validated methods for PFAS shall be used for sampling and analysis of the applicable environmental media. Where EPA has validated matrix-specific PFAS methods (e.g. Methods 1633A or 1621), those methods shall be used for the corresponding media. EPA SW-846 Method 8327 is limited to aqueous matrices and shall not be used for non-aqueous media.

1.13.9.2 Records Retention

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records, copies of all reports, and records required by this Permit, and records of all data used to complete the permit application for a period of at least three years after the date of the sample, measurement, report, record, certification, or application, in accordance with the requirements of 40 CFR § 270.30(j)(2). This period may be extended by NMED at any time and is automatically extended during the course of any unresolved enforcement action regarding this Facility. The Permittee shall also maintain records from all groundwater monitoring wells and

associated groundwater surface elevations, and any investigation and cleanup activities for the active life of the Facility and during any post-closure care period.

1.13.9.3 Monitoring Records Contents

Pursuant to 40 CFR § 270.30(j)(3), records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The name and qualification of the individual(s) who performed the analyses;
5. The measuring techniques, analytical techniques or methods used; and
6. The results of such measurements or analyses.

1.13.10 Reporting Requirements

1.13.10.1 Reporting Planned Changes

The Permittee shall give notice to NMED as soon as possible of any planned physical alterations or additions to any unit listed on the Permit at the Facility, in accordance with 40 CFR § 270.30(l)(1).

1.13.10.2 Reporting Anticipated Noncompliance

The Permittee shall give a minimum of 60 calendar days advanced notice to NMED of any planned changes to any unit listed on the Permit at the Facility or any activities that may result in noncompliance with Permit requirements, in accordance with 40 CFR § 270.30(l)(2).

1.13.10.3 24 Hour and Subsequent Reporting

The Permittee shall report to the NMED, both orally and in writing, any noncompliance that may result in a release or discharge of hazardous waste may endanger human health or the environment (40 CFR § 270.30(l)(6) and § 270.32(b)(2)). This report shall be submitted in accordance with Permit Sections 1.13.10.4, 1.13.10.4.1, and 1.13.10.5.

1.13.10.4 24 Hour Oral Report

The Permittee shall orally report to NMED any noncompliance which may endanger human health or the environment within 24 hours from the time that the Permittee becomes aware of the circumstances in accordance with 40 CFR § 270.30(l)(6)(i). The report shall include the following:

1. any information concerning any release of any hazardous waste that may cause an endangerment to public drinking water supplies; and

2. any information of a release or discharge of hazardous waste, or of a fire or explosion at the Facility, which could threaten the environment or human health outside the Facility.

1.13.10.4.1 Content of Description

In accordance with 40 CFR § 270.30(l)(6)(ii), the description of the occurrence and its cause shall include:

1. name, address, and telephone number of the owner or operator;
2. name, address, and telephone number of the Facility;
3. date, time, and type of incident;
4. name and quantity of materials involved;
5. the extent of injuries, if any;
6. an assessment of actual or potential hazards to the environment and human health outside the Facility, where this is applicable; and
7. estimated quantity and disposition of recovered material that resulted from the incident.

1.13.10.5 Five Day Written Report

The Permittee shall submit a written report to NMED within five calendar days from the time the Permittee becomes aware of the noncompliance (40 CFR § 270.30(l)(6)(iii)). The written report shall contain the following:

1. a description of the noncompliance and its cause;
2. the period of the noncompliance including exact date and time, and, if the noncompliance has not been corrected, the anticipated time it is expected to be corrected; and
3. steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

The Permittee shall include in the report all records of spill response activities as required by Permit Section 2.8.4.

The NMED may waive the five-day written notice requirement in favor of a written report within fifteen calendar days.

1.13.10.6 Other Noncompliance

The Permittee shall report all other instances of noncompliance not otherwise required to be reported under Permit Section 1.13.10 at the time of activity as required by Permit Section 1.15 (40 CFR § 270.30(l)(10)) or periodic monitoring reports are submitted.

1.13.11 Other Information

Whenever the Permittee becomes aware of a failure to submit any relevant facts in the Permit Application or a submittal of incorrect information in the Permit Application or in any report to the NMED, the Permittee shall promptly submit such facts or information in writing to the NMED as specified by 40 CFR § 270.30(l)(11).

1.14 Confidential Information

The Permittee may claim that specific information required by this Permit or otherwise submitted to the NMED is confidential pursuant to the provisions of § 74-4-4.3(D) and (F) of the HWA and 40 CFR § 260.2 and § 270.12. Any claim must include justification satisfactory to NMED that such records, reports, or information, or a particular part thereof, if made public, would divulge information entitled to protection under Section 1905 of Title 18 of the United States Code. Such information deemed by the NMED to be confidential information may be disclosed to officers, employees, or authorized representatives of NMED or the United States concerned with carrying out the Resource Conservation and Recovery Act of 1976, or when relevant in any proceedings under the Hazardous Waste Act.

1.15 Quarterly Environmental Activities Report

If required by the NMED, the Permittee shall submit to the NMED quarterly environmental activities reports that describe waste management, monitoring, and corrective action activities; list documents submitted; and identify any noncompliance required to be reported under Permit Section 1.13.10 and Permit Section 2.8.2 for the previous reporting period. The reports shall also describe scheduled monitoring activities and sampling notifications for the upcoming reporting period. The reports shall be submitted at times specified by NMED.

1.16 Signatory Requirements

The Permittee shall sign and certify all applications, reports, or information submitted to or requested by NMED or required by this Permit in accordance with 40 CFR § 270.11 and § 270.30(k).

1.17 Submissions to the NMED

The Permittee shall submit by certified mail or hand delivery all reports, notifications, or other submissions that are required by this Permit to be sent or given to the NMED. The submittals shall be in the form of two paper copies and two electronic copies or other formats acceptable to the NMED. The submissions shall be sent by certified mail or hand delivered to:

Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6313

All submittals must conform to the applicable sections of Permit Part 6, Reporting Requirements of the Facility Permit, or other format acceptable to the NMED.

1.18 Approval of Submittals

All documents that the Permittee prepares under the terms of this Permit and submits to the NMED that are subject to the requirements of 20.4.2 NMAC shall be subject to the procedures set forth therein. Documents requiring NMED approval that are subject to the requirements of 20.4.2 NMAC will be reviewed and approved, approved with modifications, disapproved, denied, or rejected by the NMED.

Upon the NMED's written approval, all submittals and associated schedules are incorporated into this permit and shall become enforceable as part of this Permit in accordance with the terms of the NMED's written approval, and such documents, as approved, shall control over any contrary or conflicting requirements of this Permit. Incorporation of a work plan to the Permit is not considered to be a permit modification. This provision does not affect any public process that is otherwise required by this Permit, the HWA, or its implementing regulations.

Failure to submit any of the work plans, schedules, reports, or other deliverable documents that the Permittee is required to prepare under this Permit according to the schedules or deadlines in this Permit, may subject the Permittee to enforcement action under § 74-4-10 of the HWA, or other applicable provisions of law, which may include fines, civil penalties, or suspension or revocation of the Permit. Failure to submit any of the required items, the submission of inadequate or insufficient information, or failure to comply with NMED direction or with the approved work plans or schedules is a violation of this Permit and may subject the Permittee to enforcement action in accordance with Permit Section 1.7.

Any noncompliance with approved plans and schedules shall cause the Permittee to be in noncompliance with this Permit. The NMED may grant extensions of written requests for due dates for submittals of reports and other deliverables, provided that the Permittee includes a written justification showing good cause and a proposed schedule for submittal in accordance with Permit Section 1.19.

1.19 Extensions of Time

The Permittee may seek an extension of time in which to fulfill a requirement of this Permit, for good cause, by sending a written request for extension of time and proposed revised schedule to the NMED at least 10 days prior to the current submittal date. The request shall state the length of the requested extension and describe the basis for the request. The NMED will respond in writing to any request for extension following receipt of the request. If the NMED denies the request for extension, it will state the reasons for the denial.

1.20 Property Rights

This Permit does not convey any property rights of any sort, or any exclusive privilege. (40 CFR § 270.30(g)).

PART 2: GENERAL FACILITY CONDITIONS

2.1 Operation and Maintenance of the Facility

The Permittee shall maintain and operate the Facility to minimize the possibility of a fire, explosion, or any unplanned, sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water that could threaten human health or the environment as specified by 40 CFR § 264.31.

The Permittee shall comply with all applicable hazardous waste generator standards in 40 CFR Part 262 including the requirements for off-Facility shipment of hazardous waste pursuant to 40 CFR § 262.10(h) and 40 CFR § 264.71(c).

The Permittee shall maintain and provide to the NMED each year by January 30 a current list and map of the hazardous waste generation locations at the Facility.

2.2 Security

Pursuant to 40 CFR § 264.14(a), the Permittee must prevent unknowing entry and minimize the possibility for unauthorized entry of persons or livestock into the active portion of the Facility to include all less than 90-day hazardous waste accumulation or storage areas. The Permittee shall comply with all 40 CFR § 264.14 security provisions to protect from unrestricted entry into the Facility.

2.3 General Inspection Requirements

The Permittee shall inspect the Facility and remedy any deterioration, malfunction, or discharge which may lead to the release of hazardous waste or hazardous waste constituents to the environment or pose a threat to human health as required in 40 CFR § 264.15. The Permittee must develop and follow a written schedule for inspecting facility monitoring equipment, security devices, and operating and structural equipment, as applicable, that are important to preventing, detecting, or responding to environmental or human health hazards.

Post-Closure Care Units must be inspected and maintained in accordance with the minimum requirements outlined in Permit Section 7.3.5, Post Closure Care Requirements and Attachment 5, Hazardous Waste Management Unit Post Closure-Care.

All records of inspection must be maintained by the Facility.

2.4 Personnel Training

To reduce the potential for incidents related to hazardous waste and remediation waste management, which may pose a threat to human health and the environment, the Permittee shall comply with the applicable personnel training requirements 40 CFR § 262.17 and § 264.16. The Permittee shall maintain training documents, as applicable, for at least three years from the date the employee last worked at the Facility in accordance with 40 CFR 262 and § 264.16(d) and (e).

2.5 Waste Sources

2.5.1 Ignitable, Reactive, or Incompatible Waste

The Permittee shall comply with the requirements for handling ignitable, reactive, and incompatible wastes as required in 40 CFR 262 and § 264.17. In doing so, the Permittee must take precautions to prevent accidental ignition or reaction of ignitable or reactive waste. This waste must be separated from sources of ignition or reaction including, but not limited to, open flames, smoking, cutting and welding, hot surfaces, frictional heat, sparks, spontaneous ignition, and radiant heat.

2.5.2 Prohibited Waste

The Permittee shall not accept hazardous waste from an off-site source. An "off-site" source refers to waste generated by sources other than the Permittee or its contractor(s) from within the Facility boundary.

2.5.3 Waste Accumulation Time

In accordance with 40 CFR 262 and any applicable provisions, the Permittee may accumulate hazardous waste on-site for 90 days or less without a permit or having interim status. Accumulation of hazardous waste at satellite accumulation areas is subject to the provision of 40 CFR § 262.15. Shipment of the waste to an off-site facility must be conducted in accordance with Permit Section 2.5.4.

2.5.4 Waste Shipped to an Off-Site Facility

Prior to off-site Facility shipments of hazardous waste, the Permittee shall comply with all generator standards of 40 CFR § 264.71(c) and the applicable requirements of 40 CFR part 262, including the waste characterization necessary to facilitate appropriate packaging for transport.

2.5.5 Waste Generated During Emergency Explosives or Munition Emergency Response

If munitions or explosives of concern are discovered that require treatment in place, the Permittee shall comply with the requirements specified in 40 CFR § 270.61 (Emergency Permits) if such treatment is not part of range clearance (40 CFR § 264.1(g)(8)). If a waste is generated as a result of explosives or munitions at the Facility, or beyond the Facility boundary in response to a waste military munition (WMM) release from the Facility, the Permittee must comply with the applicable corrective action requirements included in this Permit.

2.5.6 Waste Military Munitions

The Permittee shall identify and manage waste military munitions in accordance with 40 CFR 266 Subpart M. The Permittee shall not treat, store, or dispose of waste military munitions without first acquiring a Permit in accordance with 40 CFR 270, with the exception of storage conducted in accordance with 40 CFR § 266.205.

2.5.7 Waste Dilution

The Permittee shall not dilute in any way restricted waste or residue as a substitute for treatment. Dilution to avoid an applicable treatment standard includes, but is not limited to, the addition of solid waste or other materials to reduce the concentration of a hazardous constituent.

2.5.8 Waste Minimization

In order to minimize the present and future threat to human health and the environment, the Permittee shall maintain a waste minimization program to reduce the volume and toxicity of hazardous wastes generated by the Facility's operation to the degree determined by the Permittee to be economically practicable; and the proposed method of treatment, storage, or disposal that is the practicable method currently available to the Permittee. Compliance with the provisions of this Permit Section can be satisfied by the current Facility waste minimization program and certification per 40 CFR § 262.27(a).

2.5.9 Dust Suppression

The Permittee shall not use waste or used oil or any other material, which is contaminated with dioxin or any other hazardous waste, other than a waste identified solely on the basis of ignitability, for dust suppression or road treatment pursuant to 40 CFR § 266.23(b).

2.6 Transport, Storage, Treatment, and Disposal of Waste Military Munitions

The transport, storage, treatment, and disposal of hazardous waste military munitions are subject to the applicable permitting, procedural, and technical standards in 40 CFR Part 260 through 40 CFR Part 270.

Pursuant to 40 CFR § 266.202(b), an unused military munition is a solid waste when the following conditions have been met:

1. the munition is abandoned by being disposed of, burned, detonated (except during intended use), incinerated, or treated prior to disposal; or

2. the munition is removed from storage in a military magazine or other storage area for the purpose of being disposed of, burned or incinerated, or treated prior to disposal; or

3. the munition is deteriorated or damaged (e.g., the integrity of the munition is compromised by cracks, leaks, or other damage) to the point that it cannot be put into serviceable condition, and cannot reasonably be recycled or used for other purposes; or

4. the munition has been declared a solid waste by an authorized military official; or

5. pursuant to 40 CFR § 266.202(c), a used or fired military munition is a solid waste when the following conditions have been met:

a) when transported off-range or from the site of use, where the site of use is not a range, for the purposes of storage, reclamation, treatment, disposal, or treatment prior to disposal; or

b) if recovered, collected, and then disposed of by burial, or landfilling either on or off a range.

2.6.1 Transport of Waste Military Munitions

WMM that are being transported for treatment and disposal which exhibit a hazardous waste characteristic under 40 CFR 261 Subpart C or are listed as hazardous waste under 40 CFR Part 261 Subpart D, are subject to regulation under 40 CFR Parts 260 through 270 unless the Permittee has demonstrated that all conditions listed in 40 CFR § 266.203(a) have been met.

2.6.2 Storage of Waste Military Munitions

Should the Permittee identify a need for storage of non-chemical WMM prior to destruction and disposal, WMM shall be stored in suitable conditions at the Facility such as storage igloos or magazines as deemed appropriated by the Permittee and as governed by Department of Defense Explosives Safety Board standards and 40 CFR § 266.205 and 40 CFR § 264.1201, which describe the design and operating standards for hazardous waste munitions and explosives storage.

WMM in storage that exhibit a hazardous waste characteristic or are listed as a hazardous waste under 40 CFR Part 261 are subject to regulation as a hazardous waste under 40 CFR Parts 260 through 279 unless the conditions of 40 CFR § 266.205(a)(1) have been met as follows:

1. the waste military munitions are not chemical agents or chemical munitions;

2. the waste military munitions must be subject to the jurisdiction of the Department of Defense Explosives Safety Board (DDESB);

3. the waste military munitions must be stored in accordance with the DDESB storage standards applicable to waste military munitions;

4. within 90 days of August 12, 1997, or within 90 days of when a storage unit is first used to store WMM, whichever is later, the owner or operator must notify the NMED of the location of any waste storage unit used to store waste military munitions for which the conditional exemption in 40 CFR § 266.205 (a)(1) is claimed;

5. the Permittee must provide the NMED oral notice within 24 hours from the time the Permittee becomes aware of any loss or theft of the waste military munitions, or any failure to meet a condition of 40 CFR § 266.205 (a)(1) that may endanger health or the environment. In addition, a written submission describing the circumstances shall be provided within five days from the time the Permittee becomes aware of any loss or theft of the WMM or any failure to meet a condition of 40 CFR § 266.205 (a)(1);

6. the Permittee must inventory the WMM at least annually, must inspect the WMM at least quarterly for compliance with the conditions of paragraph 40 CFR § 266.205 (a)(1), and must maintain records of the findings of these inventories and inspections for at least three years after corrective action is complete at the Facility; and

7. access to the stored waste military munitions must be limited to appropriately trained and authorized personnel.

2.6.3 Treatment and Disposal of Waste Military Munitions

Pursuant to 40 CFR § 266.206, the treatment and disposal of hazardous WMM are subject to the applicable permitting procedural and technical standards in 40 CFR Parts 260 through 270. This Permit does not authorize treatment or disposal of hazardous WMM at any location at the Facility.

2.7 Preparedness and Prevention

2.7.1 Maintenance and Operation of Facility

The Permittee shall maintain and operate the Facility to minimize the possibility of a fire, explosion, or any unplanned, sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, groundwater, or surface water that could threaten human health or the environment in accordance with 40 CFR § 264.31.

As a mitigation measure for any sudden or unplanned hazardous waste incident, a contingency plan must be maintained by the Permittee, and the emergency procedure therein implemented, as necessary, in accordance with applicable regulations outlined in 40 CFR 264 Subpart D and 40 CFR 262.

2.7.2 Required Equipment

At a minimum, the Permittee shall maintain at the Facility the communication, spill control, decontamination, and fire control equipment as set forth in 40 CFR § 264.32 and 40 CFR § 262.252, which is incorporated herein by reference.

2.7.3 Testing and Maintenance of Equipment

The Permittee shall test and maintain the equipment specified in Permit Section 2.7.2, as necessary, to ensure its proper operation in time of emergency, in accordance with the requirements of 40 CFR § 264.33 and 40 CFR § 262.253, which is incorporated herein by reference. The Permittee shall ensure that the external communication equipment is compatible with the equipment used by the local authorities, emergency response organizations, medical providers, and contractors.

The Permittee shall ensure that if testing identifies any communication equipment, alarm system component or fire protection, spill control or decontamination equipment that is not functioning properly, it is promptly repaired. The Permittee shall immediately provide substitute equipment

or systems while the repairs are ongoing. The Permittee shall ensure that Facility employees and contractors are notified of the presence of substitute equipment and, if necessary, trained in its use. The Permittee shall ensure that malfunctioning equipment is clearly marked as "Out of Use" and the location of the substitute equipment is posted adjacent to the malfunctioning equipment.

2.7.4 Access to Communication or Alarm System

The Permittee shall maintain access to the communications or alarm system, in accordance with the requirements of 40 CFR § 264.34, which is incorporated herein by reference.

2.7.5 Arrangements with Local Authorities

The Permittee shall maintain emergency coordination arrangements to familiarize the emergency responders with the layout and potential hazards at the Facility in accordance with 40 CFR § 264.37, which is incorporated herein by reference. Copies of the Emergency Coordination Agreements shall be maintained at the Facility.

Where State or local authorities decline to enter into such an arrangement, the Permittee must document the refusal in the Operating Record, in accordance with the requirements of 40 CFR § 264.37(b), which is incorporated herein by reference.

2.8 Recordkeeping and Reporting

The Permittee shall maintain all information and records required to be maintained by this Permit. The Permittee must be able to provide paper copies of records or electronic copies in a form acceptable to NMED, if kept in electronic form, upon demand if requested by NMED.

2.8.1 Corrective Action Records

For all SWMUs, AOCs, and Post-Closure Care Units undergoing corrective action under Permit Part 3 and 40 CFR § 264.101, the Permittee shall retain, until completion of the corrective action has been approved by the NMED, records of all monitoring information (40 CFR § 270.31(b)), sampling, waste analyses, and all other pertinent data and information used to prepare the appropriate documents required for the action by this Permit, as required by 40 CFR § 270.30(j)(2).

2.8.2 Quarterly Environmental Activity Report

If required by NMED, the Permittee shall, in accordance with a schedule established by NMED, submit quarterly reports on the status of operations at the Facility to the NMED. The reports shall provide an update on activities carried out during the reporting period, including:

1. all waste management activities for the month;

2. all ongoing corrective action activities;

3. monitoring results, as required by 40 CFR § 270.30(l)(4) and 40 CFR § 270.31(c);

4. a list of documents submitted; and

5. any noncompliance issues under the Permit.

The report shall also include a discussion of planned activities for the upcoming month, including any necessary changes or modifications in operating activities approved under this Permit.

2.8.3 Additional Documents to be Maintained at the Facility

The Permittee shall maintain all other documents prepared under the Permit at the Facility, until the later of completion of corrective action or any post-closure care prepared under the Permit, and not otherwise specified. Those documents shall include all amendments, revisions, and modifications to the Permit, including all attachments, all approved plans, reports, documents, and other submittals required by this Permit.

2.8.4 Availability, Retention, and Disposition of Records

The Permittee shall furnish upon request and make available at all reasonable times for inspection by the NMED or its designee all records required to be maintained by this Permit as stipulated in 40 CFR § 264.74(a).

2.8.5 Biennial Report

In accordance 40 CFR § 262.41, the Permittee must prepare and submit a copy of a Biennial Report to the NMED by March 1 of each even numbered year. The Biennial Report must be submitted on EPA Form 8700-13A/B (as it may be updated), must cover generator activities during the previous calendar year and must include the following information:

1. the EPA identification number, name, and address of the generator;

2. the calendar year covered by the report;

3. the EPA identification number, name, and address for each off-site treatment, storage, or disposal facility in the United States to which waste was shipped during the year;

4. the name and EPA identification number of each transporter used during the reporting year for shipments to a treatment, storage, or disposal facility within the United States;

5. the description, hazardous waste numbers, DOT hazard class, and quantity of each hazardous waste shipped off-site for shipments to a treatment, storage, or disposal facility within the United States;

6. a description of the efforts undertaken during the year to reduce the volume and toxicity of waste generated;

7. a description of the changes in volume and toxicity of waste actually achieved during the year in comparison to previous years to the extent such information is available; and

8. the certification signed by the generator or authorized representative.

2.8.6 Personnel and Telephone Number Changes

The Permittee shall inform the NMED in writing of changes in its management personnel and telephone numbers within fifteen (15) calendar days of such changes.

PART 3: CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS, AREAS OF CONCERN, AND POST-CLOSURE CARE UNITS

3.1 Corrective Action from Releases

Sections 3004(u) and 3013 of the Resource Conservation and Recovery Act (RCRA), Sections 74-4-4.A.5.h and 74-4-4.2 of the New Mexico Hazardous Waste Act (HWA), and 40 CFR § 264.101 require that RCRA permits issued after April 8, 1987 address corrective action as necessary to protect human health and the environment for all releases of hazardous waste or hazardous constituents at a treatment, storage, or disposal facility, regardless of the time at which the release occurred.

Section 3004(v) of RCRA, Section 74-4-4.A.5.i of the HWA, and 40 CFR § 264.101(c) require corrective action beyond the Facility property boundary where necessary to protect human health and the environment unless the Permittee demonstrates to the satisfaction of the NMED that, despite the Permittee's best efforts, the Permittee was unable to obtain the necessary permission to undertake such actions. The Permittee is not relieved of all responsibility to clean up a release that has migrated beyond the Facility boundary where such off-site access is denied.

3.2 Applicability

This Permit Part provides requirements for corrective action at all SWMUs and AOCs identified in Permit Attachment 4 and the five Post-Closure Care Units (Closures) identified in Permit Attachment 5, any newly identified SWMUs and AOCs, and any newly identified releases of hazardous waste, hazardous constituents, and other contaminants from SWMUs, AOCs, or closed Hazardous Waste Management Units.

3.2.1 Newly Discovered SWMUs and AOCs

The Permittee shall notify the NMED in writing, within 15 calendar days of discovery, of any newly discovered release(s) of hazardous waste or hazardous constituents from a SWMU, AOC, or other location that explains the location and circumstances of the release. As used in this Permit Part, the terms “discover”, “a discovery”, or “discovered” refer to the date on which the Permittee: (1) visually or otherwise observes evidence of a new SWMU or AOC or potential SWMU or AOC, (2) visually or otherwise observes evidence of a previously unidentified release of hazardous waste or hazardous constituents to the environment, or (3) receives information which suggests the presence of a new release of hazardous waste or hazardous constituents to the environment.

If the NMED determines that investigation of a release is necessary, the Permittee shall prepare and submit an Investigation Work Plan in accordance with Permit Section 6.2.

3.2.2 Contamination Beyond the Facility Boundary

The Permittee shall implement corrective action beyond the Facility boundary where necessary to protect human health and the environment, unless the Permittee demonstrates to the satisfaction of the NMED that, despite the Permittee's best efforts, as determined by the NMED, the Permittee was unable to obtain the necessary permission to undertake such actions. The Permittee is not relieved of all responsibility to clean up a release that has migrated beyond the Facility boundary where off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis in accordance with 40 CFR § 264.101(c).

3.3 Facility-Wide Groundwater Monitoring Program

3.3.1 Facility-Wide Groundwater Monitoring Plan

The Permittee shall submit annually for the NMED's review, by April 30 of each year, an updated Facility-Wide Groundwater Monitoring Work Plan (Groundwater Monitoring Plan). The Groundwater Monitoring Plan shall set forth detailed methods, procedures, and schedules, as set forth in Permit Section 4.3, for groundwater monitoring over the entire Facility and, as necessary, beyond the Facility boundary. The Permittee shall use valid data from previous groundwater monitoring at the Facility to develop the Groundwater Monitoring Plan. The Monitoring Plan shall be prepared in accordance with Permit Section 6.2. Upon NMED approval, the Groundwater Monitoring Plan shall be incorporated herein by reference as an enforceable part of this Permit, and the Permittee shall implement its terms. Prior to NMED approval of an updated Groundwater Monitoring Plan, the Permittee shall conduct groundwater monitoring in accordance with the most recently NMED-approved Groundwater Monitoring Plan. The Groundwater Monitoring Plan shall meet the requirements of 40 CFR § 264.90(f) and at a minimum shall include:

1. A general description of the hydrogeologic system beneath the Facility;

2. A section or table to include, without limitation, a description of all existing monitoring wells, recovery wells, injection wells, and any other required sampling locations specifying their exact location, date the wells were installed including ground elevation, top of casing elevation, well casing stickup length, well depth, well casing diameter, screened interval, screen length, and stratigraphic unit(s) intersected by the well screen;

3. A facility map showing all monitoring well locations. This map must be revised as necessary to reflect any well additions and well abandonments that occur during the year;

4. The sampling requirements must include the proposed frequency of sampling, sampling methods, field water quality parameters to be measured, and chemical analytical methods;

5. A description of all sampling methods and procedures, including water level measurements, that will be applied during each monitoring event;

6. Identification of all field instruments proposed for use and the associated calibration procedures;

7. Quality assurance and quality control procedures;

8. Methods of management of investigation-derived wastes.

3.3.2 Implementation of Monitoring

Upon Department approval of a Groundwater Monitoring Plan, the Permittee shall implement the Groundwater Monitoring Plan according to its schedule and other terms.

3.3.3 Monitoring Wells

The Permittee shall install and maintain a groundwater monitoring system, and abandon wells, as necessary, in accordance with the minimum requirements of Permit Part 5, Monitoring Well Construction Requirements and the approved Groundwater Monitoring Plan.

3.3.4 Detection Monitoring

The Permittee shall conduct detection monitoring at the Facility in accordance with the minimum requirements of Permit Section 4.3, the approved Groundwater Monitoring Plan, and 40 CFR § 264.101, which is incorporated herein by reference, to ensure the earliest possible detection of hazardous waste or constituents in groundwater. In addition, the Permittee shall monitor for other contaminants identified under Permit Part 3.5 as required by the approved Groundwater Monitoring Plan. In accordance with the Groundwater Monitoring Plan, the Permittee shall notify the NMED in writing of any new detection of a hazardous waste, constituent, or contaminant at any location in groundwater. A new detection is any incidence of a hazardous waste, constituent, or contaminant being detected in a groundwater sample collected from a monitoring well that has never been detected in prior samples obtained from that monitoring well. Notification of new detections shall be made in the next periodic monitoring report. New detections shall be highlighted in the Monitoring Results section of the periodic monitoring report.

3.3.5 Compliance Monitoring

The Permittee shall conduct compliance monitoring in accordance with the NMED approved Groundwater Monitoring Plan to monitor the progress of cleanup of hazardous waste, hazardous constituents, or contaminants as defined in Section 1.12 in groundwater.

3.3.6 Elevation of Groundwater Surface and Other Measurements

The Permittee shall determine the groundwater surface elevation each time groundwater is sampled in accordance with the minimum requirements of Permit Section 4.3.1, Groundwater Levels, and the approved Groundwater Monitoring Plan. The Permittee shall report such elevation data in the periodic monitoring report covering that sampling event.

The Permittee shall record the surveyed elevation of each monitoring well at the time of installation. The elevation shall be indicated on the as-built drawing for the well. The Permittee

shall also record the total depth of the well, the elevation of the top of the casing, and the ground surface elevation or apron elevation. All such information shall be included in a well completion report prepared in accordance with Permit Section 5.4, Documentation.

3.3.7 Periodic Monitoring Reports

The Permittee shall submit to NMED quarterly periodic monitoring reports (PMRs) comprised of three "routine" and one comprehensive PMR within 90 days of completion of the field activities conducted during the associated periodic monitoring event, unless another time period is specified by NMED or according to the schedule in the Groundwater Monitoring Plan. The reports shall include the results of all groundwater monitoring conducted under the approved Groundwater Monitoring Plan, including the results of all remediation system monitoring collected during the same reporting period. The Reports shall be prepared in accordance with the format described in Permit Section 6.4, Periodic Monitoring Report. The "routine" quarterly PMRs must be submitted to NMED for review no later than April 30th (1st quarter), July 30th (2nd quarter), and October 30th (3rd quarter). A comprehensive 4th quarter PMR (reporting for January through December) must be submitted to NMED no later than January 31 of each year.

3.3.8 Recordkeeping

The Permittee shall maintain all monitoring data, including sampling procedures, records of field measurements, laboratory analytical data, quality assurance/quality control documents, chain-of-custody records, well completion reports, and periodic monitoring reports in the Facility Operating Record in a format acceptable to the NMED.

3.4 Plume Front and Mid-Plume Interception Remediation System Monitoring

A comprehensive annual update to the WSTF Remediation System Monitoring Plan for the Plume-Front and Mid-Plume Interception Remediation Systems shall be submitted by the Permittee by August 1 of each year for NMED approval. The Remediation System Monitoring Plan shall set forth, in detail, the methods, procedures, and schedules for monitoring to determine the progress and effectiveness of the plume-front and mid-plume constriction area remediation systems. The Permittee shall use valid data from previous groundwater and remediation system monitoring at the Facility to develop an annual update for the Remediation System Monitoring Plan. The Remediation System Monitoring Plan shall be prepared in accordance with Permit Section 6.2. Upon NMED approval, the Remediation System Monitoring Plan shall be incorporated herein by reference as an enforceable part of this Permit, and the Permittee shall implement its terms. Annual updates to the Remediation System Monitoring Plan will not be permit modifications.

3.4.1 Remediation System Reporting

The Permittee shall include all results of plume front remediation system groundwater monitoring in the associated PMRs required by Permit Section 3.3.7.

3.4.2 Effectiveness of Remediation Systems

Based on relevant information, NMED may determine that a remediation system is ineffective and may require upgrading or replacement of the system or some of its components, or

evaluation and selection of an alternate remedy. If NMED makes such a determination, it will notify the Permittee in writing and specify a schedule for submittal of a work plan to correct the problem. NMED may require the Permittee to re-evaluate the system and either adjust, expand, or replace the remediation system or some of its components, or evaluate and select an alternate remedy.

3.5 Cleanup Levels

The NMED's cleanup levels for protection of human health are based on excess lifetime cancer risk levels and hazard index levels that are consistent with the EPA's National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR § 300.430(e)(2)(i)(A)(2). The EPA recommends a range of 10^{-4} to 10^{-6} lifetime excess cancer risk as acceptable. In general, NMED has selected a target risk level of 10^{-5} for establishing cleanup levels for carcinogenic substances. NMED has generally selected a target hazard quotient (HQ) of one for individual non-carcinogenic regulated compounds. For contamination involving two or more non-carcinogenic regulated substances, the NMED has generally selected a target hazard index (HI) of one (1). Unless otherwise specifically provided in this Permit, the Permittee shall follow the cleanup and screening levels described in this Permit in implementing the corrective action requirements of this Permit. The Permittee shall comply with the adopted and established cleanup and reporting requirements described in this Permit. In addition, cleanup levels for the protection of the environment shall address ecological risk consistent with the NMED's guidance for assessing ecological risk as specified in Permit Section 3.6. In accordance with 40 CFR § 270.32(b)(2), this Permit part contains terms and conditions to protect human health and the environment as determined by NMED.

3.5.1 Groundwater Cleanup Levels

The cleanup levels for groundwater shall apply to hazardous constituents and other contaminants subject to corrective action under this Permit. For purposes of this permit, "other contaminants" include substances not listed as hazardous constituents but for which numeric standards exist (e.g. the New Mexico Water Quality Control Commission (WQCC) groundwater quality standards, 20.6.2.3103 NMAC, the cleanup levels calculated for toxic pollutants listed in 20.6.2.7.T(2) NMAC, and the drinking water maximum contaminant levels (MCLs) adopted by EPA under the federal Safe Drinking Water Act (42 U.S.C. §§ 300f to 300j-26) or the New Mexico Environmental Improvement Board (EIB), 20.7.10 NMAC. If both a WQCC groundwater quality standard and an MCL have been established for an individual substance, then the lower of the levels shall be the cleanup level for that substance.

The most recent version of the NMED's Tap Water Screening Levels listed in Table A-1 or as specified in other sections of the 2019 NMED Risk Assessment Guidance for Site Investigation and Remediation((RAG), as updated) shall be used to establish the cleanup level if neither a WQCC standard or an MCL has been established for a specific substance. In the absence of an

NMED tap water screening level or other cleanup level listed in the RAG, the EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites (RSLs, as updated) for tap water shall be used. If no WQCC groundwater standard, MCL, NMED tap water screening level, EPA RSL, or other screening level has been established for a hazardous constituent or other contaminant subject to corrective action under this Permit, the Permittee shall use a target excess cancer risk level of 10^{-5} for carcinogenic substances and a HI of 1.0 for non-carcinogenic substances as the basis for proposing a groundwater cleanup level for the contaminant. If the background concentration of an inorganic constituent exceeds the standard, then the cleanup level is the background concentration for that specific substance. Any cleanup level based on a risk assessment must be submitted to the NMED for review and approval.

3.5.2 Soil and Sediment

The cleanup levels for soil and sediments shall be the cleanup levels for soil set forth in this Permit section. If the Permittee is unable to achieve the Soil Cleanup Levels established under Permit Section 3.5.2.1 below, the Permittee may request a variance in accordance with Permit Section 3.7. Any cleanup level established based on a risk assessment must be submitted to NMED for review and approval.

3.5.2.1 Soil Cleanup Levels

(For purposes of this Section, "contaminants" includes both hazardous constituents and other contaminants as defined in Section 1.12 of this Permit)

The NMED has specified soil-screening levels that are based on a target total excess cancer risk of 10^{-5} for carcinogenic substances and, for non-carcinogenic substances, a target HI of 1.0 for the residential land use, industrial land use, and construction worker scenarios. If the potential for migration to groundwater is applicable for a site, NMED may determine that a dilution attenuation factor (DAF), as calculated using the NMED-approved methods described in the RAG, as updated, for contaminated soils is appropriate to achieve clean closure. This approach may apply at sites where the migration of hazardous constituents and/or contaminants (as defined in Section 1.12 of this permit) through the soil column to groundwater has occurred or when NMED determines that the potential exists for migration of hazardous constituents and/or contaminants (as defined in Section 1.12 of this permit) through the soil column to groundwater. Soil cleanup levels shall be the target soil screening levels listed in the RAG. If a NMED soil screening level has not been established for a substance for which toxicological information is published, the soil cleanup level shall be established using the most recent version of the EPA RSL for residential and industrial soil for compounds designated as "n" (non-carcinogen effects) or ten times the EPA RSL for compounds designated "c" (carcinogen effects). The cumulative risk shall not exceed a total excess cancer risk of 10^{-5} for carcinogenic substances and, for non-carcinogenic substances, a target HI of 1.0 at sites where multiple contaminants are present.

If the current and reasonably foreseeable future land use is one for which the NMED has not established soil screening levels, the Permittee may propose cleanup levels to the NMED based on a risk assessment and a target excess cancer risk level of 10^{-5} for carcinogenic substances or an HI of 1.0 for NMED review and approval.

Petroleum hydrocarbons or per- and polyfluorinated alkyl substances may be detected in environmental media as the result of contaminant releases (as defined in Section 1.12 of this permit) where individual hazardous constituents are not present at significant concentrations. In these cases, the Permittee shall use the most recent version of the RAG for cleanup of petroleum hydrocarbons or per- and polyfluorinated alkyl substances in soil.

3.5.3 Surface Water Cleanup Levels

The Permittee shall comply with the surface water quality standards outlined in the Clean Water Act (33 U.S.C. §§ 1251 to 1387), the New Mexico WQCC Regulations (20.6.2 NMAC), and the State of New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC).

3.5.4 Vapor Intrusion Cleanup Levels

The NMED has specified vapor intrusion screening levels for volatile organic compounds that are based on a target total excess cancer risk of 10^{-5} and, for noncarcinogenic contaminants, a target HI of one (1.0) for residential and industrial land use scenarios. The target residential and industrial vapor intrusion screening levels for selected substances are listed in NMED's RAG (as updated). Vapor intrusion shall be evaluated for sites that meet the criteria specified in the RAG. If a hazardous constituent or other contaminant (as defined in Section 1.12 of this permit) is not listed in NMED's RAG, the Permittee shall calculate the vapor intrusion screening level following the methodology specified in the RAG.

3.6 Ecological Risk Evaluation

The Permittee shall derive cleanup levels for each hazardous waste, hazardous constituents, or other contaminant (as defined in Section 1.12 of this permit) for each ecological zone at the Facility using the methods specified in Volume 2 of NMED's RAG (as it may be updated). If the ecological risk evaluation indicates that a lower cleanup level for a hazardous waste, hazardous constituent, or other contaminant (as defined in Section 1.12) in groundwater, soil, or surface water is necessary to protect environmental receptors, the NMED may establish cleanup levels based on ecological risk for hazardous waste, hazardous constituents, or other contaminant (as defined in Section 1.12) in a selected environmental media that are lower than levels that are solely protective of human health.

3.7 Variance from Cleanup Levels

If attainment of the established cleanup level is demonstrated to be technically infeasible, the Permittee may perform a risk-based evaluation to establish alternative cleanup levels for specific media at individual corrective action units. The risk-based evaluation should be conducted in accordance with the most recent version of NMED's RAG (as it may be updated). For groundwater, if the Permittee proposes to demonstrate the technical infeasibility of achievement of a specific groundwater cleanup level that is a WQCC standard, the applicable requirements of the WQCC Regulations, 20.6.2.4103.E NMAC, shall be followed.

For all other instances in which the Permittee seeks a variance from a cleanup level, the Permittee shall submit a demonstration to the NMED that achievement of the cleanup level is impracticable. In making such demonstration, the Permittee may consider such things as technical or physical impracticability of the project, the effectiveness of proposed solutions, the cost of the project, hazards to workers or to the public, and any other basis that may support a finding of impracticability at a particular SWMU or AOC. The Permittee may also refer to all applicable guidance concerning impracticability. In addition to demonstrating the basis for the impracticability request, the Permittee's written submission shall propose the action to be taken by the Permittee, if the NMED approves the impracticability demonstration. Such action shall include, but is not limited to, completion of a site-specific risk assessment and identification of alternate cleanup levels.

The NMED will review the Permittee's written submission concerning impracticability and determine whether achievement of the cleanup level is impracticable. The NMED may consider such things as technical or physical feasibility of the project, the effectiveness of proposed solutions, hazards to workers or to the public, and any other basis that may support or refute a finding of impracticability at a particular SWMU or AOC. If the NMED approves or disapproves the Permittee's impracticability demonstration, it will notify the Permittee in writing, and such notice will describe the specific actions to be taken by the Permittee.

3.8 Newly Identified SWMUs and AOCs

3.8.1 Notification of Newly Discovered SWMUs or AOCs

Within fifteen days after the discovery of any newly identified potential SWMU or AOC, the Permittee shall notify the NMED in writing of such discovery in accordance with Permit Section 1.13.10.3, 24 Hour and Subsequent Reporting, as applicable. The notification shall include, at a minimum, the location of the SWMU or AOC and all available information pertaining to the nature of any release of hazardous waste, hazardous constituents, or other contaminants (*as defined in Section 1.12 of this Permit*) from the SWMU or AOC, including the substances released or suspected to have been released, the magnitude of the release, and the media affected by the release.

Within 90 days, or other period established by the NMED, after submitting such notification, the Permittee shall submit to the NMED for review and written approval a SWMU Assessment Report or a Release Assessment Report for each newly identified potential SWMU or AOC. At a minimum, such Report shall include the information outlined in Permit Section 3.8.3.

Based on the results of the SWMU or Release Assessment Report, the NMED will determine the need for further investigations at the SWMU or AOC identified in the Report, including the need for the Permittee to submit an investigation work plan under Permit Section 3.10.1.

If the Permittee conducts an explosives or munitions emergency response at the Facility, or beyond the Facility boundary, in response to a waste explosive released at or from the Facility, the Permittee shall treat that response location as a newly discovered AOC, unless the response is conducted within the boundaries of an existing AOC or SWMU.

3.8.2 Notification of Release

The Permittee shall notify the NMED orally of the discovery of a SWMU or AOC and its associated release within 24 hours and shall notify the NMED in writing within fifteen days of discovery of any contamination identified at a newly discovered or suspected SWMU or suspected AOC in accordance with Permit Section 1.13.10.3.

3.8.3 SWMU or Release Assessment Report

The Permittee shall prepare and submit to the NMED, within 90 days of the notification required in Permit Section 3.8.2 or other period approved by the NMED, a SWMU Assessment Report (SAR) or Release Assessment Report (RAR) for each SWMU or suspected AOC identified under Permit Section 3.8. At a minimum, the SAR or RAR shall provide the following information:

1. location of unit(s) on a topographic map of appropriate scale;

2. designation of type and function of unit(s);

3. general dimensions, capacities, and structural description of unit(s). Any available plans/drawings shall be included;

4. dates that the unit(s) was operated;

5. specification of all wastes and other materials that have been managed at/in the unit(s), to the extent available. Any available data on hazardous constituents or other contaminants in the wastes or other materials shall be included; and

6. all available information pertaining to any release of hazardous waste, hazardous constituents, or other contaminants from such unit(s) (e.g., soil analyses, vadose zone fluids, and vadose zone organic vapors data).

Based on the results of the SAR or RAR, the Department will determine the need for further investigations at the SWMUs or AOCs identified in the report, including the need for submittal of an investigation work plan in accordance with Permit Section 3.10.1.

3.9 Interim Measures

3.9.1 Interim Measures Required by the NMED

Upon written notification by the NMED, the Permittee shall prepare and submit an Interim Measures (IM) Work Plan at any release site, SWMU, or AOC where the NMED determines that interim measures are necessary to minimize or prevent the migration of hazardous waste or hazardous constituents and limit actual or potential human and environmental exposure to hazardous waste or hazardous constituents while long term corrective action remedies are evaluated and implemented. The Permittee shall submit its IM Work Plan to the NMED within 30 calendar days of the NMED's notification unless another time period is specified by the

NMED. Such interim measures may be conducted concurrently with any other required corrective action.

3.9.2 Permittee-Initiated Interim Measures

The Permittee may initiate interim measures at a SWMU or AOC by notifying the NMED, in writing, at least 60 calendar days prior to beginning the interim measures. The NMED will approve the Permittee-initiated IM, conditionally approve the IM, or require submittal of an IM work plan for NMED review and approval prior to implementation of the Interim Measure. Upon approval, the NMED will establish a schedule for the submittal of a report(s) summarizing the actions and results of the interim measure implementation and the progress in achieving cleanup.

3.9.3 Emergency Interim Measures

The Permittee may determine that emergency interim measures are necessary to address an immediate threat of harm to human health or the environment. The Permittee shall notify the NMED within one business day of discovery of the facts giving rise to the threat and shall propose emergency interim measures to address the threat. If the NMED approves the emergency interim measures in writing, the Permittee may implement the proposed emergency interim measures without submitting an interim measures work plan. If circumstances arise resulting in an immediate threat to human health or the environment such that initiation of emergency interim measures are necessary prior to obtaining written approval from the NMED, the Permittee shall notify the NMED within one business day of taking the emergency interim measure. The notification shall contain a description of the emergency, the types and quantities of hazardous waste, hazardous constituents, or other contaminants (*as defined in Section 1.12 of this Permit*) involved, the emergency interim measures taken, and contact information for the emergency coordinator who handled the situation. The notification shall also include a written statement justifying the need to take the emergency action without prior written approval from the NMED. This requirement shall not be construed to conflict with 40 CFR § 264.1(g)(8) or 40 CFR § 270.61.

3.9.4 Interim Measures Work Plan Requirements

The IM Work Plan shall ensure that the IM are designed to mitigate any current or potential threat to human health or the environment and are consistent with, and integrated into, any long-term solution at the Facility, including attainment of cleanup levels in all media. The IM Work Plan shall include a description of the site conditions that warrant the IM, the IM objectives; procedures for implementation, including any designs, plans, or specifications; and schedules for implementation.

3.9.5 Interim Measures Work Plan Approval

The IM Work Plan imposed under Permit Section 3.9.1 or initiated by the Permittee under Permit Section 3.9.2 must be approved by the NMED in writing prior to implementation. The NMED will specify the start date of the IM Work Plan schedule in the letter approving the IM Work Plan. The NMED will approve, approve with modifications, or disapprove the IM Work Plan in accordance with Permit Section 3.16.

3.9.6 Interim Measures Implementation

The Permittee shall implement and complete interim measures within 180 days of the start of implementation of the interim measure. The Permittee may submit a written request to the NMED to extend the period for implementation of the interim measure. The request must provide justification for the extension and a proposed schedule for completion of the interim measure. The NMED will notify the Permittee, in writing, of the approval or disapproval of the request.

3.9.6.1 Notification of Changes to Interim Measures

The Permittee shall give notice to the NMED as soon as possible of any planned changes, reductions, or additions to the approved IM Work Plan imposed by the NMED under Permit Section 3.9.1 or initiated by the Permittee under Permit Section 3.9.2.

3.9.7 Interim Measures Reporting

3.9.7.1 Progress Reports

If the time required for completion of IM is greater than 180 days, the Permittee shall provide the NMED with Progress Reports at intervals specified in the approved IM Work Plan. The progress reports shall generally comply with the requirements of Permit Section 3.9.7.2 below.

3.9.7.2 Final Interim Measures Report

The Permittee shall prepare and submit an IM Report to the NMED within 90 days following completion of IM, or other time period approved by the NMED. The IM Report shall generally follow the requirement of Permit Section 6.3 and contain, at a minimum, the following information:

1. a detailed description of IM implemented, including all methods and procedures employed to construct, operate, and assess the progress of the IM;

2. a summary of results;

3. a summary of all problems encountered during IM investigations;

4. a summary of accomplishments and/or effectiveness of IM; and

5. copies of all relevant laboratory and monitoring data, maps, logs, and other related information.

3.10 Corrective Action Investigations

3.10.1 Investigation Work Plan

If the NMED determines that an Investigation Work Plan is necessary, the Permittee shall prepare and submit to the NMED, within 90 days or other time period established by the NMED, an Investigation Work Plan in accordance with Permit Section 6.2.

Investigation Work Plans shall include schedules of implementation and completion of specific actions necessary to determine the nature and extent of contamination and the potential pathways of hazardous waste, hazardous constituents, or other contaminant releases (*as defined in Section 1.12 of this Permit*) to the air, soil, surface water, and groundwater. The Permittee shall provide sufficient justification and associated documentation that a release is not probable or has already been characterized if a unit or a media/pathway associated with a unit (groundwater, surface water, soil, subsurface gas, or air) is not included in an Investigation Work Plan. Such deletions of a unit, medium, or pathway from the work plan(s) are subject to approval by the NMED.

The Permittee shall provide sufficient written justification for any omissions or deviations from the minimum requirements specified in Permit Part 6, Reporting Requirements. Such omissions or deviations are subject to the approval of the NMED. In addition, Investigation Work Plans shall include all investigations necessary to ensure compliance with 40 CFR § 264.101. The Permittee shall submit Investigation Work Plans by the dates specified by the NMED. All monitoring, sampling, and analysis shall be conducted in accordance with the investigation methods and procedures set forth in Permit Part 4.

3.10.2 Historical Documents

The Permittee shall submit to the NMED a summary of the historical information regarding site use, waste management, and assessment of known or potential releases of hazardous waste or hazardous constituents relating to each SWMU or AOC in conjunction with the unit-specific Investigation Work Plan, as appropriate. The summary shall include complete, legible copies (or best available) of all relevant photographic imprints, maps, figures, drawings, tables, attachments, enclosures, appendices, and other relevant supporting documentation.

3.10.3 Investigation Report

The Permittee shall prepare and submit to the NMED Investigation Reports for the investigations conducted in accordance with Investigation Work Plans submitted under Permit Section 3.10.1. The Permittee shall submit the Investigation Reports to the NMED for review and approval in accordance with the schedules included in its approved Investigation Work Plans. The Investigation Report shall include analyses and summaries of all investigations required by the associated Investigation Work Plan. The summaries shall describe the type and extent of contamination at each site investigated, including sources and migration pathways, identify all hazardous waste or constituents present in all media, and describe actual and potential receptors. The Investigation Report shall also describe the extent of contamination (qualitative and quantitative) in relation to background levels of the area. If the Investigation Report concludes that further work is necessary, the report shall include a schedule for submission of a work plan for the next phase of investigation.

3.10.3.1 Cleanup Levels

The Investigation Reports shall identify the applicable cleanup levels in accordance with Permit Section 3.5 for each hazardous waste, hazardous constituent, or other contaminant (*as defined in Section 1.12 of this Permit*) found during a site investigation. The Permittee shall propose, in the

Investigation Report or in a subsequent Risk Assessment or Corrective Measures Evaluation, appropriate cleanup levels for any hazardous waste, hazardous constituents or other contaminants (*as defined in Section 1.12 of this Permit*) without established cleanup levels based upon human and ecological risk.

3.10.3.2 Requirement to Proceed

Based upon the NMED's review of the Investigation Report, the NMED will notify the Permittee of the need for further investigative action, if necessary, or inform the Permittee of the need for a Corrective Measures Evaluation. If the NMED determines that further investigation is necessary, the NMED will require the Permittee to submit a work plan for approval that includes a proposed schedule for additional investigation(s).

3.11 Risk Assessment

The Permittee shall attain the cleanup goals outlined in Permit Section 3.5 including, as necessary, performance of risk analysis to establish alternate cleanup goals at each site for which the NMED determines that corrective measures are necessary, in the format included in Permit Part 6. The Permittee shall submit to the NMED for approval a Risk Assessment Report prepared in accordance with Permit Section 6.5 for sites where risk analyses are conducted.

3.12 Corrective Measures Evaluation

The NMED will require corrective measures at a site if NMED determines, based on the Investigation Report(s) and other information available to the NMED, that there has been a release of hazardous wastes, hazardous constituents, or other contaminants *as defined in Section 1.12 of this Permit* into the environment at the site and that corrective action is necessary to protect human health and the environment. Upon making such a determination, the NMED will notify the Permittee in writing and specify a due date for the submittal of the necessary reports and evaluations in the written notification.

3.12.1 Corrective Measures Evaluation Report

Following written notification from the NMED that a Corrective Measures Evaluation (CME) is required, the Permittee shall prepare and submit to the NMED for approval a CME Report in accordance with the schedule included in the written notification. The corrective measures evaluation shall evaluate potential remedial alternatives and shall recommend a preferred remedy that will be protective of human health and the environment and that will attain the appropriate cleanup goals. The CME Report shall be prepared in accordance with the format outlined in Permit Section 6.6. The CME Report shall, at a minimum, include the following:

1. a description of the location, status, and current use of the site;

2. a description of the history of site operations and the history of releases of hazardous wastes, hazardous constituents, and/or other contaminants as defined in Section 1.12;

3. a description of site surface conditions;

4. a description of site subsurface conditions;

5. a description of on-and off-site contamination in all affected media;

6. an identification and description of all sources of hazardous wastes, hazardous constituents, and/or other contaminants;

7. Identify and describe the fate and transport mechanisms that could result in the movement or transformation of hazardous wastes, hazardous constituents, or other contaminants (as defined in Section 1.12 of this Permit) through environmental media;

8. an identification and description of potential receptors;

9. a description of cleanup standards or other applicable regulatory criteria;

10. an identification and description of a range of remedy alternatives;

11. remedial alternative pilot or bench scale testing results;

12. a detailed evaluation and rating of each remedy alternative, applying the criteria provided in Permit Sections 3.12.3 and 6.6;

13. an identification of a proposed preferred remedy or remedies;

14. design criteria of the selected remedy or remedies; and

15. a proposed schedule for implementation of the preferred remedy.

3.12.2 Cleanup Standards

The Permittee shall select corrective measures that are capable of achieving the cleanup standards and goals outlined in Permit Sections 3.5 including, if applicable, approved alternate cleanup goals established by a risk assessment.

3.12.3 Remedy Evaluation Criteria

3.12.3.1 Threshold Criteria

The Permittee shall evaluate each of the remedy alternatives for the following threshold criteria. To be selected, the remedy alternative must:

1. be protective of human health and the environment;

2. attain media cleanup standards;

3. control the source or sources of releases to reduce or eliminate, to the extent practicable, further releases of hazardous wastes, hazardous constituents or other contaminants (as defined in Section 1.12) that may pose a threat to human health and the environment; and

4. comply with applicable standards for management of wastes including RCRA requirements for hazardous wastes.

3.12.3.2 Remedial Alternative Evaluation Criteria

The Permittee shall evaluate each of the remedy alternatives for the factors described in this Permit Part. These factors shall be balanced in proposing a preferred alternative.

3.12.3.3 Long-term Reliability and Effectiveness

The remedy shall be evaluated for long-term reliability and effectiveness. This factor includes consideration of the magnitude of risks that will remain after implementation of the remedy; the extent of long-term monitoring, or other management or maintenance that will be required after implementation of the remedy; the uncertainties associated with leaving hazardous wastes, hazardous constituents, or other contaminants (defined in Section 1.12) in place; and the potential for failure of the remedy. The Permittee shall give preference to a remedy that reduces risks with less long-term management, and that has proven effective under similar conditions.

3.12.3.4 Reduction of Toxicity, Mobility, or Volume

The remedy shall be evaluated for its reduction in the toxicity, mobility, and volume of hazardous wastes, hazardous constituents, or other contaminants (defined in Section 1.12 of this Permit). The Permittee shall give preference to a remedy that will more completely and permanently reduce the toxicity, mobility, and volume of hazardous wastes, hazardous constituents, or other contaminants (as defined in Section 1.12 of this Permit).

3.12.3.5 Short-Term Effectiveness

The remedy shall be evaluated for its short-term effectiveness. This factor includes consideration of the short-term reduction in existing risks that the remedy would achieve; the time needed to achieve that reduction; and the short-term risks that might be posed to the community, workers, and the environment during implementation of the remedy. The Permittee shall give preference to a remedy that more rapidly reduces short-term risks without creating significant additional risks.

3.12.3.6 Implementability

The remedy shall be evaluated for its implementability or the difficulty of implementing the remedy. This factor includes consideration of installation and construction difficulties; operation and maintenance difficulties; difficulties with cleanup technology; permitting and approvals; and the availability of necessary equipment, services, expertise, and storage and disposal capacity.

The Permittee shall give preference to a remedy that can be implemented relatively quickly and easily, and that poses fewer and reduced difficulties.

3.12.3.7 Cost

The remedy shall be evaluated for its cost. This factor includes a consideration of both capital costs and operation and maintenance costs. Capital costs shall include, without limitation, construction and installation costs; equipment costs; land development costs; and indirect costs including engineering costs, legal fees, permitting fees, startup and shakedown costs, and contingency allowances. Operation and maintenance costs shall include, without limitation, operating labor and materials costs; maintenance labor and materials costs; replacement costs; utilities; monitoring and reporting costs; administrative costs; indirect costs; and contingency allowances. All costs shall be calculated based on their net present value. A remedy that is less costly but does not sacrifice protection of health and the environment, shall be preferred.

3.12.4 Corrective Measures Evaluation Report Approval

The NMED will review the Corrective Measures Evaluation (CME) Report and notify the Permittee in writing of approval, approval with modifications, or disapproval of the report in accordance with Permit Section 3.16. The NMED's approval of the CME Report shall not be construed to mean that the NMED agrees with the recommended preferred remedy. Based on preliminary results and the CME Final Report, the NMED may require the Permittee to evaluate additional remedies or particular elements of one or more proposed remedies.

3.12.5 Relationship to Corrective Measures Requirements

The Corrective Measures Evaluation shall serve as a Corrective Measures Study for the purposes of RCRA compliance. (55 Fed. Reg. 30875-77 (July 27, 1990) (proposed 40 CFR §§ 264.520-264.524))

3.13 Remedy Approvals and Permit Modifications

Upon approval of the Corrective Measures Evaluation Report, the NMED will select a remedy or remedies for the site. The NMED may choose a different remedy from that recommended by the Permittee. The NMED will issue a Statement of Basis for selection of the remedy and will issue a draft of the decision for public comment in accordance with the public participation requirements applicable to permit modification under 40 CFR § 270.41and § 270.42(c) and 20.4.1.901 NMAC, including the opportunity for commenters to request a public hearing. The NMED will issue a response to public comments received at the time of the NMED's final decision and modification of the Permit to incorporate the selected remedy.

3.14 Corrective Measure Implementation

The Permittee shall implement the final remedy selected by the NMED.

3.14.1 Corrective Measures Implementation Plan

Within 90 days after the NMED's selection of a final remedy, or as otherwise specified by the schedule contained in the approved Corrective Measure Evaluation Report or as specified by a schedule required by the NMED in the Permit modification, the Permittee shall submit to the NMED for approval a Corrective Measures Implementation Plan outlining the design, construction, operation, maintenance, and performance monitoring for the selected remedy, and a schedule for its implementation. The Corrective Measures Implementation Plan shall, at a minimum, include the following elements:

1. a description of the selected final remedy;
2. a description of the cleanup goals and remediation system objectives;
3. an identification and description of the qualifications of all persons, consultants, and contractors that will be implementing the remedy;
4. detailed engineering design drawings and systems specifications for all elements of the remedy;
5. a construction work plan;
6. an operation and maintenance plan;
7. the results of any remedy pilot tests;
8. a plan for monitoring the performance of the remedy, including sampling and laboratory analysis of all affected media;
9. a waste management plan;
10. a proposed schedule for submission to the NMED of periodic progress reports; and
11. a proposed schedule for implementation of the remedy.

3.14.2 Approval of Corrective Measures Implementation Plan

The NMED will review the Corrective Measures Implementation Plan and notify the Permittee in writing of approval, approval with modifications, or disapproval of the plan in accordance with Permit Section 3.16.

3.14.3 Health and Safety Plan

The Permittee shall conduct all activities in accordance with a site-specific or facility-wide Health and Safety Plan during all construction, operation, maintenance, and monitoring activities conducted during corrective measures implementation.

3.14.4 Progress Reports

The Permittees shall submit to the NMED progress reports in accordance with the schedule approved in the Corrective Measures Implementation Plan. The progress reports shall, at a minimum, include the following information:

1. a description of the remedy work completed during the reporting period;

2. a summary of problems, potential problems, or delays encountered during the reporting period;

3. a description of actions taken to eliminate or mitigate the problems, potential problems, or delays;

4. a discussion of the remedy work projected for the next reporting period, including all sampling events;

5. copies of the results of all monitoring, including sampling and analysis, and other data generated during the reporting period; and

6. copies of all waste disposal records generated during the reporting period.

3.14.5 Remedy Completion

3.14.5.1 Remedy Completion Report

Within 90 days, or other time approved by the NMED, after completion of remedy, the Permittee shall submit to the NMED a Remedy Completion Report. The report shall, at a minimum, include the following items:

1. a summary of the work completed;

2. a statement, signed by a New Mexico registered professional engineer, that the remedy has been completed in accordance with the NMED approved work plan for the remedy;

3. as-built drawings and specifications signed and stamped by a registered professional engineer;

4. copies of the results of all monitoring, including sampling and analysis, and other data generated during the remedy implementation, if not already submitted in a progress report;

5. copies of all waste disposal records, if not already submitted in a progress report; and

6. a certification prepared in accordance with 40 CFR § 270.11(d)(1), signed by a responsible official of the Permittee, stating:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

3.15 Accelerated Clean-up Process

If the Permittee identifies a corrective action or measure that, if implemented voluntarily, will reduce risks to human health and the environment to levels acceptable to the NMED, reduce cost, and/or will achieve cleanup of a contaminated location ahead of schedule, the Permittee may implement the corrective measure as provided in this Permit Section (3.15), in lieu of the process established in Permit Section 3.12. The accelerated cleanup process shall be used at sites to implement presumptive remedies (61 Fed. Reg. 19432, 19439-40) (May 1, 1996)) at small-scale and relatively simple sites where groundwater contamination is not a component of the accelerated cleanup, where the remedy is considered to be the final remedy for the site, and where the field work will be accomplished within 180 days of the commencement of field activities. The proposed accelerated cleanup shall be proposed in an Accelerated Corrective Measure Work Plan, which shall include:

1. a description of the site history including historical site use, a description of hazardous wastes, hazardous constituents, and/or other contaminant releases (as defined in Section 1.12 of this Permit) and the results of site investigations and any remedial actions;

2. a description of the proposed remedial action, including details of the unit or activity that is subject to the requirements of this Permit;

3. an explanation of how the proposed cleanup action is consistent with the overall corrective action objectives and requirements of this Permit;

4. the methods and procedures for characterization and remediation sample collection and analyses; and

5. a schedule for implementation and reporting on the proposed cleanup action.

The Permittee shall notify the NMED of the implementation of the planned accelerated corrective measure a minimum of 180 days prior to the commencement of any accelerated field activity. The notification shall include the submittal of the Plan if not already submitted to the NMED.

3.15.1 Accelerated Corrective Measures Work Plan

The Permittee shall obtain approval of an Accelerated Corrective Measures Work Plan prior to implementation. The Permittee shall prepare the Work Plan in general accordance with the requirements for work plan preparation described in Permit Part 6, Reporting Requirements. The Work Plan shall be submitted to the NMED for review in accordance with the procedures in Permit Section 3.16. NMED will approve, approve with modifications, or disapprove the Accelerated Corrective Measures Work Plan in writing. If disapproved, the NMED will notify the Permittee in writing of the Plan's deficiencies and specify a due date for submission of a revised Accelerated Corrective Measures Work Plan. The Permittee shall include an implementation schedule in the revised Accelerated Corrective Measures Work Plan.

3.15.2 Accelerated Corrective Measures Implementation

The Permittee shall implement the accelerated corrective measures in accordance with the approved Accelerated Corrective Measures Work Plan. Within 90 days of completion of the accelerated corrective measures, the Permittees shall submit to the NMED for approval a Remedy Completion Report in a format approved by the NMED in general accordance with Permit Part 6. If upon review, the NMED identifies any deficiencies in the Remedy Completion Report, the NMED will notify the Permittee in writing.

3.16 Approval of Work Plans and Other Documents

All documents requiring NMED approval, including, but not limited to, monitoring plans, work plans, Investigation Work Plans, Interim Measures Work Plans, Accelerated Corrective Measures Work Plans, Corrective Measures Implementation Plan; Corrective Measures Evaluation Reports, and all associated schedules that the Permittee prepares under the terms of this Permit must be approved by the NMED prior to their implementation. Upon receiving a work plan or other document for approval, the NMED will review the document and either approve the document, approve it with modifications, disapprove, deny, or reject the document in accordance with 20.4.2.201.B(4). The NMED may require resubmittal of the document and specify a due date for such submittal. Each work plan shall meet or address the requirements of this Permit in one or more of the following ways:

1. the work plan shall provide for performance of the work in full compliance with the requirements of this Permit;

2. the work plan shall state that work meeting the requirements of this Permit has been completed; the background section of the work plan shall summarize the data or other information used to satisfy the investigation requirements of this Permit; the summaries shall cite supporting documents with corresponding page numbers; and

3. the work plan shall propose to the NMED alternate requirements that differ from those in this Permit; any such proposal shall be in writing, shall specifically identify each proposed alternate requirement and how it differs from the requirement in the Permit, and shall be accompanied by a detailed written justification; alternate requirements may be

satisfied by previous NMED-approved work that is documented in the work plan as described in Paragraph 2 above; if the NMED approves in writing a work plan with alternate requirements, the alternate requirements of the work plan, rather than the requirements of the Permit, shall be applicable and enforceable.

Upon NMED approval, all plans, reports, and associated schedules are incorporated herein by reference, including any approved extensions and required modifications, and become an enforceable part of this Permit. Work plans and reports subject to this Permit Part (3) shall not be considered modifications of this Permit. Any noncompliance with approved plans and schedules shall be noncompliance with this Permit.

Failure to submit any of the required items in plans or reports or in response to related NMED direction, the submission of inadequate or insufficient information, or failure to comply with the approved work plans or schedules are subject to enforcement action.

3.16.1 Provisions Governing Extensions of Time

The Permittee may seek an extension of time in which to perform a requirement of this Permit, for good cause, by sending a written request for extension of time and proposed revised schedule to the NMED. The request shall be submitted at least 10-days prior to the due date for the submittal, state the length of the requested extension, and describe the basis for the request. The NMED will respond in writing to any request for extension following receipt of the request. If the NMED denies the request for extension, it will state the reasons for the denial.

PART 4: INVESTIGATION AND SAMPLING METHODS AND PROCEDURES

4.1 Highlights

The Permittee must submit to the NMED, for review and written approval, site-specific work plans for sites where a release(s) of hazardous wastes, hazardous constituents, or other contaminants (as defined in Section 1.12 of this Permit) has occurred prior to the commencement of field activities where environmental investigation, corrective action, sampling, or monitoring is required. The site-specific work plans shall include detailed descriptions of all methods to be used to conduct all activities at each site or unit and shall be prepared in accordance with the format described in Permit Part 6. The Permittee shall provide notification to the NMED of corrective action field activities a minimum of 20 days prior to commencing the activity.

The methods used to conduct investigation, remediation, and monitoring activities shall be sufficient to fulfill the requirements of this Permit and provide accurate data for the evaluation of site conditions, to determine the nature and extent of contamination and fate and transport mechanisms, and for remedy selection and implementation, where necessary. The methods presented in this Permit Part (4) are minimum requirements for environmental investigation and sampling and are not intended to include all methods that may be necessary to fulfill the requirements of this Permit. The methods for conducting investigations, corrective actions, and monitoring at the Facility must be determined based on the conditions and hazardous wastes, hazardous constituents, or other contaminants (as defined in Section 1.12 of this Permit) that exist at each site.

The Permittee may propose alternate methods for data collection from those included in this Permit Part (4) for NMED approval. Such alternate methods must be approved by the NMED prior to implementation and, if approved, supersede the corresponding requirements described in this Permit Part (4). To use any alternative analytical method, the Permittee must submit to NMED a petition for approval in accordance with 40 CFR § 260.21.

4.1.1 Standard Operating Procedures

The Permittee shall provide brief descriptions of investigation, sampling, and analytical methods and procedures in documents submitted to the NMED that include sufficient detail to evaluate the adequacy of the method and the quality of the acquired data. The Permittee may not rely on references to Standard Operating Procedures (SOPs).

4.2 Investigation, Sampling, and Analyses Methods

This Permit Section (4.2) provides minimum requirements for field investigations; sample collection, handling; and screening procedures; field and laboratory sample analysis; and quality assurance/quality control (QA/QC) procedures for samples of the media being investigated or tested at the Facility. The requirements addressed in this Permit Section (4.2) include: 1) minimum requirements for drilling and sample collection in exploratory borings and other

excavations; 2) minimum requirements for sampling of the target media; 3) minimum requirements for monitoring of groundwater and vadose zone conditions; and 4) minimum required screening, analytical, and QA procedures that shall be implemented during field sampling activities and laboratory analyses.

The quality assurance procedures referenced in the previous paragraph include: 1) the Facility investigation data quality objectives; 2) the requirements for QA/QC to be followed during field investigations and by the analytical laboratories; and 3) the method for the review and evaluation of the field and laboratory QA/QC results and documentation.

4.2.1 Field Exploration Activities

The NMED may require subsurface explorations to fulfill the requirements of this Permit. Any boring locations, if required, will be determined or approved by the NMED. The depths and locations of all exploratory and monitoring well borings shall be specified in the unit-specific work plans submitted to the NMED for approval prior to the start of the respective field activities. If sampling for PFAS, utilize equipment that is laboratory-verified to be PFAS free.

4.2.2 Subsurface Features/Utility Geophysical Surveys

The Permittee shall conduct surveys, where appropriate, to locate underground utilities, pipelines, structures, drums, debris, and other buried features in the shallow subsurface prior to the start of field exploration activities. The methods used to conduct the surveys, such as magnetometer, ground penetrating radar, resistivity, or other methods, shall be selected based on the unique characteristics of the site and the possible or suspected underground structures. The results of the surveys shall be included in the investigation reports submitted to the NMED. The Permittee is responsible for locating and clearing all aboveground and underground utilities or other hazards at any site prior to conducting field work.

4.2.3 Drilling and Soil Sampling

4.2.3.1 Drilling

Exploratory and monitoring well borings shall be drilled using the most effective, proven, and practicable method for recovery of relatively undisturbed samples and potential hazardous wastes, hazardous constituents, or other contaminants (as defined in Section 1.12 of this Permit). The drilling methods selected for advancement of each boring must be approved by the NMED prior to the start of field activities. Based on the drilling conditions, the borings shall be advanced using one of the following methods:

1. hollow-stem auger;
2. air rotary/air down-the-hole hammer/ODEX;
3. direct push technology (DPT);
4. resonant sonic; or

5. other methods approved by the NMED.

All drilling equipment shall be in good working condition and capable of performing the assigned task. If sampling for PFAS, utilize equipment that is laboratory-verified to be PFAS free. Drilling rigs and equipment shall be operated by properly trained, experienced, and responsible crews. The Permittee is responsible for preventing cross-contamination from another site or facility during investigation and corrective action activities. The drilling equipment shall be properly decontaminated before drilling each boring.

Exploratory borings shall be advanced to unit- and location-specific depths specified or approved by the NMED. The Permittee shall propose drilling depths in the site-specific work plans submitted for each subject area. Unless otherwise specified in this Permit or an approved work plan, the borings shall be advanced to the following minimum depths:

1. five feet below the deepest detected contamination;

2. five feet below the base of structures such as piping, building sumps, footings or other building structures;

3. at least ten feet below the water table; and

4. depths specified by the NMED based on specific data needs.

The Permittee shall notify the NMED as early as practicable if conditions arise or are encountered that do not allow the advancement of borings to the depths specified by the NMED or sampling at locations specified in approved work plans so that alternative actions may be discussed. Precautions shall be taken to prevent chemical migration between geologic, hydrologic, or other identifiable zones during drilling and well installation activities. Contaminated zones shall be isolated from uncontaminated zones encountered in the borings.

The drilling and sampling shall be accomplished under the direction of a qualified geologist or engineer who shall maintain a detailed log of the materials and conditions encountered in each boring. Both sample information and visual observations of the cuttings and core samples shall be recorded on the boring log. Known site features and/or site survey grid markers shall be used as references to locate each boring prior to surveying the location as described in Permit Section 4.2.7. The boring locations shall be measured to the nearest foot, and locations shall be recorded on a scaled site map upon completion of each boring.

4.2.3.2 Exploratory Excavations

Trenching and other exploratory excavation methods shall follow the applicable general procedures outlined in this Permit. The specific methods proposed by the Permittee for subsurface explorations and sampling shall be included in the unit-specific investigation work plan submitted to the NMED. The NMED will include any changes or additional requirements for conducting exploratory excavation and sampling activities at the subject unit in its response to the Permittee after review of the investigation work plan.

4.2.3.3 Soil Sampling

Relatively undisturbed discrete soil samples shall be obtained during the advancement of each boring for the purpose of logging, field screening, and analytical testing. Generally, the samples shall be collected at the following intervals and depths:

1. continuously, at 2.5, 5, or 10-foot intervals, or as approved by the NMED;
2. at the depth immediately below the base of the unit structures and at the fill-native soil interface;
3. at the maximum depth of each boring;
4. at the depth of encounters, during drilling, with perched saturated zones;
5. at the water table;
6. from soil types relatively more likely to sorb or retain contamination than the surrounding lithologies;
7. at intervals suspected of being source or contaminated zones; and
8. at other intervals approved or required by NMED.

The sampling interval for the borings may be modified, or samples may be obtained from a specific depth, based on field observations. A decontaminated split-barrel sampler, a coring device, or other method approved by the NMED shall be used to obtain samples during the drilling of each boring.

A split barrel sampler or coring device which produces a continuous, relatively undisturbed sample is the preferred sampling method for borehole soil, rock, and sediment sampling. The recovered sample shall be directly placed in pre-cleaned, laboratory-prepared sample containers for laboratory chemical analysis. The use of an Encore® Sampler or other similar device is required during collection of soil samples for VOC analysis. If sampling for PFAS, utilize sample containers that are laboratory-verified to be PFAS free. The remaining portions of the sample shall be used for logging and field screening as described in Permit Sections 4.2.4 and 4.2.5, respectively.

Discrete samples shall be collected for field screening and laboratory analyses. Homogenization of discrete samples collected for analyses other than for VOC and SVOC analyses shall be performed by the analytical laboratory, if homogenization is necessary. The Permittee may submit site-specific, alternative methods for homogenization of samples in the field to NMED for approval.

Samples to be submitted for laboratory analyses shall be selected based on: 1) the results of the field screening or mobile laboratory analyses; 2) the position of the sample relative to

groundwater, suspected releases, or site structures; 3) the sample location relative to former or altered site features or structures; 4) the stratigraphy encountered in the boring; and 5) the specific objectives and requirements of this Permit. The proposed number of samples and analytical parameters shall be included as part of the unit-specific work plan submitted to the NMED for approval prior to the start of field investigation activities at each unit. The work plans shall allow for flexibility in modifying the project-specific tasks based on information obtained during the course of the investigation. Modifications to site-specific work plan tasks must be approved by the NMED prior to implementation, if data quality or investigation objectives will be affected.

4.2.3.4 Surface Sampling

Surface samples shall be collected using decontaminated, hand-held stainless-steel coring device, Shelby tube, thin-wall sampler, or other method approved by the NMED, where surface or sediment sampling is conducted without the use of the drilling methods described in Permit Section 4.2.3.1. The samples shall be directly transferred to pre-cleaned laboratory prepared containers for submittal to the laboratory. Samples obtained for volatiles analysis shall be collected using Encore® or equivalent samplers, Shelby tubes, thin-wall samplers, or other method approved by the NMED. If sampling for PFAS, utilize sample containers that are laboratory-verified to be PFAS free.

The physical characteristics of the material (such as mineralogy, ASTM [American Society of Testing and Materials] soil classification, AGI [American Geological Institute]) rock classification, moisture content, texture, color, presence of stains or odors, and/or field screening results), depth where each sample was obtained, method of sample collection, and other observations shall be recorded in the field log.

4.2.3.5 Drill Cuttings (Investigation Derived Waste)

Drill cuttings, excess sample material and decontamination fluids, and all other investigation derived waste (IDW) shall be contained and characterized using methods based on the boring location, boring depth, drilling method, and type of contamination suspected or encountered. An IDW management plan shall be included with the unit-specific investigation work plan submitted to the NMED for approval prior to the start of field investigations. The method of containment for drill cuttings must be approved by the NMED prior to the start of drilling activities. Borings not completed as groundwater or vadose zone monitoring wells shall be properly abandoned in accordance with the methods listed in Permit Section 5.3. Borings completed as groundwater monitoring wells shall be constructed in accordance with the minimum requirements described in Permit Section 5.2.

4.2.4 Logging of Soil, Rock and Sediment Samples

Samples obtained from all exploratory borings and excavations shall be visually inspected and the soil or rock type classified in general accordance with ASTM (ASTM International) D2487 (Unified Soil Classification System) and D2488 and/or AGI (American Geosciences Institute) Methods for soil and rock classification. Detailed logs of each boring shall be completed in the field by a qualified geologist or engineer. Additional information, such as the presence of water-

bearing zones and any unusual or noticeable conditions encountered during drilling shall be recorded on the logs. Field boring logs, test pit logs, and field well construction diagrams shall be converted to the format acceptable for use in final reports submitted to the NMED.

4.2.5 Soil Sample Field Screening

Samples obtained from the borings shall be screened in the field for evidence of the presence of contamination. Field screening results shall be recorded on the exploratory boring and excavation logs. Field screening results are used as a general guideline to determine the nature and extent of possible contamination. In addition, screening results shall be used to aid in the selection of soil samples for laboratory analysis. Field screening alone cannot be used to demonstrate compliance and will not detect the possible presence or full nature and extent of all contamination that may be encountered at the site.

The primary screening methods to be used shall include one or more of the following: (1) visual examination; (2) headspace vapor screening for volatile organic compounds; and (3) metals screening using X-ray fluorescence. Additional screening for site- or release-specific characteristics such as pH or specific compounds using field test kits shall be conducted where appropriate.

Visual screening includes examination of soil samples for evidence of staining caused by petroleum-related compounds or other substances that may cause staining of natural soils such as elemental sulfur or cyanide compounds.

Headspace vapor screening targets volatile organic compounds and involves placing a soil sample in a plastic sample bag or a foil sealed container allowing space for ambient air. The container shall be sealed and then shaken gently to expose the soil to the air trapped in the container. The sealed container shall be allowed to rest for a minimum of five minutes while vapors equilibrate. Vapors present within the sample bag's headspace shall then be measured by inserting the probe of the instrument in a small opening in the bag or through the foil. The maximum value and the ambient air temperature shall be recorded on the field boring or test pit log for each sample. The monitoring instruments shall be calibrated each day to the manufacturer’s standard for instrument operation. A photo-ionization detector (PID) equipped with a 9.5 or higher electron volt (eV) lamp, flame ionization detector, combustible gas indicator, or other instrument approved by the NMED shall be used for VOC field screening. The lamp strength of the PID used for field screening shall be recorded in the field logs. The limitations, precision, and calibration of the instrument to be used for VOC field screening shall be included in the site-specific investigation work plan prepared for each unit.

X-ray fluorescence (XRF) may be used to screen soil samples for the presence of metals. XRF screening requires proper sample preparation and proper instrument calibration. Sample preparation and instrument calibration procedures shall be documented in the field logs. The methods and procedures for sample preparation and calibration shall be approved by the NMED prior to the start of field activities. Field XRF screening results for selected metals may be used in lieu of laboratory analyses upon approval by the NMED; however, the results shall, at a

minimum, be confirmed by laboratory analyses at a frequency of 20 percent (1 sample per every five analyzed by field XRF analysis).

Field screening results are site- and boring-specific, and the results vary with instrument type, the media screened, weather conditions, moisture content, soil type, and type of contamination; therefore, all conditions capable of influencing the results of field screening shall be recorded on the field logs. The conditions potentially influencing field screening results shall be submitted to the NMED as part of the site-specific investigation, remediation, and/or monitoring reports.

At a minimum, samples with the greatest apparent degree of contamination, based on field observations and field screening, shall be submitted for laboratory analysis. The location of the sample relative to groundwater, stratigraphic units, and/or contacts and the proximity to significant site or subsurface features or structures also should be used as a guideline for sample selection. In addition, samples with no or low apparent contamination, based on field screening, shall be submitted for laboratory analysis, if the intention is to confirm that the base (or other depth interval) of a boring or other sample location is not contaminated.

4.2.6 Soil Sample Types

The Permittee shall collect soil samples at the frequencies stated in the approved site-specific investigation work plans for each unit. The samples collected shall be representative of the media and site conditions being investigated or monitored. QA/QC samples shall be collected to monitor the validity of the soil sample collection procedures and shall follow the following sampling protocols:

1. field duplicates shall be collected at a rate of 10 percent with a minimum of one per day;

2. equipment blanks shall be collected from all sampling apparatus at a frequency of 10 percent for chemical analysis;

3. equipment rinse blanks for PFAS sampling must utilize laboratory-verified PFAS-free water (decontamination blank). Collect one prior to the start of a sampling event per piece of sampling equipment following an initial decontamination. One per day per piece of sampling equipment used for each matrix sampled.

4. Disposable sampling equipment needs to have an equipment blank collected at a frequency of one per day for each type of disposable sampling equipment used. Note many disposable sampling equipment can potentially contain PFAS, thus it is imperative to know that any PFAS detections are from sampling equipment and not the soil media.

5. field blanks shall be collected at a frequency of one per day for each medium (except for air samples) at each unit; and

6. reagent blanks shall be used, if chemical analytical procedures requiring reagents are employed in the field as part of the investigation or monitoring program.

The blanks and duplicates shall be submitted for laboratory analyses associated with the project-specific contamination, data quality concerns, and media being sampled. The resulting data shall provide information on the variability associated with sample collection, sample handling, and laboratory analysis operations.

4.2.7 Sample Point and Structure Location Surveying

The horizontal coordinates and elevation of each surface sampling location, the surface coordinates and elevation of each boring or test pit, the top of each monitoring well casing, the ground surface at each monitoring well location, and the locations of all other pertinent structures shall be determined by a registered New Mexico professional land surveyor in accordance with the State Plane Coordinate System (NMSA 1978, §§ 47-1-49 through 56 (Repl. Pamp. 1993)).

Alternate survey methods may be proposed by the Permittee in site specific work plans. Any proposed survey method must be approved by the NMED prior to implementation. The surveys shall be conducted in accordance with Sections 500.1 through 500.12 of the Regulations and Rules of the Board of Registration for Professional Engineers and Surveyors Minimum Standards for Surveying in New Mexico. Horizontal positions shall be measured to the nearest 0.1-ft, and vertical elevations shall be measured to the nearest 0.01-ft. The Permittee shall prepare site map(s), certified by a registered New Mexico professional land surveyor, presenting all surveyed locations and elevations including relevant site features and structures for submittal with all associated reports to the NMED.

4.2.8 Subsurface Vapor-phase Monitoring and Sampling

Samples of subsurface vapors shall be collected from vapor monitoring points from discrete zones, selected based on investigation and field screening results, and as total well subsurface vapor samples as required by the NMED.

The Permittee shall, at a minimum, collect field measurements of the following:

1. organic vapors (using a photo-ionization detector with a 9.5 or higher eV lamp as appropriate for the chemicals of concern, a flame ionization detector, a combustible gas indicator, or other method approved by the NMED) and, if applicable;

2. percent oxygen;

3. percent carbon dioxide;

4. static subsurface pressure; and

5. other parameters (e.g., carbon monoxide, hydrogen sulfide) as required by the NMED.

The Permittee also shall collect vapor samples for laboratory analysis of the following as required:

1. percent moisture;

2. VOCs; and

3. other analytes required by the NMED.

Vapor samples analyzed by the laboratory for percent moisture and VOCs shall be collected using SUMMA canisters or other sample collection method approved by the NMED. The samples shall be analyzed for VOC concentrations by EPA Method TO-15, as updated, or equivalent VOC analytical method.

Field vapor measurements, the date and time of each measurement, and the instrument used, shall be recorded on a vapor monitoring data sheet. The instruments used for field measurements shall be calibrated daily in accordance with the manufacturer's specifications. The methods used to obtain vapor-phase field measurements and samples must be approved by the NMED in writing prior to the start of air monitoring at each Facility site where vapor-phase monitoring is conducted.

Total well vapor sampling and vapor monitoring shall be conducted by sealing the top of the well with a cap containing a sample port. Polyethylene, Teflon or other nonreactive tubing shall be used to connect the sample port to a low-velocity pump not associated with a field instrument. The well shall be purged of a minimum of three well volumes prior to collection of samples or field measurements. If a sample is not obtained for laboratory analysis, the well may be purged using the field instrument pump. SUMMA canisters, Tedlar bags, or field instruments shall draw samples either directly or through polyethylene, Teflon, or other nonreactive tubing. All connections between the wellhead, the instruments, and the sample containers must be airtight.

PFAS Vapor Intrusion Considerations:

While certain PFAS precursors may exhibit volatility sufficient to warrant conceptual evaluation of the vapor intrusion (VI) pathway, EPA and ITRC have not established validated methods for PFAS vapor-phase sampling or published vapor intrusion screening levels. VI assessment for PFAS may be considered in site-specific scenarios; however, because no standardized PFAS vapor-phase protocols exist, vapor intrusion evaluations shall follow EPA's VI guidance for volatile and semi-volatile compounds.

4.3 Groundwater and Monitoring

4.3.1 Groundwater Levels

Groundwater level measurements shall be obtained at intervals required by the NMED. Groundwater levels also shall be obtained prior to purging in preparation for a sampling event. Measurement data and the date and time of each measurement shall be recorded on a site monitoring data sheet. The depth to groundwater levels shall be measured to the nearest 0.01 ft. The depth to groundwater shall be recorded relative to the surveyed well casing rim or other surveyed datum. The method of water level measurements shall be approved by the NMED.

Groundwater levels shall be measured in all wells within 48 hours of the start of obtaining water level measurements.

4.3.2 Groundwater Sampling

Groundwater samples shall initially be obtained from newly constructed monitoring wells no later than five days after the completion of well development. All monitoring wells scheduled for sampling during a groundwater sampling event shall be sampled within 15 days of the start of the monitoring and sampling event. The Permittee shall sample all saturated zones screened to allow entry of groundwater into each monitoring well during each sampling event. All requests for variances from the groundwater sampling schedule shall be submitted to the NMED, in writing, at least 30 days prior to the start of scheduled monitoring and sampling events. Groundwater samples shall be collected from all exploratory borings not intended to be completed as monitoring wells prior to abandonment of the borings, where practicable, unless otherwise specified in a NMED-approved work plan.

Water samples shall be analyzed for one or more general chemistry parameters as required by NMED to include nitrate/nitrite, sulfate, chloride, dissolved CO2, alkalinity, carbonate/ bicarbonate, fluoride, manganese, calcium, biological activity testing, ferric/ferrous iron, ammonia, potassium, magnesium, phosphate, sodium, methane, pH, total organic carbon (TOC), total Kjeldahl nitrogen (TKN), dissolved oxygen (DO), oxidation-reduction potential (ORP), total suspended solids (TSS), electrical conductivity (EC), temperature, total dissolved solids (TDS), stable isotopes, and any additional analytes required by the NMED.

4.3.3 Well Purging

All zones in each monitoring well shall be purged by removing groundwater prior to sampling in order to ensure that formation water is being sampled. Purge volumes shall be determined by monitoring, at a minimum, groundwater pH, specific conductance, dissolved oxygen concentrations, oxidation-reduction potential, and temperature during purging of volumes and at measurement intervals approved by the NMED.

The groundwater quality parameters shall be measured using instruments approved by the NMED. The volume of groundwater purged, the instruments used, and the readings obtained at each interval shall be recorded on the field-monitoring log. Water samples may be obtained from the well after the measured parameters of the purge water have stabilized to within ten percent (0.1 for pH) for three consecutive measurements. Field water quality parameters shall be compared to historical data to ensure that the measurements are indicative of formation water.

The Permittee may submit to the NMED for approval a written request for a variance from the described methods of well purging for individual wells no later than 90 days prior to scheduled sampling activities.

4.3.4 Groundwater Sample Collection

Groundwater samples shall be obtained from each well after a sufficient amount of water has been removed from the well casing to ensure that the sample is representative of formation

water. Groundwater samples shall be obtained using methods approved by the NMED within 24 hours of the completion of well purging. Sample collection methods shall be documented in the field monitoring reports. The samples shall be transferred to the appropriate, clean, laboratory-prepared containers provided by the analytical laboratory. Sample handling and chain-of-custody procedures are described in Permit Section 4.3.6. Decontamination procedures shall be established for reusable water sampling equipment as described in Permit Section 4.3.8.

All purged groundwater and decontamination water shall be characterized prior to disposal. The methods for disposal of purge/decontamination water must be approved by the NMED prior to disposal. Disposable materials shall be handled as described in Permit Section 4.3.10.

Groundwater samples intended for metals analysis shall be submitted to the laboratory as total metals samples. If required by the NMED, the Permittee shall obtain groundwater samples for dissolved metals analysis to be filtered using disposable in-line filters with a 0.10-micron, 0.45-micron, or other mesh size approved by the NMED.

4.3.4.1 Per- and Polyfluoroalkyl Substances (PFAS) sample collection.

PFAS sampling and analytical methods are evolving and more effective and precise field and laboratory analytical methods will likely be developed in the future. As improved methods become accepted, the NMED will require use of such methods as applicable. At a minimum, the following practices shall be followed until improved methods become available:

The EPA SW-846 methods under development utilize PFAS-free, high-density polyethylene containers; whole sample preparation; and sample holding times of 28 days. EPA has also developed guidelines for field sampling, to minimize sample contamination and optimize data quality for site characterization and remediation. (USEPA, September 2018, Technical Brief, Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), EPA/600/F-17/022d)

Due to the widespread use of PFAS, many materials normally used in field and laboratory operations contain PFAS. For example, polytetrafluoroethylene products (tubing, sample containers, and sampling tools) are often used in sampling; however, since these products can contain PFAS, they cannot be used in sampling for PFAS. In addition, many consumer goods, such as water-resistant jackets or fast food wrappers, brought to a sampling site may contain PFAS that can contaminate samples. Proper field sampling and laboratory hygiene protocols are critical to ensuring that testing results reflect actual PFAS levels in the analyzed media. (USEPA, September 2018, Technical Brief, Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), EPA/600/F-17/022d)

EPA developed Analytical Method 537 and has since developed more accurate methods for the determination of selected perfluorinated alkyl acids in media. Specific methods are required for PFAS sampling to avoid cross contamination and to collect representative samples. For example, Section 8, Sample Collection, Preservation, and Storage, of Method 537 describes the field sample collection procedure as follows (USEPA, September 2009, Method 537. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), EPA/600/R-08/092). Since PFAS sampling and analysis techniques are evolving, the Permittee must use the most updated methods when proposing and implementing PFAS sampling.

4.3.5 Groundwater Sample Types

Groundwater samples shall be collected from each monitoring well, and remediation system samples shall be collected as required by the NMED. Field duplicates, field blanks, equipment rinsate blanks, reagent blanks, if necessary, and trip blanks shall be obtained for quality assurance during groundwater and other water sampling activities. The samples shall be handled as described in Permit Section 4.3.6.

Field duplicate water samples for non-PFAS sampling shall be obtained at a minimum frequency of ten percent. At a minimum, one duplicate sample per sampling day shall always be obtained. The recommended frequency for PFAS sampling is one per day or one per 20 samples, whichever is greater.

Field blanks shall be obtained at a minimum frequency of one per day per site or unit. Field blanks shall be generated by filling sample containers in the field with deionized water and submitting the samples, along with the groundwater or surface water samples, to the analytical laboratory for the appropriate analyses.

Equipment rinsate blanks (ERB) for non-PFAS sampling shall be obtained for chemical analysis at the rate of ten percent or a minimum of one rinsate blank per sampling day. Equipment rinsate blanks shall be collected at a rate of one per sampling day if disposable sampling apparatus is used. Rinsate samples shall be generated by rinsing deionized water through unused or decontaminated sampling equipment. The rinsate sample shall then be placed in the appropriate sample container and submitted with the groundwater or surface water samples to the analytical laboratory for the appropriate analyses.

The recommended frequency for ERB relative to PFAS-sampling is one ERB prior to the start of a sampling event per piece of sampling equipment, following an initial decontamination. And, one per day per piece of sampling equipment used, following decontamination. Laboratory-verified PFAS-free water should be utilized. Any equipment that is non-dedicated or is reused throughout the sampling event, should have an ERB collected from it after decontamination and prior to its next use. It is noted that many dedicated or disposable equipment may potentially contain PFAS.

Reagent blanks for non-PFAS sampling shall be obtained at a frequency of 20 percent or a minimum of one per day per unit if chemical analyses requiring the use of chemical reagents are conducted in the field during water sampling activities. For PFAS sampling the recommended frequency is one per day per sample set.

Trip blanks shall accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks shall consist of a sample of analyte-free deionized water prepared by the laboratory and placed in an appropriate sample container. The trip blank shall be prepared by the analytical laboratory prior to the sampling event and shall be kept with the shipping containers and placed with other water samples obtained from the site each day. Trip blanks shall be analyzed at a frequency of one for each shipping container of samples.

Source Water and Source Water Blank at PFAS sites. Site groundwater or surface water at known or potential PFAS-contaminated sites should not be used as source water for decontamination and certain drilling techniques. If publicly supplied water (a.k.a. potable water source) is utilized at a site, then it should be evaluated when considering it for use as source water. Source water and source water blanks should be sampled and analyzed in the same manner as normal samples (e.g. if source water is collected through a hose, the source water blank should be collected from the same hose). The recommended frequency of source water blanks is one per site, preferably prior to the sampling event and at least once during the sampling event.

Note for PFAS sampling and blanks: any water used for QC blanks should be supplied by the laboratory performing the analysis and the laboratory should provide documentation verifying that the water is PFAS-free.

4.3.6 Sample Handling

At a minimum, the following procedures shall be used at all times when collecting samples during investigation, corrective action, and monitoring activities:

1. neoprene, nitrile, or other protective gloves shall be worn when collecting samples. New disposable gloves shall be used to collect each sample;

2. all samples collected from each medium for chemical analysis shall be transferred into clean sample containers supplied by the project analytical laboratory with the exception of soil, rock, and sediment samples obtained in brass sleeves or in Encore® or equivalent samplers. Upon recovery of the sample collected using split barrel samplers with brass sleeves, the brass sleeves shall be removed from the split barrel sampler and the open ends of the sleeves shall be lined with Teflon tape or foil and sealed with plastic caps. The caps shall be fastened to the sleeve with tape for storage and shipment to the analytical laboratory. The sample depth and the top of the sample shall be clearly marked. Sample container volumes and preservation methods shall be in accordance with the most recent standard EPA SW 846 and established industry practices for use by accredited analytical laboratories. Sufficient sample volume shall be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis; and

3. sample labels and documentation shall be completed for each sample following procedures approved by the NMED. Immediately after the samples are collected, they shall be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard chain-of-custody procedures, as described in Permit Section 4.4.1, shall be followed for all samples collected. All samples shall be submitted to the laboratory soon enough to allow the laboratory to conduct the analyses within the method holding times.

4. For PFAS sampling: exclude all materials in sampling equipment known to contain PFAS and document the sampling approach in the associated work plan.

Shipment procedures shall include the following:

1. individual sample containers shall be packed to prevent breakage and transported in a sealed cooler with ice or other suitable coolant or other EPA or industry-wide accepted method. The drain hole at the bottom of the cooler shall be sealed and secured in case of sample container leakage. Temperature blanks shall be included with each shipping container;

2. each cooler or other container shall be delivered directly to the analytical laboratory;

3. glass bottles shall be separated in the shipping container by cushioning material to prevent breakage;

4. plastic containers shall be protected from possible puncture during shipping using cushioning material;

5. the chain-of-custody form and sample request form shall be shipped inside the sealed storage container to be delivered to the laboratory;

6. chain-of-custody seals shall be used to seal the sample-shipping container in conformance with EPA protocol; and

7. signed and dated chain-of-custody seals shall be applied to each cooler prior to transport of samples from the site.

All sample collection procedures shall follow the EPA and industry-accepted methods appropriate for the intended analyses.

4.3.7 In-situ Testing

In-situ permeability tests, remediation system pilot tests, stream flow tests, and other tests conducted to evaluate site and subsurface conditions shall be designed to accommodate specific site conditions and to achieve the test objectives. The testing methods must be approved by the NMED prior to implementation. The tests shall be conducted in order to appropriately represent site conditions and in accordance with EPA, USGS, ASTM, or other methods generally accepted by the industry. Detailed logs of all relevant site conditions and measurements shall be maintained during the testing events. If required by the NMED, a summary of the general test results, including unexpected or unusual test results and equipment failures or testing limitations, shall be reported to the NMED within 30 days of completion of the test. The summary shall be presented in a format acceptable to the NMED and in general accordance with the report formats outlined in Permit Part 6. A formal report summarizing the results of each test shall be submitted to the NMED within 120 days of completion of each test or other time frame approved by the NMED.

4.3.8 Decontamination Procedures

The objective of the decontamination procedures is to minimize the potential for cross-contamination. A designated decontamination area shall be established for decontamination of drilling equipment, reusable sampling equipment, and well materials. The drilling rig shall be decontaminated prior to entering the site or unit. Drilling equipment or other exploration equipment that may come in contact with the borehole shall be decontaminated by steam cleaning, hot-water pressure washing, or other methods approved by the NMED prior to drilling each new boring.

Sampling or measurement equipment, including but not limited to, stainless steel sampling tools, split-barrel or core samplers, well developing or purging equipment, groundwater quality measurement instruments, and water level measurement instruments, shall be decontaminated in accordance with the following procedures or other methods approved by the NMED before each sampling attempt or measurement:

1. brush equipment with a wire or other suitable brush, if necessary or practicable, to remove large particulate matter;

2. rinse with potable tap water; if sampling for PFAS, utilize laboratory-verified PFAS-free water.

3. wash with nonphosphate detergent or other detergent approved by the NMED (e.g., Fantastik™, Liqui-Nox®) followed by a tap water rinse; if sampling for PFAS, wash with PFAS-free soap.

4. rinse with 0.1 M nitric acid (to remove trace metals, if necessary) followed by a tap water rinse; if sampling for PFAS, utilize laboratory-verified PFAS-free water or potable tap water that meets the source water requirements specified in Section 4.3.5;

5. rinse with methanol (to remove organic compounds, if necessary) followed by a tap water rinse; if sampling for PFAS, utilize laboratory-verified PFAS-free water or potable tap water that meets the source water requirements specified in Section 4.3.5;

6. rinse with potable tap water; if sampling for PFAS, utilize laboratory-verified PFAS-free water or potable tap water that meets the source water requirements specified in Section 4.3.5; and

7. double rinse with deionized water; if sampling for PFAS, utilize laboratory-verified PFAS-free water or certified PFAS-free deionized water.

All decontamination solutions shall be collected and stored temporarily as described in Permit Section 4.3.10. Decontamination procedures and the cleaning agents used shall be documented in the daily field log.

4.3.9 Field Equipment Calibration Procedures

Field equipment requiring calibration shall be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. At a minimum, calibration checks shall be conducted daily, or at other intervals approved by the NMED, and the instruments shall be recalibrated, if necessary. Calibration measurements shall be recorded in the daily field logs. If field equipment becomes inoperable, its use shall be discontinued until the necessary repairs are made. In the interim, a properly calibrated replacement instrument shall be used.

4.3.10 Collection and Management of Investigation Derived Waste

Investigation derived waste (IDW) includes general refuse, drill cuttings, excess sample material, water (decontamination, development and purge), and disposable equipment generated during the course of investigation, corrective action, or monitoring activities. All IDW shall be properly characterized and disposed of in accordance with all federal, State, and local rules and regulations for storage, labeling, handling, transport, and disposal of waste. The Permittee shall

submit an IDW management and disposal plan as part of all work plans submitted to NMED for approval prior to disposal of any IDW produced during investigation, corrective action, or monitoring activities.

All water generated during sampling and decontamination activities shall either be temporarily stored at satellite accumulation areas or transfer stations in labeled 55-gallon drums or other containers approved by NMED until proper characterization and disposal can be arranged. The IDW may be characterized for disposal based on the known or suspected contamination potentially present in the waste. The methods for waste characterization and disposal of IDW must be approved by NMED prior to disposal.

4.4 Documentation of Field Activities

Daily field activities, including observations and field procedures, shall be recorded on appropriate forms. The original field forms shall be maintained at the Facility. Copies of the completed forms shall be maintained in a bound and sequentially numbered field file for reference during field activities. Indelible ink shall be used to record all field activities. Photographic documentation of field activities shall be performed, as appropriate. The daily record of field activities shall include the following:

1. site or unit designation;
2. date;
3. time of arrival and departure;
4. field investigation team members including subcontractors and visitors;
5. weather conditions;
6. daily activities and times conducted;
7. observations;
8. record of samples collected with sample designations and locations specified;
9. photographic log;
10. field monitoring data, including health and safety monitoring;
11. equipment used and calibration records, if applicable;
12. list of additional data sheets and maps completed;

13. an inventory of the waste generated and the method of storage or disposal; and

14. signature of personnel completing the field record.

4.4.1 Sample Custody

All samples collected for analysis shall be recorded in the field report or data sheets. Chain-of-custody forms shall be completed at the end of each sampling day, prior to the transfer of samples off site, and shall accompany the samples during shipment to the laboratory. A signed and dated custody seal shall be affixed to the lid of the shipping container. Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form shall be signed as received by the laboratory, and the conditions of the samples shall be recorded on the form. The original chain-of-custody form shall remain with the laboratory and copies shall be returned to the relinquishing party. The Permittee shall maintain copies of all chain-of-custody forms generated as part of sampling activities. Copies of the chain-of-custody records shall be included with all draft and final laboratory reports submitted to the NMED.

4.5 Chemical Analyses

The Permittee shall submit all samples for laboratory analysis to accredited contract laboratories. The laboratories shall use the most recent standard EPA and industry-accepted analytical methods for target analytes as the testing methods for each medium sampled. Chemical analyses shall be performed in accordance with the most recent EPA standard analytical methodologies and extraction methods.

The Permittee shall submit a list of analytes and analytical methods to the NMED for approval as part of each site-specific investigation, corrective measures, or monitoring work plan. The detection and reporting limits for each method shall be less than applicable background, screening, and regulatory cleanup levels. The preferred method reporting (practical quantitation) limits are a maximum of 20 percent of the cleanup, screening, or background levels. Analyses conducted with detection limits that are greater than applicable background, screening, or regulatory cleanup levels shall be considered data quality exceptions, and the reasons for the elevated detection limits shall be reported to the NMED. Sample analyses with detection limits greater than applicable background, screening, and regulatory cleanup levels shall not be used for risk assessment or compliance purposes.

4.5.1 Per- and Polyfluoroalkyl Substances (PFAS) Sampling and Analytical Methods

PFAS sampling and analytical methods have been evolving, more effective and precise field and laboratory analytical methods have been developed, and those will continue to be refined in the future. The NMED will require use of these improved, validated, and EP`A approved methods. The Permittee must use the most current PFAS sampling and analytical methods specific to each matrix (media) when proposing and implementing PFAS sampling.

Sampling conducted for PFAS in various media is similar for other chemical compounds, however, there are several additional specific considerations and protocols. Due to the widespread use of PFAS, many materials normally used in field and laboratory operations contain PFAS. Proper field sampling and laboratory hygiene protocols are critical in ensuring that resting results reflect actual PFAS levels in the analyzed media (USEPA, September 2018, Technical Brief, Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), EPA/600/F-17/022d). Several EPA Methods that analyze for PFAS have undergone multi-laboratory validation.

4.5.2 Laboratory QA/QC Requirements

The following requirements for laboratory QA/QC procedures shall be considered the minimum QA/QC standards for the laboratories employed by the Permittee that provide analytical services for environmental investigation, corrective action, and monitoring activities conducted at the Facility. The Permittee shall provide the names of the contract analytical laboratories and copies of the laboratory quality assurance manuals to NMED, if requested, within 180 days of awarding a contract for analytical services to any contract laboratory.

4.5.3 Quality Assurance Procedures

Contract analytical laboratories shall maintain internal quality assurance programs in accordance with EPA and industry accepted practices and procedures. At a minimum, the laboratories shall use a combination of standards, blanks, surrogates, duplicates, matrix spike/matrix spike duplicates (MS/MSD), blank spike/blank spike duplicates (BS/BSD), and laboratory control samples to demonstrate analytical QA/QC. The laboratories shall establish control limits for individual chemicals or groups of chemicals based on the long-term performance of the test methods. In addition, the laboratories shall establish internal QA/QC that meets EPA's laboratory certification requirements. The specific procedures to be completed are identified in the following sections.

4.5.4 Equipment Calibration Procedures and Frequency

The laboratory's equipment calibration procedures, calibration frequency, and calibration standards shall be in accordance with the EPA test method requirements and documented in the laboratory’s quality assurance and SOP manuals. All instruments and equipment used by the laboratory shall be operated, calibrated, and maintained according to manufacturers' guidelines and recommendations. Operation, calibration, and maintenance shall be performed by personnel who have been properly trained in these procedures. A routine schedule and record of instrument calibration and maintenance shall be kept on file at the laboratory.

4.5.5 Laboratory QA/QC Samples

Analytical procedures shall be evaluated by analyzing reagent or method blanks, surrogates, MS/MSDs, BS/BSDs, and laboratory duplicates, as appropriate for each method. The laboratory QA/QC samples and frequency of analysis to be completed shall be documented in the cited EPA or ASTM test methods. At a minimum, the laboratory shall analyze laboratory blanks, MS/MSDs, BS/BSDs, and laboratory duplicates at a frequency of one in twenty for all batch runs

requiring EPA test methods and at a frequency of one in ten for non-EPA test methods. Laboratory batch QA/QC samples shall be specific to the project.

4.5.6 Laboratory Deliverables

The analytical data package submitted to the NMED shall be prepared in accordance with EPA-established Level II analytical support protocol. The laboratory analytical data package shall be prepared in accordance with EPA-established Level III or IV analytical support protocol, which must be kept on file by the contract laboratory and submitted to the Permittee upon request. Any or all of the following items also shall be made available to the NMED upon request:

1. transmittal letter, including information about the receipt of samples, the testing methodology performed, any deviations from the required procedures, any problems encountered in the analysis of the samples, any data quality exceptions, and any corrective actions taken by the laboratory relative to the quality of the data contained in the report;

2. sample analytical results, including sampling date; date of sample extraction or preparation; date of sample analysis; dilution factors and test method identification; soil, rock, or sediment sample results in consistent units (mg/kg) or micrograms per kilogram (µg/kg) in dry-weight basis; water sample results in consistent units (milligrams per liter (mg/L) or micrograms per liter (µg/L)); vapor sample results in consistent units (µg/m^3); and detection limits for undetected analytes; results shall be reported for all field samples, including field duplicates and blanks, submitted for analysis;

3. method blank results, including detection limits for undetected analytes;

4. surrogate recovery results and corresponding control limits for samples and method blanks (organic analyses only);

5. MS/MSD and/or BS/BSD spike concentrations, percent recoveries, relative percent differences (RPDs), and corresponding control limits;

6. laboratory duplicate results for inorganic analyses, including relative percent differences and corresponding control limits;

7. sample chain-of-custody documentation;

8. holding times and conditions;

9. conformance with required analytical protocol(s);

10. instrument calibration;

11. blanks;

12. detection/quantitation limits;

13. recoveries of surrogates;

14. variability for duplicate analyses;

15. completeness;

16. data report formats;

17. the following data deliverables for organic compounds shall be required from the laboratory:
    a. a cover letter referencing the procedure used and discussing any analytical problems, deviations, and/or modifications, including a signature from authority representative certifying to the quality and authenticity of data as reported;

    b. report of sample collection, extraction, and analysis dates, including sample holding conditions;

    c. tabulated results for samples in units as specified, including data qualification in conformance with EPA protocol, and definition of data descriptor codes;

    d. reconstructed ion chromatograms for gas chromatograph/mass spectrometry (GC/MS) analyses for each sample and standard calibration;

    e. selected ion chromatograms and mass spectra of detected target analytes (GC/MS) for each sample and calibration with associated library/reference spectra;

    f. gas chromatograph/electron capture device (GC/ECD) and/or gas chromatograph/flame ionization detector (GC/FID) chromatograms for each sample and standard calibration;

    g. raw data quantification reports for each sample and calibrations, including areas and retention times for analytes, surrogates, and internal standards;

    h. a calibration data summary reporting calibration range used and a measure of linearity (include decafluorotriphenylphosphine (DFTPP) and p-bromofluorobenzene (BFB) spectra and compliance with tuning criteria for GC/MS);

i. final extract volumes (and dilutions required), sample size, wet-to-dry weight ratios, and instrument practical detection/quantitation limit for each analyte;

j. analyte concentrations with reporting units identified, including data qualification in conformance with the CLP Statement of Work (SOW) (include definition of data descriptor codes);

k. quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample;

l. recovery assessments and a replicate sample summary, including all surrogate spike recovery data with spike levels/concentrations for each sample and all MS/MSD results (recoveries and spike amounts); and

m. report of tentatively identified compounds with comparison of mass spectra to library/reference spectra; and

18. the following data deliverables for inorganic compounds shall be required from the laboratory:

a. a cover letter referencing the procedure used and discussing any analytical problems, deviations, and modifications, including signature from authority representative certifying to the quality and authenticity of data as reported;

b. report of sample collection, digestion, and analysis dates, with sample holding conditions;

c. tabulated results for samples in units as specified, including data qualification in conformance with the CLP SOW (including definition of data descriptor codes);

d. results of all method QA/QC checks, including inductively coupled plasma (ICP) Interference Check Sample and ICP serial dilution results;

e. tabulation of instrument and method practical detection/quantitation limits;

f. raw data quantification report for each sample;

g. a calibration data summary reporting calibration range used and a measure of linearity, where appropriate;

h. final digestate volumes (and dilutions required), sample size, and wet-to-dry weight ratios;

i. quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample; and

j. recovery assessments and a replicate sample summary, including post-digestate spike analysis; all MS data (including spike concentrations) for each sample, if accomplished; all MS results (recoveries and spike amounts); and laboratory control sample analytical results).

The Permittee shall present summary tables of these data in the general formats described in Permit Part 6. The raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets, and other laboratory support data for samples from this project, shall be compiled and kept on file at either the contract laboratory or the Facility for reference. The Permittee shall make the data available to the NMED upon request. The Permittee shall maintain an electronic laboratory analytical database that contains all historical laboratory data and is updated as new data is acquired. The updated database shall be provided to NMED as an electronic file in each report and upon request.

4.5.7 Review of Field and Laboratory QA/QC Data

The Permittee shall evaluate the field and laboratory data QA/QC results for acceptability with respect to the data quality objectives (DQOs). Each group of samples shall be compared with the DQOs and evaluated using data validation guidelines contained in EPA guidance documents and the most recent version of SW-846, and industry-accepted QA/QC methods and procedures.

The Permittee shall require the laboratory to notify the Facility project manager of data quality exceptions within one business day in order to allow for sample re-analysis, if possible. The Facility project manager shall contact the NMED within one business day of receipt of laboratory notification of data quality exceptions in order to discuss the implications and determine whether the data will still be considered acceptable or if sample re-analysis or resampling is necessary. The Facility project manager shall summarize the results of the discussion with the NMED project leader regarding the data quality exceptions in a memorandum. The Permittee shall submit the memorandum to the NMED by fax or electronic mail within two business days of the conclusion of the data quality discussion.

4.5.8 Blanks, Field Duplicates, Reporting Limits, and Holding Times

4.5.8.1 Blanks

The analytical results of field blanks and field rinsate blanks shall be reviewed to evaluate the adequacy of the equipment decontamination procedures and the possibility of cross-contamination caused by decontamination of sampling equipment. The analytical results of trip blanks shall be reviewed to evaluate the possibility for contamination resulting from the laboratory-prepared sample containers or the sample transport containers. The analytical results of laboratory blanks shall be reviewed to evaluate the possibility of contamination caused by the analytical procedures. If any substance is detected in field or laboratory blanks that could

indicate contamination, the sample data shall be qualified as appropriate (e.g. flagged with "B" for blank contamination) in accordance with data validation guidelines.

4.5.8.2 Field Duplicates

Field duplicates shall consist of two samples either split from the same sample device or collected sequentially. Field duplicate samples shall be collected at a minimum frequency of 10 percent of the total number of samples submitted for analysis and one per day. Relative percent differences for field duplicates shall be calculated. A precision of no more than 20 percent for duplicates shall generally be considered acceptable for soil sampling conducted at the Facility. The analytical DQO for precision shall be used for water and soil vapor duplicates. Failure of an RPD implies failure to achieve the DQO for the batch of samples represented by the duplicate pair. This data must be qualified as failing DQOs. For reporting purposes, the highest concentration value of any replicate, duplicate, or triplicate sample set must be presented in tables and on figures.

4.5.8.3 Method Reporting Limits

Method reporting limits for sample analyses for each medium shall be established at the lowest level practicable for the method and analyte concentrations and shall not exceed soil, groundwater, surface water, or vapor emissions background levels, cleanup standards, or screening levels. The preferred method detection limits are a maximum of 20 percent of the background, screening, or cleanup levels. Detection limits that exceed established soil, groundwater, surface water, or air emissions cleanup standards, screening levels, or background levels and are reported as "not detected" or "estimated" shall be considered data quality exceptions and an explanation for the exceedance shall be provided. This data cannot demonstrate compliance and must not be used for decision making purposes and must be qualified as exceptions.

4.5.8.4 Holding Times

The Permittee shall review the sampling, extraction, and analysis dates to confirm that extraction and analyses were completed within the recommended holding times as specified by EPA protocol. Appropriate data qualifiers shall be noted if holding times were exceeded.

4.5.9 Representativeness and Comparability

4.5.9.1 Representativeness

Representativeness is a qualitative parameter related to the degree to which the sample data represent the relevant specific characteristics of the media sampled. The Permittee shall implement procedures to assure representative samples are collected and analyzed, such as repeated measurements of the same parameter at the same location over several distinct sampling events. The Permittee shall note any procedures or variations that may affect the collection or analysis of representative samples and shall qualify the data.

4.5.9.2 Comparability

Comparability is a qualitative parameter related to whether similar sample data can be compared. To assure comparability, the Permittee shall report analytical results in appropriate units for comparison with other data (past studies, comparable sites, screening levels, and cleanup standards) and shall implement standard collection and analytical procedures. Any procedure or variation that may affect comparability shall be noted and the data shall be qualified.

4.5.10 Laboratory Reporting, Documentation, Data Reduction, and Corrective Action

Upon receipt of each laboratory data package, data shall be evaluated against the criteria outlined in the sections above. Any deviation from the established criteria shall be noted and the data will be qualified. A full review and discussion of analytical data QA/QC and all data qualifiers shall be submitted as appendices or attachments to investigation and monitoring reports prepared in accordance with Permit Part 6. Data validation procedures for all samples shall include checking the following, when appropriate:

1. holding times;
2. detection limits;
3. field equipment rinsate blanks;
4. field blanks;
5. field duplicates;
6. trip blanks;
7. reagent blanks;
8. laboratory duplicates;
9. laboratory blanks;
10. laboratory matrix spikes;
11. laboratory matrix spike duplicates;
12. laboratory blank spikes;
13. laboratory blank spike duplicates; and
14. surrogate recoveries.

If significant quality assurance problems are encountered, appropriate corrective action shall be implemented. All corrective action shall be defensible, and the corrected data shall be qualified.

PART 5: MONITORING WELL CONSTRUCTION REQUIREMENTS

Vadose zone or groundwater monitoring wells required to be constructed at the Facility must be installed in accordance with this Permit Part. General drilling procedures are presented in Permit Section 5.1 and monitoring well construction requirements are presented in Permit Section 5.2.

5.1 Drilling Methods

Vadose zone and groundwater monitoring wells and piezometers must be designed and constructed in a manner that will yield high quality samples, ensure the well will last the duration of the project, and ensure the well will not serve as a conduit for contamination to migrate between different stratigraphic units or aquifers. The design and construction of monitoring wells shall comply with the guidelines established in various EPA RCRA guidance, including, but not limited to:

1. U.S. EPA, RCRA Groundwater Monitoring: Draft Technical Guidance, EPA/530-R-93-001, November 1992;

2. U.S. EPA, RCRA Groundwater Monitoring Technical Enforcement Guidance Document, OSWER-9950.1, September 1986; and

3. Aller, L., Bennett, T.W., Hackett, G., Petty, R.J., Lehr, J.H., Sedoris, H., Nielsen, D.M., and Denne, J.E., Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells, EPA 600/4-89/034, 1989.

A variety of methods are available for drilling monitoring wells. While the selection of the drilling procedure is usually based on the site-specific geologic conditions, the following issues shall also be considered:

1. drilling shall be performed in a manner that minimizes impacts to the natural properties of the subsurface materials;

2. contamination and cross-contamination of groundwater and aquifer materials during drilling shall be avoided;

3. the drilling method shall allow for the collection of representative samples of rock, unconsolidated materials, and soil;

4. the drilling method shall allow the Permittee to determine when the appropriate location for the screened interval(s) has been encountered; and

5. the drilling method shall allow for the proper placement of the filter pack and annular sealants. The borehole diameter shall be at least four inches larger in diameter than the

nominal diameter of the well casing and screen to allow adequate space for placement of the filter pack and annular sealants.

The drilling method shall allow for the collection of representative vadose zone and groundwater samples. Drilling fluids (including air) shall be used only when minimal impact to the surrounding formation and groundwater can be ensured.

A brief description of the different drilling methods that may be appropriate for the construction of monitoring wells at the Facility follows. Many of these methods may be used alone, or in combination, to install monitoring wells at the Facility. While the selection of the specific drilling procedure will usually depend on the site-specific geologic conditions, justification for the method selected must be provided to the NMED.

5.1.1 Hollow-Stem Auger

The hollow-stem continuous flight auger consists of a hollow, steel shaft with a continuous, spiraled steel flight welded onto the exterior side of the stem. The stem is connected to an auger bit and, when rotated, transports cuttings to the surface. The hollow stem of the auger allows drill rods, split-spoon core barrels, Shelby tubes, and other samplers to be inserted through the center of the auger so that samples may be retrieved during the drilling operations. The hollow stem also acts to temporarily case the borehole allowing the well screen and casing (riser) to be inserted down through the center of the augers once the desired depth is reached, minimizing the risk of possible collapse of the borehole.

A bottom plug or pilot bit can be fastened onto the bottom of the augers to keep out most of the soils and/or water that have a tendency to clog the bottom of the augers during drilling. Drilling without a center plug is acceptable provided that the soil plug, formed in the bottom of the auger, is removed before sampling or installing well casings. The soil plug can be removed by washing out the plug using a side discharge rotary bit or auger advancement through the plug with a solid-stem auger bit sized to fit inside the hollow-stem auger. In situations where heaving sands are a problem, potable water may be poured into the augers to equalize the pressure so that the inflow of formation materials and water shall be held to a minimum when the bottom plug is removed. The hollow-stem auger method is best suited for drilling in relatively shallow soils and unconsolidated sediments.

5.1.2 Air Rotary/Air Down-The Hole Hammer/ODEX

The air rotary method consists of a drill pipe or drill stem coupled to a drill bit that rotates and cuts through soils and rock. The cuttings produced from the rotation of the drilling bit are transported to the surface by compressed air, which is forced down the borehole through the drill pipe and returns to the surface through the annular space (between the drill pipe and the borehole wall). The circulation of the compressed air not only removes the cuttings from the borehole but also helps to cool the drill bit. The use of air rotary drilling is best suited for hard-rock formations. In soft unconsolidated formations, casing is driven to keep the formation from caving.

When using air rotary, the air compressor shall have an in-line filter system to filter the air coming from the compressor. The filter system shall be inspected regularly to ensure that the system is functioning properly. In addition, a cyclone velocity dissipater or similar air containment/dust-suppression system shall be used to funnel the cuttings to one location instead of allowing the cuttings to discharge uncontrolled from the borehole. Air rotary that employs the dual-tube (reverse circulation) drilling system is acceptable because the cuttings are contained within the drill stem and are discharged through a cyclone velocity dissipater to the ground surface.

The injection of air into the borehole during air rotary drilling has the potential to alter the natural properties of the subsurface. This can occur through air-stripping of the VOCs in both soil and groundwater in the vicinity of the borehole, altering the groundwater geochemical parameters (e.g., pH and redox potential), and potentially increasing biodegradation of organic compounds in the aquifer near the borehole. These factors may prevent the well from yielding vadose zone or groundwater samples that are representative of in-situ conditions.

In hard, abrasive, consolidated rock, a down-the-hole hammer may be more appropriate than the air rotary method. In this method, compressed air is used to actuate and operate a pneumatic hammer as well as lift the cuttings to the surface and cool the hammer bit. One drawback of the down-the-hole hammer is that oil is required in the air stream to lubricate the hammer-actuating device, and this oil could potentially contaminate the soil in the vicinity of the borehole and the aquifer.

The ODEX method is a variation of the air rotary method in which a casing-driving technique is used in combination with air rotary drilling. With the ODEX system, the drill bit extends outward and reams a pilot hole large enough for a casing assembly to slide down behind the drill bit assembly. As a result, casing is advanced simultaneously while drilling the hole.

5.1.3 Resonant Sonic

Resonant Sonic drilling is a method that uses a sonic drill head to produce high frequency, high-force vibrations in a steel drill pipe. The vibrations in the pipe create a cutting action at the bit face, which allows a continuous core of the formation to move into the core barrel. The method requires no drilling fluid, advances relatively quickly (up to one ft/sec in certain formations), drills at any angle through all formations (rock, clay, sand, boulders, permafrost, glacial till), and yields virtually no cuttings in the drilling process. While there are numerous advantages to this process, the primary disadvantages are the generation of heat and the cost of the method. This drilling method has been used and proven at various facilities.

5.2 Well Construction/Completion Methods

5.2.1 Well Construction Materials

Well construction materials shall be selected based on the goals and objectives of the proposed monitoring program and the geologic conditions at the site. When selecting well construction materials, the primary concern shall be selecting materials that will not contribute foreign

constituents or remove contamination from the vadose zone or groundwater. Other factors to be considered include the tensile strength, compressive strength, and collapse strength of the materials, length of time the monitoring well will be in service, and the material's resistance to chemical and microbiological corrosion. Generally, if the monitoring program requires the analysis of organic constituents, stainless steel materials should be used. However, if the monitoring program requires only inorganic constituent analyses, PVC materials may be used. PVC is less desirable for monitoring wells where organic constituents will be analyzed due to its potential for sorption and leaching of contamination. If stainless steel is used for groundwater monitoring wells where low levels of metals may be present, the steel must be passivated to minimize sorption and leaching of metals.

Well screen and casing materials acceptable for the construction of RCRA monitoring wells include stainless steel (304 or 316) or rigid PVC (meeting American National Standards Institute/National Sanitation Foundation Standard 14). In addition, there are other materials available for the construction of monitoring wells including acrylonitrile butadiene styrene (ABS), fiberglass-reinforced plastic (FRP), black iron, carbon steel, and galvanized steel, but these materials are not recommended for use in long term monitoring wells due to their low resistance to chemical attack and potential contribution of contamination to the groundwater. However, these materials may be used in the construction of monitoring wells where they will not be in contact with the groundwater or vadose zone interval that will be sampled (e.g., carbon steel pipe used as surface casing).

5.2.1.1 PFAS-Specific Well Construction Materials

Monitoring wells installed for PFAS investigation or corrective action shall be constructed using materials and practices that minimize the potential for PFAS cross-contamination. Consistent with current EPA and ITRC guidance, fluoropolymer materials (including PTFE/Teflon) shall not be used in well casings, screens, risers, or permanent tubing. Preferred materials include stainless steel and high-density polyethylene (HDPE); PVC may be used where documented as compatible. PFAS-containing products such as Teflon tape, PFAS-based lubricants, waterproof markers and similar materials shall not be used in contact with monitoring wells or associated equipment. Guidance References:

1. ITRC (2021, updated 2023). PFAS Technical and Regulatory Guidance Document. Sections on Investigation Methods, Well Construction Materials, and Cross-Contamination Prevention.
2. EPA (2022-2024). PFAS Sampling and Analysis Guidance, including materials restrictions referenced in Draft Method 1633 and associated Best Practices for PFAS Sampling.
3. EPA (2020). Interim Guidance on PFAS in Groundwater and Investigations, emphasizing avoidance of fluoropolymer materials and PFAS-containing field supplies.

5.2.2 Well Construction Techniques

5.2.2.1 Single-Cased Wells

The borehole shall be bored, drilled, or augered as close to vertical as possible, and checked with a plumb bob, level, or appropriate downhole logging tool. Angled boreholes shall not be acceptable unless specified in the design. The borehole shall be of sufficient diameter so that well construction can proceed without major difficulties. To assure an adequate size, a minimum two-inch annular space is required between the casing and the borehole wall (or the hollow-stem auger wall). The two-inch annular space around the casing will allow the filter pack, bentonite seal, and annular grout to be placed at an acceptable thickness. Also, the two-inch annular space will allow up to a 1.5-inch outer diameter tremie pipe to be used for placing the filter pack, bentonite seal, and grout at the specified intervals.

It may be necessary to overdrill the borehole so that any soils that have not been removed (or that have fallen into the borehole during augering or drill stem retrieval) will fall to the bottom of the borehole below the depth where the filter pack and well screen are to be placed. Normally, three to five feet is sufficient for overdrilling shallow wells. Deep wells may require deeper overdrilling. The borehole can also be overdrilled to allow for an extra space for a well sump to be installed. If the borehole is overdrilled deeper than desired, it can be backfilled to the designated depth with bentonite pellets or the filter pack.

Well casings (riser assembly) should be secured to the well screen by flush-jointed threads or other appropriate connections, placed into the borehole, and plumbed by the use of centralizers, a plumb bob, or a level. Petroleum-based lubricating oils or grease shall not be used on casing threads. Teflon tape can be used to wrap the threads to ensure a tight fit and minimize leakage, if per-and poly-fluorinated alkyl substances are not a chemical of concern. No glue of any type shall be used to secure casing joints. Teflon “O” rings can also be used to ensure a tight fit and minimize leakage. “O” rings made of materials other than Teflon must be used if the well will be sampled for organic compounds or per-and poly-fluorinated alkyl substances analyses. Before the well screen and casings are placed at the bottom of the borehole, at least six inches of filter material shall be placed at the bottom to serve as a firm footing. The string of well screen and casing should then be placed into the borehole and plumbed. If centralizers are used, they shall be placed below the well screens and above the bentonite annular seals so that the placement of the filter pack, overlying bentonite seal, and annular grout will not be hindered. Centralizers placed in the wrong locations can cause bridging during material placement.

If installing the well screen and casings through hollow-stem augers, the augers shall be slowly extracted as the filter pack, bentonite seal, and grout are tremied or poured into place. The gradual extraction of the augers will allow the materials being placed in the augers to flow out of the bottom of the augers into the borehole. If the augers are not gradually extracted, the materials will accumulate at the bottom of the augers causing potential bridging problems. After the string of well screen and casing is plumb, the filter material shall be placed around the well screen (preferably by the tremie pipe method) up to the designated depth.

After the filter pack has been installed, the bentonite seal shall be placed directly on top of the filter pack up to the designated depth or a minimum of two feet above the filter pack, whichever is greater. After the bentonite seal has hydrated for the specified time, the annular grout shall be pumped by the tremie method into the annular space around the casings (riser assembly) up to within two feet of the ground surface or below the frost line, whichever is greater. The grout shall be allowed to cure for a minimum of 24 hours before the surface pad and protective casing are installed. After the surface pad and protective casing are installed, bumper guards (guideposts) shall be installed (if necessary).

5.2.2.2 Double-Cased Wells

Double-cased wells should be constructed when there is reason to believe that interconnection of two aquifers by well construction may cause cross contamination, or when flowing sands make it impossible to install a monitoring well using conventional methods. A pilot borehole should be advanced through the overburden and the contaminated zone into a clay, confining layer, or bedrock. An outer casing (surface or pilot casing) shall be placed into the borehole and sealed with grout. The borehole and outer casing should extend into tight clay a minimum of two feet or into competent bedrock a minimum of one foot. The total depth into the clay or bedrock will vary depending upon the plasticity of the clay and the extent of weathering and fracturing of the bedrock. The size of the outer casing shall be of sufficient inside diameter to contain the inner casing and the two-inch annular space. In addition, the borehole shall be of sufficient size to contain the outer casing and the two-inch minimum outer annular space, if applicable.

The outer casing shall be grouted by the tremie method from the bottom of the borehole to within two feet of the ground surface. The grout shall be pumped into the annular space between the outer casing and the borehole wall. This can be accomplished by either placing the tremie pipe in the annular space and pumping the grout from the bottom of the borehole to the surface or placing a grout shoe or plug inside the casing at the bottom of the borehole and pumping the grout through the bottom grout plug and up the annular space on the outside of the casing. The grout shall consist of a Type I Portland cement and bentonite or other approved grout to provide a rigid seal. A minimum of 24 hours shall be allowed for the grout plug (seal) to cure before attempting to drill through it. When drilling through the seal, care shall be taken to avoid cracking, shattering, and washing out of the seal. If caving conditions exist so that the outer casing cannot be sufficiently sealed by grouting, the outer casing shall be driven into place and a grout seal placed in the bottom of the casing.

5.2.2.3 Bedrock Wells

The installation of monitoring wells into bedrock can be accomplished in two ways. The first method is to drill or bore a pilot borehole through the soil overburden into the bedrock. An outer casing is installed into the borehole by setting it into the bedrock and grouting it into place. After the grout has set, the borehole can be advanced through the grout seal into the bedrock. The preferred method of advancing the borehole into the bedrock is rock coring. Rock coring makes a smooth, round hole through the seal and into the bedrock without cracking or shattering the seal. Roller cone bits are used in soft bedrock, but extreme caution should be taken when using a roller cone bit to advance through the grout seal in the bottom of the borehole because

excessive water and bit pressure can cause cracking, eroding (washing), and/or shattering of the seal. Low volume air hammers may be used to advance the borehole, but they have a tendency to shatter the seal because of the hammering action. If the structural integrity of the grout seal is in question, a pressure test can be utilized to check for leaks. If the seal leaks, the seal is not acceptable. When the drilling is complete, the finished well will consist of an open borehole from the ground surface to the bottom of the well. The major limitation of open borehole bedrock wells is that the entire bedrock interval serves as the monitoring zone.

The second method is to install the outer surface casing and drill the borehole into bedrock and then install an inner casing and well screen with the filter pack, bentonite seal, and annular grout. The well is completed with a surface protective monument and concrete pad. This well installation method gives the flexibility of isolating the monitoring zone(s) and minimizing inter-aquifer flow. In addition, it provides structural integrity, especially in unstable areas (e.g., steeply dipping shales) where the bedrock may shift or move when disturbed.

5.2.3 Well Screen and Filter Pack Design

Well screens and filter packs shall be designed to accurately sample the vadose zone interval or aquifer zone that the well is intended to target, minimize the passage of formation materials (turbidity) into the well, and ensure sufficient structural integrity to prevent the collapse of the intake structure. The selection of the well screen length depends upon the objective of the well. Piezometers and wells where only a discrete flow path is monitored are generally completed with short screens (two feet or less). While monitoring wells are usually constructed with longer screens (usually five to twenty feet), they shall be kept to the minimum length appropriate for intercepting a groundwater plume. The screen slot size shall be selected to retain from 90 to 100 percent of the filter pack material in artificially filter packed wells, and from 50 to 100 percent of the formation material in naturally packed wells. All well screens shall be factory wire-wrapped or machine slotted.

A filter pack shall be used when: 1) the natural formation is poorly sorted; 2) a long screen interval is required or the screen spans highly stratified geologic materials of widely varying grain sizes; 3) the natural formation is uniform fine sand, silt, or clay; 4) the natural formation is thin-bedded; 5) the natural formation is poorly cemented sandstone; 6) the natural formation is highly fractured or characterized by relatively large solution channels; 7) the natural formation is shale or coal that will act as a constant source of turbidity to groundwater samples; or 8) the diameter of the borehole is significantly greater than the diameter of the screen. The use of natural formation material as a filter pack is only recommended when the natural formation materials are relatively coarse-grained, permeable, and uniform in grain size.

Filter pack materials shall consist of clean, rounded to well-rounded, hard, insoluble particles of siliceous composition (industrial grade quartz sand or glass beads). The required grain-size distribution or particle sizes of the filter pack materials shall be selected based upon a sieve analysis of the aquifer materials or the formation to be monitored, or the characteristics of the aquifer materials using information acquired during previous investigations.

Where sieve analyses are used to select the appropriate filter pack particle size, the results of a sieve analysis of the formation materials are plotted on a grain-size distribution graph, and a grain-size distribution curve is generated. The 70 percent retained grain size value should be multiplied by a factor between four and six (four for fine, uniform formations and six for coarse, non-uniform formations). A second grain-size distribution curve is then drawn on the graph for this new value, ensuring that the uniformity coefficient does not exceed 2.5. The filter pack that shall be used must fall within the area defined by these two curves.

Once the filter pack size is determined, the screen slot size shall be selected to retain at least 90 percent of the filter pack material. The Permittee may propose the use of a pre-determined well screen slot size and filter pack for monitoring wells in the site-specific work plans submitted to the NMED.

The filter pack shall be installed in a manner that prevents bridging and particle-size segregation. Filter packs placed below the water table shall be installed by the tremie pipe method. Filter pack materials shall not be poured into the annular space unless the well is shallow (e.g., less than 30 feet deep) and the filter pack material can be poured continuously into the well without stopping. At least two inches of filter pack material shall be installed between the well screen and the borehole wall, and two feet of material shall extend above the top of the well screen. A minimum of six-inches of filter pack material shall also be placed under the bottom of the well screen to provide a firm footing and an unrestricted flow under the screened area.

In deep wells (e.g., greater than 200 feet deep), the filter pack may not compress when initially installed. As a result, filter packs may need to be installed as high as five feet above the screened interval in these situations. The precise volume of filter pack material required shall be calculated and recorded before placement, and the actual volume used shall be determined and recorded during well construction. Any significant discrepancy between the calculated and actual volume shall be explained. Prior to installing the filter pack annular seal, a one to two-foot layer of chemically inert fine sand shall be placed over the filter pack to prevent the intrusion of annular sealants into the filter pack.

5.2.4 Annular Sealant

The annular space between the well casing and the borehole must be properly sealed to prevent cross-contamination of samples and the groundwater. The materials used for annular sealants shall be chemically inert with respect to the highest concentration of chemical constituents expected in the groundwater or vadose zone at the Facility. In general, the permeability of the sealing material shall be one to two orders of magnitude lower than the least permeable parts of the formation in contact with the well. The precise volume of annular sealants required shall be calculated and recorded before placement, and the actual volume shall be determined and recorded during well construction. Any significant discrepancy between the calculated volume and the actual volume shall be explained.

During well construction, an annular seal shall be placed on top of the filter pack. This seal shall consist of a high solids (10-30 percent) bentonite material in the form of bentonite pellets, granular bentonite, or bentonite chips. The bentonite seal shall be placed in the annulus through

a tremie pipe if the well is deep (greater than 30 feet), or by pouring directly down the annulus in shallow wells (less than 30 feet). If the bentonite materials are poured directly down the annulus (which is an acceptable method only in wells less than 30 feet deep), a tamping device shall be used to ensure that the seal is emplaced at the proper depth and the bentonite has not bridged higher in the well casing. The bentonite seal shall be placed above the filter pack a minimum of two feet vertical thickness. The bentonite seal shall be allowed to completely hydrate in conformance with the manufacturer's specifications prior to installing the overlying annular grout seal. The time required for the bentonite seal to completely hydrate will differ with the materials used and the specific conditions encountered but is generally a minimum of four to twenty-four hours.

A grout seal shall be installed on top of the filter pack annular seal. The grout seal may consist of a high solids (30 percent) bentonite grout, a neat cement grout, or a cement/bentonite grout. The grout shall be pumped under pressure (not gravity fed) into the annular space by the tremie pipe method, from the top of the filter pack annular seal to within a few feet of the ground surface. The tremie pipe shall be equipped with a side discharge port (or bottom discharge for grouting at depths greater than 100 feet) to minimize damage to the filter pack or filter pack annular bentonite seal during grout placement. The grout seal shall be allowed to cure for a minimum of 24 hours before the concrete surface pad is installed. All grouts shall be prepared in accordance with the manufacturer's specifications. High solids (30 percent) bentonite grouts shall have a minimum density of ten pounds per gallon (as measured by a mud balance) to ensure proper setup. Cement grouts shall be mixed using six and one-half to seven gallons of water per 94-pound bag of Type I Portland cement. Bentonite (five to ten percent) may be added to delay the setting time and reduce the shrinkage of the grout.

5.2.5 Groundwater Well Development

All groundwater monitoring wells shall be developed to create an effective filter pack around the well screen, correct damage to the formation caused by drilling, remove fine particles from the formation near the borehole, and assist in restoring the natural water quality of the aquifer in the vicinity of the well. Development stresses the formation around the screen, as well as the filter pack, so that mobile fines, silts, and clays are pulled into the well and removed. Development is also used to remove any foreign materials (e.g., water, drilling mud) that may have been introduced into the borehole during the drilling and well installation activities, and to aid in the equilibration that will occur between the filter pack, well casing, and the formation water. The development of a well is extremely important to ensuring the collection of representative groundwater samples.

Newly installed groundwater monitoring wells shall not be developed for at least 48 hours after the surface pad and outer protective casing are installed. This will allow sufficient time for the well materials to cure before the development procedures are initiated. Newly installed groundwater monitoring wells shall be developed no later than 30 calendar days after installation is complete. A new monitoring well shall be developed until the column of water in the well is free of visible sediment, and the pH, temperature, turbidity, and specific conductivity have stabilized. In most cases, the above requirements can be satisfied. However, in some cases, the

pH, temperature, and specific conductivity may stabilize but the water remains turbid. In this case, the well may still contain well construction materials, such as drilling mud in the form of a mud cake or formation soils that have not been washed out of the borehole. Thick drilling mud cannot be flushed out of a borehole with one or two well volumes of flushing. Instead, continuous flushing over a period of several days may be necessary to complete the well development. If the well is pumped dry, the water level shall be allowed to sufficiently recover before the next development period is initiated. The common methods used for developing wells include:

1. pumping and overpumping;
2. backwashing;
3. surging (with a surge block);
4. bailing;
5. jetting; and
6. airlift pumping.

These development procedures can be used, either individually or in combination, to achieve the most effective well development. However, the most favorable well development methods include pumping, overpumping, bailing, surging, or a combination of these methods. Well development methods and equipment that alter the chemical composition of the groundwater shall not be used. Development methods that involve adding water or other fluids to the well or borehole, or that use air to accomplish well development, should be avoided if possible. Approval shall be obtained from the NMED prior to introducing air, water, or other fluids into the well for the purpose of well development. If water is introduced into a borehole during well drilling and completion, the same or greater volume of water shall be removed from the well during development. In addition, the volume of water withdrawn from a well during development shall be recorded.

5.2.6 Surface Completion

Monitoring wells may be completed either as flush-mounted wells, or as above-ground completions. A surface seal shall be installed over the grout seal and extended vertically up the well annulus to the land surface. The lower end of the surface seal shall extend a minimum of one foot below the frost line to prevent damage from frost heaving. The composition of the surface seal shall be neat cement or concrete. In above-ground completions, a minimum three-feet wide, four-inch-thick concrete surface pad shall be installed around the well at the same time the protective monument is installed. The surface pad shall be sloped so that drainage will flow away from the protective monument and off the pad. In addition, a minimum of one inch of the finished pad shall be below grade or ground elevation to prevent washing and undermining by soil erosion.

A locking protective monument shall be installed around the well casing (riser) to prevent damage or unauthorized entry. The protective monument shall be anchored in the concrete surface pad below the frost line and extend several inches above the well riser stickup. A weep hole shall be drilled into the protective monument just above the top of the concrete surface pad

to prevent water from accumulating and freezing inside the protective monument around the well riser. A cap shall be placed on the well riser to prevent tampering or the entry of foreign materials, and a lock shall be installed on the protective monument to provide security. If the wells are located in an area that receives traffic, a minimum of three bumper guards consisting of steel pipes three to four inches in diameter and a minimum of five-feet length should be installed. The bumper guards should be installed to a minimum depth of two feet below the ground surface in a concrete footing and extend a minimum of three feet above ground surface. The pipes should be filled with concrete to provide additional strength. The pipes should be painted a bright color to reduce the possibility of vehicular damage.

If flush-mounted completions are required (e.g., in active roadway areas), a protective structure such as a utility vault or meter box should be installed around the well casing. In addition, measures should be taken to prevent the accumulation of surface water in the protective structure and around the well intake. These measures should include outfitting the protective structure with a steel lid or manhole cover that has a rubber seal or gasket and ensuring that the bond between the cement surface seal and the protective structure is watertight.

5.3 Well Abandonment

Wells deleted from the facility monitoring program or that have been damaged beyond repair shall be plugged and abandoned. Well plugging and abandonment methods and certification shall be conducted in accordance with Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells (19.27.4 NMAC). The Permittee shall notify the NMED and submit a well abandonment plan to the New Mexico State Engineers Office and to the NMED no less than 30 days prior to the date the wells are removed from the monitoring program.

The goal of well abandonment is to seal the borehole in such a manner that the well cannot act as a conduit for migration of contamination from the ground surface to the aquifer or between aquifers. To properly abandon a well, the preferred method is to completely remove the well casing and screen from the borehole, clean out the borehole, and backfill with a cement or bentonite grout, neat cement, or concrete.

For wells with small diameter casing, abandonment shall be accomplished by overdrilling the well with a large diameter hollow-stem auger. After the well has been overdrilled, the well casing and grout can be lifted out of the ground with a drill rig, and the remaining filter pack can be drilled out. The open borehole can then be pressure grouted (via the tremie pipe method) from the bottom of the borehole to the ground surface. After the grout has cured, the top two feet of the borehole shall be filled with concrete to ensure a secure surface seal.

Several other well abandonment procedures are available for wells with larger diameter screens and casings. One method is to force a drill stem with a tapered wedge assembly or a solid-stem auger into the well casing and pull the casing out of the ground. However, if the casing breaks or the well cannot be pulled from the ground, the well will have to be grouted in place. To abandon a well in place, a tremie pipe shall be placed at the lowest point in the well (at the bottom of the

screen or in the well sump). The entire well is then pressure grouted from the bottom of the well upward. The pressurized grout will be forced out through the well screen into the filter pack and up the inside of the well casing sealing off all breaks and holes in the casing. Once the well is grouted, the casing is cut off even with the ground surface and covered with concrete.

If a PVC well cannot be abandoned due to internal casing damage (e.g., the tremie pipe cannot be extended to the bottom of the screen), it may be necessary to drill out the casing with a roller cone or drag bit using the wet rotary drilling method or grind out the casing using a solid-stem auger equipped with a carbide tooth bit. Once the casing is removed, the open borehole can be cleaned out and pressure grouted from the bottom of the borehole upward.

5.4 Documentation

All information on the design, construction, and development of each monitoring well shall be recorded and presented on a boring log, a well construction log, and a well construction diagram. The well construction log and well construction diagram shall include the following information:

1. well name/number;
2. date/time of well construction;
3. borehole diameter and well casing diameter;
4. well depth;
5. casing length;
6. casing materials;
7. casing and screen joint type;
8. screened interval(s);
9. screen materials;
10. screen slot size and design;
11. filter pack material and size;
12. filter pack volume (calculated and actual);
13. filter pack placement method;
14. filter pack interval(s);
15. annular sealant composition;
16. annular sealant placement method;
17. annular sealant volume (calculated and actual);
18. annular sealant interval(s);
19. surface (grout) sealant composition;
20. surface (grout) seal placement method;
21. surface (grout) sealant volume (calculated and actual);
22. surface(grout) sealant interval;
23. surface completion and well apron design and construction;
24. well development procedure and turbidity measurements;
25. well development purge volume(s) and stabilization parameter measurements;
26. type and design and construction of protective casing;
27. well cap and lock;
28. ground surface elevation;

29. survey reference point elevation on well casing;
30. top of monitoring well casing elevation; and
31. top of protective steel casing elevation.

PART 6: REPORTING REQUIREMENTS

6.1 Highlights

The purpose of this Permit Part (6) is to provide the general reporting requirements and report formats for corrective action activities required under this Permit. This Permit Part is not intended to provide reporting requirements for every potential corrective action conducted at the Facility; therefore, the formats for all types of reports are not presented below. The formats described in this Permit Part include the general reporting requirements and formats for site-specific investigation work plans, investigation reports, routine monitoring reports, risk assessment reports, and corrective measures evaluations. The Permittee shall generally consider the work plan and reports referenced below to be the equivalents of RCRA Facility Investigation (RFI) work plans, RFI reports, periodic monitoring reports, risk assessments, and Corrective Measure Study (CMS) reports, respectively, for the purposes of RCRA compliance. The Permittee shall include detailed, site-specific requirements for all interim status unit, SWMU, and AOC investigation work plans, investigation reports, monitoring reports, and corrective measures evaluations. All plans and reports shall be prepared with technical and regulatory input from the NMED. All work plans and reports shall be submitted to the NMED in the form of two paper copies and two electronic copies.

The reporting requirements listed in this Part (6) do not include all sections that may be necessary to complete each type of report listed. The Permittee or the NMED may determine that additional sections are required to address additional site-specific issues or information collected during corrective action or monitoring activities not listed below. The Permittee must submit variations of the general report format and the formats for reports not listed in this Permit Part in outline form to the NMED for approval prior to submittal of the reports. The NMED will approve or disapprove, in writing, the proposed outline after receipt. If the NMED disapproves the report outline, the NMED will notify the Permittee, in writing, of the outline's deficiencies and will specify a date for submittal of a revised report outline. All reports submitted by the Permittee shall follow the general approach and limitations for data presentation described in this Permit Part (6).

Every page of every section, table, figure, appendix, or attachment of every document submitted to NMED must be numbered in a logical, sequential fashion. References to information in other documents cited in work plans and reports shall include specific page, table, and figure numbers for the information referenced in the cited documents.

All documents required by this Permit shall include a statement on the signature page that meets the requirements of 40 CFR § 270.11(d)(1).

6.2 Investigation Work Plan

The Permittee shall fulfill the requirements acceptable to the NMED for preparation of work plans for unit-specific or corrective action activities at the Facility using the general outline below. The minimum requirements for describing proposed activities within each section are included. All research, locations, depths and methods of exploration, field procedures, analytical

analyses, data collection methods, and schedules shall be included in each work plan. In general, interpretation of data acquired during previous investigations shall be presented only in the background sections of the work plans. New data which has not been previously reviewed and approved by NMED shall not be included in any Work Plan. The other text sections of the work plans shall be reserved for presentation of anticipated site-specific activities and procedures relevant to the project. The general work plan outline is provided below.

6.2.1 Title Page

The title page shall include the type of document, Facility name and the unit, SWMU, or AOC name(s), and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible representative of the Facility shall be provided on the title page in accordance with the signature requirements in 40 CFR 270.11(b).

6.2.2 Executive Summary (Optional)

The executive summary, if included, shall provide a brief summary of the purpose and scope of the investigation to be conducted at the subject site. The Facility, unit, SWMU, or AOC name, revision number if applicable, and location shall be included in the executive summary. The executive summary shall be limited to one page with a font size consistent with the rest of the document.

6.2.3 Table of Contents

The table of contents shall list all text sections and subsections, tables, figures, and appendices or attachments included in the work plan. The corresponding page numbers for the titles of each section and subsection of the work plan shall be included in the table of contents.

6.2.4 Introduction

The introduction shall include the Facility name, unit name and location, and unit status (e.g., active operations, closed, corrective action). General information on the current site usage and status shall be included in this section. A brief description of the purpose of the investigation and the type of site investigation to be conducted shall be provided in this section.

6.2.5 Background

The background section shall describe relevant background information. This section shall briefly summarize historical site uses including the locations of current and former site structures and features. A labeled figure shall be included in the document showing the locations of current and former site structures and features. The locations of pertinent subsurface features such as pipelines, underground tanks, utility lines, and other subsurface structures shall be included in the background summary and labeled on the site plan.

This section shall identify potential receptors, including groundwater, and include a brief summary of the type and characteristics of all waste and all contamination, the known and possible sources of contamination, the history of releases or discharges of contamination, and the known extent of contamination. This section shall include brief summaries of results of previous

investigations, including references to pertinent figures, data summary tables, and text in previous reports. At a minimum, detections of chemicals encountered during previous investigations shall be presented in table format, with an accompanying figure showing sample locations. References to previous reports shall include page, table, and figure numbers for referenced information. Summary data tables and site plans showing relevant investigation locations shall be included in the Tables and Figures sections of the document, respectively.

6.2.6 Site Conditions

6.2.6.1 Surface Conditions

A section on surface conditions shall provide a detailed description of current site topography, features, and structures including a description of drainages, vegetation, erosional features, and a detailed description of current site uses and operations at the site. In addition, descriptions of features located in surrounding sites that may have an impact on the subject site regarding sediment transport, surface water runoff, or fate and transport mechanisms shall be included in this section.

6.2.6.2 Subsurface Conditions

A section on subsurface conditions shall provide a brief, detailed description of the site conditions observed during previous subsurface investigations, including relevant soil horizons, stratigraphy, presence of vadose zone fluids and groundwater, and other relevant information. A site plan showing the locations of all borings and excavations advanced during previous investigations shall be included in the Figures section of the work plan. A brief description of the anticipated stratigraphic units that may be encountered during the investigation may be included in this section if no previous investigations have been conducted at the site.

6.2.7 Scope of Activities

A section on the scope of activities shall briefly describe a list of all anticipated activities to be performed during the investigation, including, but not limited to, background information research, health and safety requirements that may affect or limit the completion of tasks, drilling, test pit or other excavations, well construction, field data collection, survey data collection, chemical analytical testing, aquifer testing, and IDW storage, disposal, and reporting.

6.2.8 Investigation Methods

A section on investigation methods shall provide a description of all anticipated locations and methods for conducting the activities to be performed during the investigation. This section shall include, but is not limited to, research methods, health and safety practices that may affect the completion of tasks, drilling methods, test pit or other excavation methods, sampling intervals and methods, well construction methods, field data collection methods, geophysical and land survey methods, field screening methods, chemical analytical testing, materials testing, aquifer testing, pilot testing, and other proposed investigation and testing methods. This information may also be summarized in table format, if appropriate. References to quality assurance project

plans (QAPPs) or standard operating procedures (SOPs) are not acceptable in lieu of the required information.

6.2.9 Monitoring and Sampling Program

A section on monitoring and sampling shall describe the anticipated monitoring and sampling program to be implemented after the initial investigation activities are completed. This section shall provide a description of the anticipated vadose zone fluids, groundwater, vadose zone vapor, vadose zone moisture, and other monitoring and sampling programs to be implemented at the unit.

6.2.10 Schedule

A section shall provide the anticipated schedule for completion of field investigation, pilot testing, and monitoring and sampling activities. In addition, this section shall provide a schedule for submittal of reports and data to the NMED including a schedule for submitting status reports, preliminary data, and the final investigation report.

6.2.11 Tables

The following summary tables may be included in the investigation work plans if previous investigations have been conducted at the unit. Data presented in the tables shall include information on dates of data collection, analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. Data quality exceptions must be clearly flagged or otherwise indicated in all tables. The following tables shall be included in investigation work plans, as applicable:

1. summaries of regulatory criteria, background, and applicable cleanup levels (may be included in the analytical data tables instead of as separate tables);

2. summaries of historical field survey location data;

3. summaries of historical field screening and field parameter measurements of soil, rock, sediments, soil vapor, groundwater, surface water, and air quality;

4. summaries of historical soil, rock, or sediment laboratory analytical data shall include the analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that could influence interpretation of the data;

5. summaries of historical soil vapor laboratory analytical data shall include the analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that could influence interpretation of the data;

6. summaries of historical groundwater elevation and depth to groundwater data. The table shall include the monitoring well depths, the screened intervals in each well, and the dates and times measurements were taken;

7. summaries of historical groundwater laboratory analytical data. The analytical data tables shall include the analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that could influence interpretation of the data;

8. summary of historical surface water laboratory analytical data. The analytical data tables shall include the analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that could influence interpretation of the data;

9. summary of historical air sample screening and chemical analytical data. The data tables shall include the screening instruments used, laboratory analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that could influence interpretation of the data; and

10. summary of historical pilot test or other test data, if applicable, including units of measurement and types of instruments used to obtain measurements.

6.2.12 Figures

The following figures shall be included with each investigation work plan for each site, including presentation of data where previous investigations have been conducted. All figures must include an accurate bar scale and a north arrow. An explanation shall be included on each figure for all abbreviations, symbols, acronyms, and qualifiers. All data quality exceptions must be flagged or otherwise clearly indicated as such on all figures. Geographic information system (GIS) data must be provided to NMED upon request. The following figures shall be included in investigation work plans, as applicable:

1. a vicinity map showing topography and the general location of the site relative to surrounding features and properties;

2. a unit site plan that presents pertinent site features and structures, underground utilities, well locations, and remediation system locations and details. Off-site well locations and other relevant features shall be included on the site plan, if appropriate; additional site plans may be required to present the locations of relevant off-site well locations, structures, and features;

3. figures showing historical and proposed soil boring locations, excavation locations, and sampling locations;

4. figures presenting historical soil sample field screening and laboratory analytical data;

5. figures presenting the locations of all existing and proposed borings and vapor monitoring point locations;

6. figures presenting historical vadose zone soil vapor data;

7. figures showing all existing and proposed monitoring wells and piezometers;

8. figures presenting historical groundwater and vadose zone fluid elevation data, and indicating groundwater and vadose zone fluid flow directions;

9. figures presenting historical groundwater and vadose zone fluid laboratory analytical data, if applicable. Chemical analytical data corresponding to each sampling location can be presented in tabular form on the figure or as an isoconcentration map;

10. figures presenting historical and proposed vadose zone fluid neutron probe access tube locations and field measurement data for soil moisture, if applicable;

11. figures presenting historical surface water laboratory analytical data, if applicable;

12. figures showing historical and proposed air sampling locations and presenting historical air quality data, if applicable;

13. figures presenting historical pilot testing locations and data, where applicable, including site plans and graphic data presentation; and

14. figures presenting geologic cross-sections based on outcrop and borehole data acquired during previous investigations, if applicable.

6.2.13 Appendices

An IDW management plan shall be included as an appendix to the investigation work plan. Additional appendices may be necessary to present additional data or documentation not listed above.

6.3 Investigation Report

The Permittee shall prepare investigation reports at the Facility using the general outline below. The Investigation Report shall be the reporting mechanism for presenting the results of completed Investigation Work Plans. This Permit Section (6.3) describes the minimum requirements for reporting on site investigations. All data collected during each site investigation event in the reporting period shall be included in the reports. In general, interpretation of data shall be presented only in the background, conclusions, and

recommendations sections of the reports. The other text sections of the reports shall be reserved for presentation of facts and data without interpretation or qualifications. The general report outline is provided below.

6.3.1 Title Page

The title page shall include the type of document and version number, Facility name, the unit, SWMU, or AOC, and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible Facility representative shall be provided on the title page in accordance with the signature requirements in 40 CFR § 270.11(b).

6.3.2 Executive Summary (Optional)

The executive summary shall provide a brief summary of the purpose, scope, and results of the investigation conducted at the subject site during the reporting period. In addition, this section shall include a brief summary of conclusions based on the investigation data collected and recommendations for future investigation, monitoring, remedial action, or site closure. The executive summary shall be limited to one page with a font size consistent with the rest of the document.

6.3.3 Table of Contents

The table of contents shall list all text sections, subsections, tables, figures, and appendices or attachments included in the report. The corresponding page numbers for the titles of each section of the report shall be included in the table of contents.

6.3.4 Introduction

The introduction section shall include the Facility name, unit name and location, and unit status (e.g., active operations, closed, corrective action). General information on the site usage and status shall be included in this section. A brief description of the purpose of the investigation, the type of site investigation conducted, and the type of results presented in the report also shall be provided in this section.

6.3.5 Background

The background section shall describe relevant background information. This section shall briefly summarize historical site uses including the locations of current and former site structures and features. A labeled figure shall be included in the document showing the locations of current and former site structures and features. The locations of subsurface features such as pipelines, underground tanks, utility lines, and other subsurface structures shall be included in the background summary and labeled on the figure. In addition, this section shall include a brief summary of the possible sources of contamination, the history of releases or discharges of contamination, the known extent of contamination, and the results of previous investigations including references to previous reports. The references to previous reports shall include page, table, and figure numbers for referenced information. A site plan showing relevant investigation

locations and summary data tables shall be included in the Figures and Tables sections of the document, respectively.

6.3.6 Scope of Activities

This section on the scope of activities shall briefly describe all activities performed during the investigation event including background information research, implemented health and safety measures that affected or limited the completion of tasks, drilling, test pit or other excavation methods, well construction methods, field data collection, survey data collection, chemical analytical testing, aquifer testing, remediation system pilot testing, and IDW storage or disposal. References to the work plan, a QAPP, or SOPs are not acceptable in lieu of descriptions of site-specific activities.

6.3.7 Field Investigation Results

A section shall provide a summary of the procedures used and the results of all field investigation activities conducted at the site including, but not limited to, the dates that investigation activities were conducted, the type and purpose of field investigation activities performed, field screening measurements, logging and sampling results, pilot test results, construction details, and conditions observed. Field observations or conditions that altered the planned work or may have influenced the results of sampling, testing, and logging shall be reported in this section. At a minimum, the following subsections shall be included, where appropriate.

6.3.7.1 Surface Conditions

A section on surface conditions shall describe current site topography, features, and structures including topographic drainages, man-made drainages, vegetation, and erosional features. It shall also include a description of current site uses and any operations at the site. In addition, descriptions of features located in surrounding sites that may have an impact on the subject site regarding sediment transport, surface water runoff, or fate and transport mechanisms shall be included in this section.

6.3.7.2 Exploratory Drilling or Excavation Investigations

A section shall describe the locations, methods, and depths of subsurface explorations. The description shall include the types of equipment used, logging procedures, decontamination procedures, and conditions encountered that may have affected or limited the investigation. Samples obtained from all exploratory borings and excavations shall be visually inspected and the soil or rock type classified in general accordance with ASTM D2487 (Unified Soil Classification System) and D2488 or AGI Methods for soil and rock classification. Detailed logs of each boring shall be completed in the field by a qualified engineer or geologist.

A description of the site conditions observed during subsurface investigation activities shall be included in this section, including soil horizon and stratigraphic information. Site plans showing the locations of all borings and excavations shall be included in the Figures section of the report.

Boring and test pit logs for all exploratory borings and test pits shall be presented in an appendix or attachment to the report.

6.3.7.3 Subsurface Conditions

A section on subsurface conditions shall describe known subsurface lithology and structures based on observations made during the current and previous subsurface investigations, including interpretation of geophysical logs and as-built drawings of man-made structures. A description of the known locations of pipelines, utility lines, and observed geologic structures shall also be included in this section. A site plan showing boring and excavation locations and the locations of the site's above- and below-ground structures shall be included in the Figures section of the report. In addition, cross-sections shall be constructed, if appropriate, to provide additional visual presentation of site or regional subsurface conditions.

6.3.7.4 Monitoring Well Construction, Boring, or Excavation Abandonment

A section shall describe the methods and details of monitoring well construction and the methods used to abandon exploratory borings or backfill excavations. The description shall include the dates of well construction, boring abandonment, or excavation backfilling. In addition, boring logs, test pit logs, and well construction diagrams shall be included in an attachment or appendix. Well construction diagrams shall be included with the associated boring logs for borings that are converted to monitoring wells.

6.3.7.5 Groundwater Conditions

A section shall describe groundwater conditions observed beneath the subject site and relate local groundwater conditions to regional groundwater conditions. A description of the depths to water, aquifer thickness, and groundwater flow directions shall be included in this section for alluvial groundwater, shallow perched groundwater, intermediate perched groundwater, and regional groundwater, as appropriate to the investigation. Figures showing well locations, surrounding area, groundwater elevations, and flow directions for each hydrologic zone shall be included in the Figures section of the report.

6.3.7.6 Surface Water Conditions

A section shall describe surface water conditions and include a description of surface water ponding, surface water runoff, surface water drainage, surface water sediment transport, and fate and transport mechanisms in surface water as suspended load and as a dissolved phase in surface water, if applicable.

6.3.7.7 Subsurface Air and Soil Moisture Conditions

A section shall describe subsurface air monitoring and sampling methods used during the site investigation. It shall also describe observations made during the site investigation regarding subsurface flow pathways and the subsurface air-flow regime.

6.3.7.8 Materials Testing Results

A section shall discuss the materials testing results, such as core permeability testing, grain size analysis, or other materials testing results. A description of sample collection methods, locations, and depths shall also be included. Corresponding summary tables shall be included in the Tables section of the report.

6.3.7.9 Pilot Testing Results

A section shall discuss the results of any pilot testing. Pilot testing is typically conducted after initial subsurface investigations are completed and the need for additional investigation or remediation has been evaluated. Pilot testing, including aquifer testing and remediation system pilot testing, shall be addressed through separate pilot test work plans and reports. The format for pilot test work plans and reports shall be approved by the NMED prior to submittal.

6.3.8 Regulatory Criteria

A section shall set forth the applicable cleanup standards, screening levels, and risk-based cleanup goals for each pertinent medium at the subject site. The appropriate cleanup levels for each site shall be included if site-specific levels have been established at separate Facility sites or units. A table summarizing the applicable cleanup standards shall be included as part of the document. Alternately, the report may include applicable cleanup standards as a column in the data tables. Risk-based evaluation procedures, if used to calculate cleanup levels, shall be presented in a separate document or in an appendix to this report. If cleanup levels calculated in a risk evaluation are employed, the risk evaluation document shall be referenced and shall include pertinent page numbers for referenced information.

6.3.9 Site Contamination

A section shall provide a description of sampling intervals and methods for detection of surface and subsurface contamination in soils, rock, sediments, groundwater, surface water, and soil vapor. Only factual information shall be included in this section. Interpretation of the data shall be reserved for the summary and conclusions sections of the report. Tables summarizing all sampling, testing, and screening results for detected chemicals shall be prepared in a format approved by the NMED. The tables shall be presented in the Tables section of the report.

6.3.9.1 Soil, Rock, and Sediment Sampling

A section shall describe the sampling of soil, rock, and sediment. It shall include the dates, locations, and methods of sample collection, sampling intervals, sample logging methods, screening sample selection methods, and laboratory sample selection methods including the collection depths for samples submitted for laboratory analyses. A site plan showing the sample locations shall be included in the Figures section of the report.

6.3.9.2 Sample Field Screening Results

A section shall describe the field screening methods used during the investigation and the field screening results. Field screening results also shall be presented in summary tables in the Tables

section of the document. The limitations of field screening instrumentation and any conditions that influenced the results of field screening shall be discussed in this subsection.

6.3.9.3 Soil, Rock, and Sediment Sampling Chemical Analytical Results

A section shall briefly summarize the laboratory analyses conducted, discuss the analytical methods and results, and provide a comparison of the data to cleanup standards or established cleanup levels for the site. The laboratory results also shall be presented in summary tables in the Tables section of the document. Field conditions and sample collection methods that could potentially affect the analytical results shall be described in this section. If appropriate, soil analytical data shall be presented with sample locations depicted on a plan view of the site and included in the Figures section of the report.

6.3.9.4 Ambient Air or Subsurface Vapor Sampling

A section shall describe the ambient air or subsurface vapor sampling. It shall describe the dates, locations, methods of sample collection, methods for sample logging, and methods for laboratory sample selection. A plan view of the site showing all air and subsurface vapor sampling locations shall be provided in the Figures section of the report.

6.3.9.5 Ambient Air or Subsurface Vapor Field Screening Results

A section shall describe the ambient air or subsurface vapor field screening results. It shall describe the field screening methods used for ambient air and subsurface vapors during the investigation and the field screening results. Field screening results shall also be presented in summary tables in the Tables section of the report. The locations of ambient air and subsurface vapor screening sample collection shall be presented on a site plan included in the Figures section of the report. The limitations of field screening instrumentation and any conditions that influenced the results of field screening shall be discussed in this section.

6.3.9.6 Ambient Air and Subsurface Vapor Laboratory Analytical Results

This section shall describe the results of ambient air and subsurface vapor laboratory analyses. It shall describe the laboratory analytical methods and analytical results and provide a comparison of the data to applicable cleanup levels for the site. The rationale or purpose for any altercations or modifications to the subsurface vapor sampling program outlined in the site investigation work plan also shall be provided in this section. Field conditions that may have affected the analytical results during sample collection shall be described in this section. Tables summarizing the air or vapor sample laboratory, field, and analytical QA/QC data; applicable cleanup levels; and modifications to the air sampling program shall be provided in the Tables section of the report. Chemicals concentrations shall be presented as data tables and as isoconcentration contours on a map included in the Figures section of the report.

6.3.10 Conclusions

A conclusions section shall provide a brief summary of the investigation activities and a discussion of the conclusions of the investigation conducted at the site. In addition, this section shall provide a comparison of the results to applicable cleanup levels and relevant historical

investigation data. Potential receptors, including groundwater, shall be identified and discussed. An explanation shall be provided regarding data gaps. A risk assessment may be included as an appendix to the investigation report; however, the risk analysis shall be presented in the Risk Assessment format described in Permit Section 6.5. References to the risk analysis shall be presented only in the summary and conclusions sections of the Investigation Report.

6.3.11 Recommendations

A section shall discuss the need for further investigation, corrective measures, risk assessment, or monitoring or provide recommendations for corrective action complete status based on the conclusions provided in the Conclusions section. It shall include explanations regarding additional sampling, monitoring, and site closure. A corresponding schedule for further action regarding the site shall also be provided.

6.3.12 Tables

This section shall provide the following summary tables. Data presented in the tables shall include the current data, dates of data collection, analytical methods, detection limits, and significant data quality exceptions. All summary data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. All new data tables must include a column indicating the specific analytical laboratory report where the sample analysis can be found. A separate table providing this information can also satisfy this requirement. The following tables shall be included in investigation reports, as applicable:

1. tables summarizing regulatory criteria, background levels, and applicable cleanup levels; this information may be included in the analytical data tables instead of as separate tables;

2. tables summarizing field survey location data; separate tables shall be prepared for well locations and individual medium sampling locations except where the locations are the same for more than one medium;

3. tables summarizing field screening and field parameter measurements of soil, sediment, vadose zone fluid, vadose zone vapor, vadose zone moisture, and groundwater, surface water, and air quality;

4. a table summarizing soil laboratory analytical data; it shall include the analytical methods, detection limits, reporting limits or limits of quantitation, and significant data quality exceptions that would influence interpretation of the data;

5. a table summarizing the groundwater elevations and depth-to-water data; the table shall include the monitoring well depths and the screened intervals in each well;

6. a table summarizing the groundwater laboratory analytical data; the analytical data tables shall include the analytical methods, detection limits, reporting limits or limits of

quantitation, reporting limits or limits of quantitation, and significant data quality exceptions that would influence interpretation of the data;

7. a table summarizing the surface water laboratory analytical data; the analytical data tables shall include the analytical methods, detection limits, reporting limits or limits of quantitation, and significant data quality exceptions that would influence interpretation of the data;

8. a table summarizing the air sample screening and laboratory analytical data; the data tables shall include the screening instruments used, laboratory analytical methods, detection limits, reporting limits or limits of quantitation, and significant data quality exceptions that would influence interpretation of the data;

9. tables summarizing the pilot testing data, if applicable, including units of measurement and types of instruments used to obtain measurements; and

10. a table summarizing materials testing data, if applicable.

6.3.13 Figures

Figures shall be included with each investigation report, as appropriate. All figures must include a scale and a north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers. All maps shall provide a preparation date. All data quality exceptions must be flagged or otherwise clearly indicated as such on all figures. GIS data must be provided to NMED upon request. A section shall provide the following figures:

1. a vicinity map showing topography and the general location of the site relative to surrounding features and properties;

2. a site plan that presents pertinent site features and structures, underground utilities, well locations, and remediation system locations and details; off-site well locations and other relevant features shall be included on the site plan; additional site plans may be required to present the locations of relevant off-site well locations, structures and features;

3. figures showing boring, excavation, and sampling locations;

4. figures presenting soil sample field screening and laboratory analytical data;

5. figures displaying the locations of all newly installed and existing wells and borings;

6. figures presenting monitoring well locations, groundwater elevation data, and groundwater flow directions;

7. figures presenting groundwater laboratory analytical data, including any past data requested by the NMED; the chemical analytical data corresponding to each sampling location may be presented in table form on the figure or as an isoconcentration map;

8. figures presenting surface water sample locations and field measurement data including any past data requested by the NMED;

9. figures presenting surface water laboratory analytical data including any past data, if applicable; the laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure;

10. figures showing air and subsurface vapor sampling locations and presenting air and subsurface vapor quality data; the field screening or laboratory analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map;

11. figures presenting geologic cross-sections based on outcrop and borehole data; and

12. figures presenting pilot testing locations and data, where applicable, including site plans or graphic data presentation.

6.3.14 Appendices

Each investigation report shall include the following appendices. Additional appendices may be necessary to present data or documentation not listed below. Appendices must be logically ordered, and all pages of all appendices must be numbered.

6.3.14.1 Field Methods

An appendix shall provide detailed descriptions of the methods used to acquire field measurements of each medium that was surveyed or tested during the investigation. Methods shall include, but are not limited to, exploratory drilling or excavation methods, the methods and types of instruments used to obtain field screening, field analytical or field parameter measurements, instrument calibration procedures, sampling methods for each medium investigated, decontamination procedures, sample handling procedures, documentation procedures, and a description of field conditions that affected procedural or sample testing results. Methods of measuring and sampling during pilot testing shall be reported in this appendix, if applicable. References to SOPs shall not substitute for such investigation methods descriptions. Copies of IDW disposal documentation shall be provided in a separate appendix.

6.3.14.2 Boring/Test Pit Logs and Well Construction Diagrams

An appendix shall provide boring logs, test pit or other excavation logs, and well construction details. In addition, a key to symbols and a soil or rock classification system shall be included in this appendix. Geophysical logs shall be provided in a separate section of this appendix.

6.3.14.3 Chemical Analytical Program

Chemical analytical methods, a summary of data quality objectives, and a summary of data quality review procedures shall be reported in an appendix. A summary of data quality exceptions and their effect on the acceptability of the field and laboratory analytical data with regard to the investigation and the site status shall be included in this appendix, along with references to case narratives provided in the laboratory reports.

6.3.14.4 Chemical Analytical Reports

An appendix shall include all laboratory chemical analytical data generated for the reporting period. The reports must include all chain-of-custody records and Level II QA/QC results provided by the laboratory. The laboratory reports may be provided electronically in a format approved by the NMED and shall be in the form of a final laboratory report. Laboratory report data tables may be submitted in Microsoft Excel format. Hard (paper) copies, or electronic copies in PDF format, of the chain-of-custody forms shall be submitted with the reports regardless of whether the final laboratory report is submitted electronically or in hard copy.

6.3.14.5 Other Appendices

Other appendices containing additional information shall be included as required by the NMED or as otherwise appropriate.

6.4 Periodic Monitoring Report

The Permittee shall use the following guidance for preparing periodic monitoring reports. The reports shall present the results of periodic groundwater, surface water, vapor, and remediation system monitoring at the Facility. The following sections provide a general outline for monitoring reports and the minimum requirements for reporting of periodic monitoring conducted at the Facility. All data collected during each monitoring or sampling event in the reporting period shall be included in the reports. In general, interpretation of data shall be presented only in the background, conclusions, and recommendations sections of the reports. The other text sections of the reports shall be reserved for presentation of facts and data without interpretation or qualifications.

6.4.1 Title Page

The title page shall include the type of document, revision number if applicable, the facility name, the unit, SWMU, or AOC name(s), and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible representative of the Facility shall be provided on the title page in accordance with the signature requirements in 40 CFR § 270.11(b).

6.4.2 Executive Summary (Optional)

The executive summary shall provide a brief summary of the purpose, scope, and results of the monitoring conducted at the subject site during the reporting period. The facility, unit, SWMU,

and AOC name(s) and location(s) shall be included in the executive summary. The executive summary shall be limited to one page with a font size consistent with the rest of the document.

6.4.3 Table of Contents

The table of contents shall list all text sections, subsections, tables, figures, and appendices or attachments included in the report. The corresponding page numbers for the titles of each section of the report shall be included in the table of contents.

6.4.4 Introduction

The introduction section shall include the Facility name and the unit name(s), location(s), and status (e.g., active operations, closed, corrective action). General information on the site usage and status shall be included in this section. A brief description of the purpose of the monitoring, type of monitoring conducted, and the type of results presented in the report also shall be provided in this section.

6.4.5 Scope of Activities

A section on the scope of activities shall briefly describe all activities performed during the monitoring event or reporting period including field data collection, analytical testing, if applicable, and purge/decontamination water storage and disposal.

6.4.6 Regulatory Criteria

A section on regulatory criteria shall provide information regarding applicable cleanup standards, risk-based screening levels, and risk-based cleanup goals for the site. A table summarizing the applicable cleanup standards, or inclusion of applicable cleanup standards as a column in the data tables can be substituted for this section. The appropriate cleanup levels for each site shall be included if site-specific levels have been established at separate sites. Risk-based evaluation procedures, if used to calculate cleanup levels, must either be included as an attachment or submitted as a separate document and referenced. The specific document and page numbers must be included for all referenced materials.

6.4.7 Monitoring Results

A section shall provide a summary of the results of monitoring conducted at the site. This section shall include the dates and times that monitoring was conducted, the measured depths to groundwater, directions of groundwater and vadose zone fluids flow, field air and water quality measurements, static pressures, field measurements, and a comparison to previous monitoring results. Field observations or conditions that may influence the results of monitoring shall be reported in this section. Tables summarizing leachate and vapor-monitoring parameters, groundwater and vadose zone fluid elevations, depth-to-water measurements, and other field measurements may be substituted for this section. The tables shall include all information required in Permit Section 6.4.11.

6.4.8 Chemical Analytical Data Results

A section shall discuss the results of the chemical analyses. It shall provide the dates of sampling and the analytical results. It shall also provide a comparison of the data to previous results and to any cleanup standards or established cleanup levels for the site. The rationale or purpose for altering or modifying the sampling program shall be provided in this section. A table summarizing the laboratory analytical data, QA/QC data, applicable cleanup levels, and modifications to the sampling program may be substituted for this section. The tables shall include all information required in Permit Section 6.4.11.

6.4.9 Remediation System Monitoring

A section shall discuss remediation system monitoring. It shall summarize the remediation system's capabilities and performance. It shall also provide monitoring data, treatment system discharge sampling requirements, and system influent and effluent sample analytical results. The dates of operation, system failures, and modifications made to the remediation system during the reporting period shall also be included in this section. A summary table may be substituted for this section. The tables shall include all information required in Permit Section 6.4.11.

6.4.10 Summary

A summary section shall provide a discussion and conclusions of the monitoring conducted at the site. In addition, this section shall provide a comparison of the results to applicable cleanup levels and to relevant historical monitoring and chemical analytical data. An explanation shall be provided with regard to data gaps. A discussion of remediation system performance, monitoring results, modifications if applicable, and compliance with discharge requirements shall be provided in this section. Recommendations and explanations regarding future monitoring, remedial actions, or site closure shall also be included in this section.

6.4.11 Tables

A section shall provide the following summary tables for the media sampled. With prior approval from the NMED, the Permittee may combine one or more of the tables. Data presented in the tables shall include the current sampling and monitoring data, as well as data from the three previous monitoring events or, if data from less than three monitoring events is available, data acquired during previous investigations. Remediation system monitoring data also shall be presented. The dates of data collection shall be included in the tables. Summary tables may be substituted for portions of the text. All new data tables must include a column indicating the specific analytical laboratory report where the sample analyses can be found. A separate table providing this information can also satisfy this requirement. The analytical data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. The following tables shall be included, as applicable:

1. a table summarizing the regulatory criteria (a regulatory criteria text section may be substituted for this table or the applicable cleanup levels may be included in the analytical data tables);

2. a table summarizing groundwater and vadose zone fluid elevations, and depths to water data; the table shall include the monitoring well depths, casing elevations, the screened intervals in each well, and the dates and times of measurements;

3. a table summarizing field measurements of surface water quality data, if applicable;

4. a table summarizing field measurements of subsurface vapor monitoring and soil moisture data (including historical vapor monitoring data as described above);

5. a table summarizing field measurements of groundwater and vadose zone fluid quality data (including historical water quality data as described above);

6. a table summarizing subsurface vapor chemical analytical data, if applicable (including historical analytical data as described above);

7. a table summarizing surface water chemical analytical data, if applicable (including historical surface water analytical data as described above);

8. a table summarizing groundwater and vadose zone fluid chemical analytical data (including historical groundwater analytical data as described above); and

9. a table summarizing remediation system monitoring data, if applicable (including historical remediation system monitoring data as described above).

6.4.12 Figures

A section shall include the following figures. All figures shall include a scale and north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers. All figures shall have a date. All data quality exceptions must be flagged or otherwise clearly indicated as such on all figures. GIS data must be provided to NMED upon request. The following figures must be included, as applicable:

1. a vicinity map showing topography and the general location of the site relative to surrounding features or properties;

2. a facility site plan that presents pertinent site features and structures, well and piezometer locations and remediation system location(s) and features; off-site well locations and pertinent features shall be included on the site plan, if practical; additional site plans may be required to present the locations of relevant off-site well locations, structures, and features;

3. figures presenting the locations of monitoring and other well locations, groundwater and vadose zone fluid elevation data, and groundwater and vadose zone fluid flow directions;

4. figures presenting groundwater and vadose zone fluid analytical data for the current monitoring event; the analytical data corresponding to each sampling location may be presented in tabular form on the figure or as an isoconcentration map;

5. figures presenting surface water sampling locations and analytical data for the current monitoring period;

6. figures presenting subsurface vapor sampling locations and analytical data for the current monitoring event; the analytical data corresponding to each sampling location may be presented in table form on the figure or as an isoconcentration map; and

7. figures presenting geologic cross-sections based on outcrop and borehole data, if applicable.

6.4.13 Appendices

Each monitoring report shall include the following appendices. Additional appendices may be necessary to present data or documentation not listed below. Appendices must be logically ordered, and all pages of all appendices must be numbered.

6.4.13.1 Field Methods

The report shall include a section that describes the methods used to acquire field measurements of groundwater and vadose zone fluid elevations, subsurface vapor, soil moisture, water quality data, subsurface vapor samples, vadose zone fluid samples, and groundwater samples. It shall include the methods and types of instruments used to measure depths to water, air, headspace, or subsurface vapor parameters, soil moisture information, and water quality parameters. In addition, decontamination, well purging techniques, well sampling techniques, and sample handling procedures shall be provided in this appendix. Methods of measuring and sampling remediation systems shall be reported in this section, if applicable. Purge and decontamination water storage and disposal methods shall also be presented in this appendix. References to SOPs shall not substitute for such descriptions. Copies of purge and decontamination water disposal documentation shall be provided in a separate appendix.

6.4.13.2 Chemical Analytical Program

An appendix shall discuss the analytical program. It shall include the analytical methods, a summary of data quality objectives, and data quality review procedures. A summary of data quality exceptions and their effect on the acceptability of the analytical data with regard to the monitoring event and the site status shall be included in this appendix along with references to case narratives provided in the laboratory reports.

6.4.13.3 Chemical Analytical Reports

An appendix shall include all laboratory chemical analytical data generated for the reporting period. The reports must include all chain-of-custody records and Level II QA/QC results provided by the laboratory. The laboratory reports may be provided electronically in a format

approved by the NMED and shall be in the form of a final laboratory report. Laboratory report data tables may be submitted in Microsoft Excel format. Hard (paper) copies, or electronic copies in PDF format, of the chain-of-custody forms shall be submitted with the reports regardless of whether the final laboratory report is submitted electronically or in hard copy.

6.5 Risk Assessment Report

The Permittee shall prepare risk assessment reports for sites requiring corrective action at the Facility using the format described below. This Permit Section (6.5) provides a general outline for risk assessments and also sets forth the minimum requirements for describing risk assessment elements. In general, interpretation of data shall be presented only in the background, conceptual site model, and conclusions and recommendations sections of the reports. The other text sections of the Risk Assessment report shall be reserved for presentation of sampling results from all investigations, conceptual and mathematical elements of the risk assessment, and presentations of toxicity information and screening values used in the risk assessment. Permit Section 6.5.8 (Risk Assessment Results) and subsequent sections should be presented in separate sections for the human health and ecological risk assessments. The general risk assessment outline applicable to both sections is provided below.

6.5.1 Title Page

The title page shall include the type of document, revision number if applicable, the facility name, the unit, SWMU, or AOC name(s), and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible representative of the Facility shall be provided on the title page in accordance with the signature requirements in 40 CFR § 270.11(b).

6.5.2 Executive Summary (Optional)

The executive summary section shall provide a brief summary of the purpose and scope of the risk assessment of the subject site. The executive summary shall also briefly summarize the conclusions of the risk assessment. The Facility, unit, SWMU, or AOC name(s) and location(s) shall be included in the executive summary. The executive summary shall be limited to one page with a font size consistent with the rest of the document.

6.5.3 Table of Contents

The table of contents shall list all text sections, subsections, tables, figures, and appendices or attachments included in the risk assessment. The corresponding page numbers for the titles of each unit of the report shall be included in the table of contents.

6.5.4 Introduction

The introduction section shall include the Facility name, unit name(s) and location(s), and unit status (e.g., active operations, closed, corrective action). General information on the current site use and status shall be included in this section.

6.5.5 Background

The background section shall describe relevant background information. This section shall briefly summarize historical site uses including the locations of current and former site structures and features. A labeled figure shall be included in the document showing the locations of current and former site structures and features.

6.5.5.1 Site Description

A section shall provide a description of current site topography, features, and structures including a description of drainages, erosional features, current site uses, and other data relevant to assessing risk at the site. Depth to groundwater, vadose zone fluids, and directions of groundwater and vadose zone fluids flow shall be included in this section. The presence and location of surface water bodies such as springs or wetlands shall be noted in this section. Photos of the site may be incorporated into this section, if desired. Ecological features of the site should be described here, including type and amount of vegetative cover, observed and expected wildlife receptors, and level of disturbance of the site. A topographical map of the site and general vicinity showing habitat types, boundaries of each habitat, and any surface water features shall be included in the Figures section of the document.

6.5.5.2 Sampling Results

A section shall include a summary of the history of releases of chemicals, known and possible sources of contamination, and the vertical and lateral extent of contamination present in each media. This section shall include summaries of sampling results of all investigations, including site plans in the Figures section of the document depicting locations of detected chemicals. This section shall reference pertinent figures, data summary tables, and citations for references to previous reports. References to previous reports shall include page, table, and figure numbers for referenced information. Summaries of sampling data for each constituent shall include the maximum value detected, the detection limit, the 95% upper confidence level (UCL) of the mean value detected (if applicable to the data set) and whether that 95% UCL of the mean was calculated based on a normal or lognormal distribution. Background values used for comparison to inorganic constituents at the site shall be presented in this subsection. The table of background values should appear in the Tables section of the document and include actual values used as well as the origin of the values (facility-wide, site-specific, UCL, upper tolerance limit (UTL)). This section shall also include a discussion of how “non-detect” sample results were handled in the averaging of data.

6.5.6 Conceptual Site Model

A section shall present the conceptual site model. It shall include information on the expected fate and transport of chemicals detected at the site. This section shall provide a list of all sources of contamination at the site. Sources that are no longer considered to be ongoing but represent the point of origination for contamination transported to other locations shall be included. The discussion of fate and transport shall address potential migration of each chemical in each medium, potential breakdown products and their migration, and anticipated pathways of

exposure for human or ecological receptors. Diagrammatic representations of the conceptual site model shall be provided in the Figures section of the document.

For human health risk assessments, the conceptual site model shall include residential land use as the future land use for all risk assessments. In addition, site-specific future land use may be included, provided that written approval to consider a site-specific future land use has been obtained from the NMED prior to inclusion in the risk assessment. If a site-specific future land use scenario is included in the risk assessment, all values for exposure parameters and the source of those values shall be provided in table format and presented in the Tables section of the document.

Conceptual site models presented for ecological risk assessments shall identify assessment endpoints and measurement receptors for the site. The discussion of the model shall explain how the measurement receptors for the site are protective of the wildlife receptors identified by the Permittee in the site description, Permit Section 6.5.5.1.

6.5.7 Risk Screening Levels

A section shall present the actual screening values used for each chemical of potential concern for comparison to all human health and ecological risk screening levels. A discussion of the methods used to calculate screening levels in accordance with Permit Section 3.7, Variance from Cleanup Levels, and any variances from those procedures shall be included in this Section. If no valid toxicological studies exist for the receptor or chemical of potential concern, then both shall be addressed using qualitative methods. If an approved site-specific risk scenario is used for the human health risk assessment, this section shall include all toxicity information and exposure assessment equations used for the site-specific scenario, as well as the sources for that information. Other regulatory levels applicable to screening the site, such as drinking water MCLs, shall also be included in this section.

6.5.8 Risk Assessment Results

This section shall present all risk values, Hazard Quotients (HQs), and Hazard Indices (HIs) for human health under projected future residential scenario and any site-specific scenarios. This section shall also present the HQ and HI for each chemical of potential concern for each ecological receptor.

6.5.8.1 Uncertainty Analysis

This section shall include discussion of qualitative, semi-quantitative, and quantitative uncertainty in the risk assessment and estimate the potential impact of the various uncertainties.

6.5.9 Conclusions and Recommendations

This section shall include an interpretation of the results of the risk assessment and any recommendations for future disposition of the site. This section may include additional information and considerations that the Permittee believes are relevant to the analysis of the site.

6.5.10 Tables

Data presented in the summary tables shall include information on detection limits and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. If any new data is presented, the data tables must include a column indicating the specific analytical laboratory report where the sample analyses can be found. A separate table providing this information can also satisfy this requirement. A section shall provide the following summary tables, as appropriate. With prior approval from the NMED, the Permittee may combine one or more of the tables:

1. a table presenting background values used for comparison to inorganic constituents at the site; the table shall include actual values used as well as the origin of the values (Facility-wide, site-specific, UCL, UTL, or maximum);

2. a table summarizing sampling data shall include, for each constituent, all detected values above background, the maximum value detected, the 95 percent UCL of the mean value detected (if applicable to the data set), and whether that 95 percent UCL of the mean was calculated based on a normal or lognormal distribution;

3. a table of all screening values used and the sources of those values;

4. a table presenting all risk values, HQs, and HIs under projected future residential scenario;

5. a table presenting all risk values, HQs, and HIs under approved additional site-specific future land use scenario; and

6. a table presenting the HQ and HI for each chemical of potential concern for each ecological receptor.

6.5.11 Figures

This section shall present the following figures for each site, as appropriate. With prior approval from the NMED, the Permittee may combine one or more of the figures. All figures shall include a scale and a north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers. The following figures shall be included, as applicable:

1. a vicinity map showing topography and the general location of the site relative to surrounding features or properties;

2. for human health risk assessments, a site plan that presents pertinent site features and structures, underground utilities, well locations, and remediation system locations and its details; off-site well locations and other relevant features shall be included on the site plan if practical; additional site plans may be required to present the locations of relevant off-site wells, structures, and features;

3. for ecological risk assessments, a topographical map of the site and general vicinity of the site showing habitat types, boundaries of each habitat, and any surface water features; and

4. conceptual site model diagrams for both human health and ecological risk assessments.

6.5.12 Appendices

Appendices may be included to present additional relevant information for the risk analysis such as the results of statistical analyses of data sets and comparisons of data, ecological checklists for the site, full sets of results of all sampling investigations at the site, or other data as appropriate. Appendices must be logically ordered, and all pages of all appendices must be numbered.

6.6 Corrective Measures Evaluation

The Permittee shall prepare corrective measures evaluations for sites requiring corrective measures using the format described below. This Permit Section (6.6) provides a general outline for corrective measures evaluations and sets forth the minimum requirements for describing corrective measures when preparing these documents. All investigation summaries, site condition descriptions, corrective action goals, corrective action options, remedial options selection criteria, and schedules shall be included in the corrective measures evaluations. In general, interpretation of historical investigation data shall be presented only in the background sections of the corrective measures evaluations. At a minimum, detections of chemicals encountered during previous site investigations shall be presented in the corrective measures evaluations in table format with an accompanying site plan depicting sample locations. The other text sections of the corrective measures evaluations shall be reserved for presentation of corrective action-related information regarding anticipated or potential site-specific corrective action options and methods relevant to the project. The general corrective measures evaluation outline is provided below.

6.6.1 Title Page

The title page shall include the type of document, revision number if applicable, the Facility name, the unit, SWMU, or AOC name(s), and the submittal date. A signature block providing spaces for the name, title, and organization of the preparer and the responsible Facility representative shall be provided on the title page in accordance with the signature requirements in 40 CFR § 270.11(b).

6.6.2 Executive Summary (Optional)

The executive summary shall provide a brief summary of the purpose and scope of the corrective measures evaluation to be conducted at the site. The Facility, unit, SWMU, or AOC name(s) and location(s) shall be included in the executive summary. The executive summary shall be limited to one page with a font size consistent with the rest of the document.

6.6.3 Table of Contents

The table of contents shall list all text sections, subsections, tables, figures, and appendices or attachments included in the corrective measures evaluation. The corresponding page numbers for the titles of each section of the report shall be included in the table of contents.

6.6.4 Introduction

The introduction section shall include the Facility name, unit name(s) and location(s) and unit status (e.g., active operations, closed, corrective action). General information on the current site use and status shall be included in this section. A brief description of the purpose of the corrective measures evaluation and the corrective action objectives for the project also shall be provided in this section.

6.6.5 Background

The background section shall describe the relevant background information. This section shall briefly summarize historical site activities including the locations of current and former site structures and features. A labeled figure shall be included in the document showing the locations of current and former site structures and features. The locations of subsurface features such as pipelines, underground tanks, utility lines, and other subsurface structures shall be included in the background section and labeled on the site plan.

This section shall include contamination and waste characteristics, a brief summary of the history of releases, known and possible sources of contamination, and the vertical and lateral extent of contamination present in each medium. This section shall include brief summaries of results of previous investigations, including references to pertinent figures, data summary tables, and text in previous reports. References to previous reports shall include page, table, and figure numbers for referenced information. Summary tables and site plans showing relevant investigation locations shall be referenced and included in the Tables and Figures sections of the document, respectively.

6.6.6 Site Conditions

6.6.6.1 Surface Conditions

A section on surface conditions shall describe current and historic site topography, features, and structures, including a description of topographic drainages, man-made drainages, vegetation, and erosional features. It shall also include a description of current uses of the site and any current operations at the site. This section shall also include a description of those features that could potentially influence corrective action option selection or implementation such as topographic features, archeological sites, wetlands, or other features that may affect remedial activities. In addition, descriptions of features located in surrounding sites that may have an effect on the subject site regarding sediment transport, surface water runoff, or fate and transport mechanisms shall be included in this section. A site plan displaying the locations of all pertinent surface features and structures shall be included in the Figures section of the corrective measures evaluation.

6.6.6.2 Subsurface Conditions

A section on subsurface conditions shall describe the site conditions observed during previous subsurface investigations. It shall include relevant soil horizon and stratigraphic information, groundwater and vadose zone fluid conditions, fracture data, and subsurface vapor information. A site plan displaying the locations of all borings and excavations advanced during previous investigations shall be included in the Figures section of the corrective measures evaluation.

6.6.7 Potential Receptors

6.6.7.1 Sources

A section shall provide a list of all sources of contamination at the site where corrective measures are to be considered or are required. Sources that are no longer considered to be releasing contamination at the site, but may be the point of origination for migration of contamination to other locations, shall be included in this section.

6.6.7.2 Pathways

A section shall describe potential migration pathways that could result in either acute or chronic exposures to releases. It shall include such pathways as utility trenches, paleochannels, surface exposures, surface drainages, stratigraphic units, fractures, structures, and other features. All migration pathways and each medium should be tied to the potential receptors for each pathway. A discussion of chemical characteristics relating to fate and transport mechanisms through each pathway shall also be included in this section.

6.6.7.3 Receptors

A section shall provide a listing and description of all anticipated potential receptors that could possibly be affected by the contamination present at the site. Potential receptors shall include human and ecological receptors, groundwater, and other potential receptors. This section shall identify relevant pathways, such as pathways that could divert or accelerate the transport of contamination to human receptors, ecological receptors, and/or groundwater.

6.6.8 Regulatory Criteria

A section shall set forth the applicable cleanup standards, risk-based screening levels, and risk-based cleanup goals for each medium at the site. The appropriate cleanup levels for each site shall be included, if site-specific levels have been established. A table summarizing the applicable cleanup standards shall be included as part of the document. Alternately, the report may include applicable cleanup standards as a column in the data tables. If cleanup levels calculated in a risk evaluation are employed, the risk evaluation document shall be referenced including pertinent page numbers for referenced information.

6.6.9 Identification of Corrective Measures Options

A section shall identify and describe potential corrective measures for source, pathway, and receptor controls. Corrective measures options shall include the range of available options including, but not limited to, a no action alternative, institutional controls, engineering controls,

in-situ and onsite remediation alternatives, complete removal, and any combination of alternatives that would potentially achieve cleanup goals.

6.6.10 Evaluation of Corrective Measures Options

A section shall provide an evaluation of the corrective measures options identified in Permit Section 6.6.9. The evaluation shall be based on the applicability, technical feasibility, short- and long-term effectiveness, implementability, impacts to human health and the environment, and cost of each option. A table summarizing the corrective measures alternatives and the criteria listed below shall be included in the Tables section of this document. The general basis for evaluation of corrective measures options is described below.

6.6.10.1 Applicability

Applicability addresses the overall suitability for the corrective action option for containment or remediation of the contamination in the relevant media with regard to protection of human health and the environment.

6.6.10.2 Technical Feasibility

Technical feasibility describes the uncertainty in designing, constructing, and operating a specific remedial alternative. The description shall include an evaluation of historical applications of the remedial alternative including performance, reliability, and minimization of hazards.

6.6.10.3 Effectiveness

Effectiveness assesses the ability of the corrective measure to mitigate the measured or potential impact of contamination in a medium under the current and projected site conditions. The assessment also shall include the anticipated duration for the technology to attain regulatory compliance. In general, all corrective measures described above will have the ability to mitigate the impacts of contamination at the site, but not all remedial options will be equally effective at achieving the desired cleanup goals to the degree and within the same time frame as other options. Each remedy shall be evaluated for both short-term and long-term effectiveness.

6.6.10.4 Implementability

Implementability characterizes the degree of difficulty involved during the installation, construction, and operation of the corrective measure. Operation and maintenance of the alternative shall be addressed in this section.

6.6.10.5 Human Health and Ecological Protectiveness

This category evaluates the short-term (remedy installation-related) and long-term (remedy operation-related) hazards to human health and the environment of implementing the corrective measure. The assessment shall include whether the technology will create a hazard or increase existing hazards and the possible methods of hazard reduction.

6.6.10.6 Cost

A section shall discuss the anticipated cost of implementing the corrective measure. The costs shall be divided into: 1) capital costs associated with construction, installation, pilot testing, evaluation, permitting, and reporting of the effectiveness of the alternative; and 2) continuing costs associated with operating, maintaining, monitoring, testing, and reporting on the use and effectiveness of the technology.

6.6.11 Selection of Preferred Corrective Measure

The Permittee shall propose the preferred corrective measures at the site and provide a justification for the selection in this section. The proposal shall be based upon the ability of the remedial alternative to: 1) achieve cleanup standard objectives in a timely manner; 2) protect human and ecological receptors; 3) control or eliminate the sources of contamination; 4) control migration of releases; and 5) manage remediation waste in accordance with State and Federal regulations. The justification shall include the supporting rationale for the remedy selection, based on the factors listed in Permit Section 6.6.10, and a discussion of short- and long-term objectives for the site. The benefits and possible hazards of each potential corrective measure alternative shall be included in this section.

6.6.12 Design Criteria to Meet Cleanup Objectives

The Permittee shall present descriptions of the preliminary design for the selected corrective measures in this section. The description shall include appropriate preliminary plans and specifications to effectively illustrate the technology and the anticipated implementation of the remedial option at the site. The preliminary design shall discuss the design life of the alternative and provide engineering calculations for proposed remediation systems.

6.6.13 Schedule

A section shall set forth a proposed schedule for completion of remedy-related activities such as bench testing, pilot testing, construction, installation, remedial excavation, cap construction, installation of monitoring points, and other remedial actions. The anticipated duration of corrective action operations and the schedule for conducting monitoring and sampling activities shall also be presented. In addition, this section shall provide a schedule for submittal of reports and data to the NMED, including a schedule for submitting all status reports and preliminary data.

6.6.14 Tables

A section shall present the following summary tables, as appropriate. Data presented in the summary tables shall include information on dates of sample collection, analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions. All data tables shall include only detected analytes and data quality exceptions that could potentially mask detections. Data quality exceptions must be clearly flagged or otherwise indicated in all tables. All new data tables must include a column indicating the specific analytical laboratory report where the sample analyses can be found. A separate table providing

this information can also satisfy this requirement. The following summary tables shall be included in the corrective measures evaluations, as appropriate:

1. a table summarizing regulatory criteria, background, and the applicable cleanup standards;

2. a table summarizing historical field survey location data;

3. tables summarizing historical field screening and field parameter measurements for each media;

4. tables summarizing historical soil, rock, or sediment laboratory analytical data; the summary tables shall include the analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that would influence interpretation of the data;

5. a table summarizing historical groundwater elevation and depth to water data; the table shall include the monitoring well depths and the screened intervals in each well;

6. tables summarizing historical groundwater and vadose zone laboratory analytical data; the analytical data tables shall include the analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that would influence interpretation of the data;

7. tables summarizing historical surface water laboratory analytical data; the analytical data tables shall include the analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that would influence interpretation of the data;

8. tables summarizing historical air sample screening and analytical data; the data tables shall include the screening instruments used, laboratory analytical methods, detection limits, reporting limits (or limits of quantitation), and significant data quality exceptions that would influence interpretation of the data;

9. tables summarizing historical pilot or other testing data, if applicable, including units of measurement and types of instruments used to obtain measurements;

10. a table summarizing the corrective measures alternatives and evaluation criteria; and

11. a table presenting the schedule for installation, construction, implementation, and reporting of selected corrective measures.

6.6.15 Figures

This section shall present the following figures for each site, as appropriate. All figures shall include a scale. All plan view figures shall include a north arrow. An explanation shall be provided on each figure for all abbreviations, symbols, acronyms, and qualifiers. All data quality exceptions must be flagged or otherwise clearly indicated as such on all figures. GIS data must be provided to NMED upon request. All figures shall contain a date of preparation. The following figures shall be included, as applicable:

1. a vicinity map showing topography and the general location of the subject site relative to surrounding features or properties;

2. a unit site plan that presents pertinent site features and structures, underground utilities, well locations, and remediation system locations and details; off-site well locations and other relevant features shall be included on the site plan if practical; additional site plans may be required to present the locations of relevant off-site well locations, structures, and features;

3. figures showing historical soil boring locations, excavation locations, and sampling locations;

4. figures presenting historical soil sample field screening and laboratory analytical data, if appropriate;

5. figures showing all existing wells including vapor monitoring wells and piezometers; the figures shall present historical groundwater elevation data and indicate groundwater flow directions;

6. figures presenting historical groundwater laboratory analytical data including past data, if applicable; the analytical data corresponding to each sampling location may be presented as individual concentrations, in table form on the figure, or as an isoconcentration map;

7. figures presenting historical surface water sample locations and analytical data including past data, if applicable; the laboratory analytical data corresponding to each sampling location may be presented as individual concentrations or in table form on the figure;

8. figures presenting historical air sampling locations and presenting air quality data; the field screening or laboratory analytical data corresponding to each sampling location may be presented as individual concentrations, in table form on the figure or as an isoconcentration map;

9. figures presenting historical pilot or other test locations and data, where applicable, including site plans or graphic data presentation;

10. figures presenting geologic cross-sections based on outcrop and borehole data, if applicable;

11. figures presenting the locations of existing and proposed remediation systems;

12. figures presenting existing remedial system design and construction details; and

13. figures presenting preliminary design and construction details for preferred corrective measures.

6.6.16 Appendices

Each corrective measures evaluation shall include, as appropriate, as an appendix, the management plan for waste, including investigation derived waste, generated as a result of construction, installation, or operation of remedial systems or activities conducted. Each corrective measures evaluation shall include additional appendices presenting relevant additional data, such as pilot or other test or investigation data, remediation system design specifications, system performance data, or cost analyses as necessary. Appendices must be logically ordered, and all pages of all appendices must be numbered.

PART 7: HAZARDOUS WASTE MANAGEMENT UNIT POST-CLOSURE CARE

7.1 Post-Closure Care Requirements for Closed Hazardous Waste Management Units

The Facility contains five closed hazardous waste management units located at the 200 Area (two units), 300 Area, 400 Area, and 600 Area, respectively, that require post-closure care.

The Permittee shall inspect and maintain all environmental closure covers at each regulated hazardous waste management area in order to minimize the possibility of fire, explosion, flooding or erosion, including run-on and run-off control, or any release of hazardous waste or hazardous constituents to air, soil, groundwater, or surface water which could threaten human health or the environment as required by Permit Part 2, General Facility Conditions, and as specifically outlined in this Permit Part (7) for Post-Closure Care Units.

In addition, the Permittee shall continue to conduct corrective action to investigate and remediate all releases of hazardous waste, hazardous constituents, or other contaminants (*as defined in Section 1.12 of this Permit*) to air, soil, groundwater, surface water, or other environmental media at each Post-Closure Care Unit identified in this Permit in accordance with Permit Part 3, Corrective Action For Solid Waste Management Units, Areas of Concern, and Post-Closure Care Units, and the requirements of 40 CFR § 264.101 and § 264.111 which are incorporated herein by reference.

7.2 Background

7.2.1 Unit Identification

Five closed RCRA hazardous waste management areas are located within the NASA White Sands Test Facility. All of these hazardous waste management units have been closed and are regulated by this Permit Part (7). The hazardous waste management units were formerly used for management of hazardous waste after November 19, 1980. Each unit was closed under an NMED-approved Closure Plan. Each unit was closed without complete removal of hazardous waste or hazardous waste constituents released to the environment and therefore must undergo post-closure care.

Two closed hazardous waste management units are located in the 200 Area. The 300, 400, and 600 Areas each contain one unit. The hazardous waste management unit locations are identified on Facility site topographic maps in Permit Attachment 2.

The closed units in the 200 Area consisted of underground storage tanks. The hazardous waste area used by the “Chemistry Lab” (200 Area East Closure) contained an underground storage tank and a sump, which was in operation from 1964 to 1986. The hazardous waste unit used by the “Clean Room” (200 Area West Closure) contained two underground storage tanks. The tanks were in operation from 1964 to 1986. The storage tanks were removed during the closure activities. While in service, the contents of the tanks were removed periodically and transported to the surface impoundments at the 600 Area. The engineered cover for the 200 Area East Closure is an asphalt parking area, and the cover of the 200 Area West Closure consists of a concrete floor inside an operational building.

The closed hazardous waste management units in the 300 and 400 Area are similar in design, and similar waste streams were managed at these areas. The hazardous waste management units consisted of three open, interconnected reaction tanks constructed of reinforced concrete located between two concrete-lined surface impoundments. Each reaction tank was capable of holding approximately 10,000 gallons and the impoundments had an approximate combined capacity of 600,000 gallons (300 Area) and 400,000 gallons (400 Area) and were in operation from 1965 to 1986. Neither contaminated soils nor the constructed portion of the impoundments were removed during closure. A small quantity of soil removed from the 300 and 400 Areas surface impoundments was disposed in the 600 Area closure. The bottom of each surface impoundment was sealed and their basins were filled in and covered with gravel. The concrete treatment tanks were left in place, and their tops were sealed with concrete.

The hazardous waste management unit in the 600 Area consisted of two surface impoundments, which operated from 1965 to 1985. The combined capacity of both units was 2,000,000 gallons. The liquid and sludge content of the impoundments was stabilized by mixing it with underlying soils and clay. A low permeability continuous clay cap was installed over the two adjacent impoundments, which was subsequently covered with gravel.

Clean-closed hazardous waste management units at NASA WSTF that do not require post-closure care include the Open Detonation Unit (ODU) located at the 700 Area and closed in 2002, the Evaporation Treatment Unit (ETU) located at the 200 Area and closed in 2014, and the Fuel Treatment Unit (FTU) located at the 500 Area and closed in 2019. No additional hazardous waste management units are in operation at the Facility.

Currently, NASA WSTF is a large quantity generator of hazardous waste that manages hazardous waste at various less than 90-day storage and satellite accumulation areas at the Facility. A permit is not required for management of hazardous waste at less than 90-day accumulation areas.

7.3 Post-Closure Care

7.3.1 Post-Closure Care Plan

The Permittee shall implement post-closure care for the five closed hazardous waste management units at the 200, 300, 400, and 600 Areas, in accordance with this Permit Part (7) and the respective post-closure care plans for each unit as required by 40 CFR § 264.117(d) and § 264.118(b), which are incorporated herein by reference. The requirements for maintaining the conditions of each post-closure care unit and continued corrective action are provided in this section (7.3) and supporting subsections and conform to the post-closure care plans previously submitted to NMED for each hazardous waste management unit.

7.3.2 Post-Closure Care Period

The Permittee shall conduct post-closure care for the five closed hazardous waste management areas identified in Permit Section 7.2.1. The post-closure care period, which began after the completion of closure activities, was for a period of thirty (30) years from the closure certification date for each unit. The 200 and 400 Area closures were certified on May 11, 1989, and the 300 and 600 Area closures were certified on August 11, 1989.

Releases of contamination from the units require continued investigation and/or monitoring. For protection of human health and the environment and as required by 40 CFR § 264.117(a)(2)(ii), the post-closure care period is extended under this Permit in accordance with Permit Section 1.9.1, Duration of Permit, for 10 years and must continue beyond the expiration date of this Permit in accordance with Permit Part 1.9.6, Continuation of Expired Permit, until issuance of a new Permit by the NMED in accordance with 40 CFR § 270.51.

Requirements for corrective action at all Post-Closure Care Units are outlined in Permit Sections 7.3.3 and 7.3.4. Post-closure care requirements for the units are outlined in Permit Section 7.3.5.

7.3.3 Corrective Action for Post-Closure Care Units

The Permittee shall continue to submit, to NMED for approval, investigation work plans as required by NMED to determine the extent of releases from each hazardous waste management unit under post-closure care. The work plans shall propose the necessary investigation for delineation of contamination in soil, groundwater, surface water, air, or other environmental media at the Post Closure Care Units, and if necessary, beyond the facility boundary in accordance with Permit Section 3.1, Corrective Action from Releases. Required investigation work plans must be submitted by the Permittee on a schedule either specified by the NMED or as proposed by the Permittee for NMED approval. All work plans and investigation reports must be prepared in accordance with the applicable formats in Permit Part 6 and the corrective action conducted in general accordance with Permit Parts 3 through 5.

7.3.4 Groundwater Monitoring

The Permittee shall continue to maintain and monitor the Facility groundwater monitoring system and comply with all other applicable requirements of 40 CFR Part 264 Subpart F during the post-closure period as specified in 40 CFR § 264.117(a)(1), which is incorporated herein by reference. Permit requirements for groundwater monitoring and remediation at the Facility are specified in Permit Sections 3.3 and 3.4, respectively.

7.3.5 Post-Closure Care Requirements

7.3.5.1 Surface Impoundment Post-Closure Care Requirements

The Permittee shall comply with the post-closure care requirements for the 300, 400, and 600 Areas surface impoundments as follows:

1. The Permittee shall maintain the integrity and effectiveness of the final cover, including making repairs to the cap, as necessary, to correct the effects of settling, subsidence, erosion, and other events in accordance with the requirements of 40 CFR § 264.228 (b)(1).

2. The Permittee shall maintain and monitor the ground water monitoring system and comply with all other applicable requirements of 40 CFR 264 Subpart F as required by 40 CFR § 264.228(b)(3).

3. The Permittee shall maintain all surface water diversion structures located in the vicinity of the 300, 400, and 600 Areas surface impoundments. The Permittee shall

prevent run-on and run-off from eroding or otherwise damaging the final cover in accordance with the requirements of 40 CFR § 264.228(b)(4).

4. The Permittee shall not allow the use of any of the units closed as surface impoundments that will disturb the integrity of any final covers or liners, or the function of the Facility's monitoring system during the post-closure in accordance with the requirements of 40 CFR § 264.117(c).

5. The Permittee shall prevent the movement of vehicles on the side slopes of the cover at the 600 Area, except on the roadway that crosses the side slope to access the top of the cover. The Department may allow additional exceptions to this prohibition, if stated in writing, for good cause shown.

7.3.5.2 Landfill Requirements

The Permittee shall comply with the post-closure requirements for landfills for the 200 Area and the reaction tanks in the 300 and 400 Areas as set forth in 40 CFR § 264.197(b) requiring post-closure to be conducted in accordance with § 264.310(b). The post-closure care requirements are as follows:

1. The Permittee shall maintain the integrity and effectiveness of the final cover, including making repairs to the cap, as necessary, to correct the effects of settling, subsidence, erosion, or other events in accordance with the requirements of 40 CFR § 264.310(b)(1).

2. The Permittee shall inspect for cracks, potholes, or damage in the asphalt or concrete in the 200 Area final covers on at least a monthly basis and record the inspections and repairs in the Facility Operating Record. The Permittee shall repair any cracks exceeding five millimeters in width, and any other damage, within 10 days after observing the damage, unless the damage is too extensive to repair within 10 days. In such circumstance, the Permittee shall notify NMED and propose a schedule for completion of the repair.

3. The Permittee shall maintain and monitor the ground water monitoring system and comply with all other applicable requirements of 40 CFR Subpart F and in accordance with the requirements of 40 CFR § 264.310(b)(4).

4. The Permittee shall prevent run-on and run-off from eroding or otherwise damaging the final cover in accordance with the requirements of 40 CFR § 264.310(b)(5).

5. The Permittee shall protect and maintain surveyed benchmarks used in complying with the surveying and recordkeeping requirements of 40 CFR § 264.309 and in accordance with the requirements of 40 CFR § 264.310(b)(6).

6. The Permittee shall not allow any use of the units closed as landfills that will disturb the integrity of the final cover, liners, or any components of the containment system, or the function of the Facility's monitoring systems during the post-closure care period in accordance with the requirements of 40 CFR § 264.117(c).

7.3.5.3 Post-Closure Inspections and Maintenance

The Permittee shall inspect the components, structures, and equipment at each post-closure care unit in accordance with Permit Attachment 5, Hazardous Waste Management Unit Post Closure Care, and the requirements of 40 CFR § 264.117(a)(1)(ii).

The Permittee shall inspect the channels or equivalent diversion structures at the 300 Area, 400 Area, and the 600 Area at least monthly. The Permittee shall keep a written log of all such inspections as part of the Facility Operating Record. The Permittee shall maintain the diversion structures to ensure that run-on and runoff controls are functioning properly.

The Permittee shall inspect the 600 Area Closure cap for signs of erosion, subsidence, and any other physical damage that could potentially compromise the integrity of the surface impoundment cap. Any damage identified must be immediately repaired by the Permittee, if possible. If immediate repairs are not possible, the Permittee shall repair any such damage within ten days after observing the damage unless the damage is too extensive to repair within ten days. In such circumstance, the Permittee shall notify the department and propose a schedule for completion of the repair. The 600 Area Closure cap shall be inspected at least once a month. The Permittee shall keep a written log of all such inspections as part of the facility Operating Record.

The Permittee shall inspect the asphalt cover at the 200 Area at least once per month for cracks exceeding five millimeters in width, potholes, settling, vegetation growth or other damage that would allow water to drain through the cover. The Permittee shall keep a written log of all such inspections as part of the Facility Operating Record. The Permittee shall repair any such damage within ten days after observing the damage unless the damage is too extensive to repair within ten days. In such circumstance, the Permittee shall notify the Department and propose a schedule for completion of the repair.

7.3.5.4 Security Measures

The Permittee shall comply with all security requirements of 40 CFR § 264.117(b) and Permit Section 2.2, which incorporates § 264.14(a).

7.4 Notices and Certifications

7.4.1 Record Keeping Requirements

The Permittee shall maintain documentation of certification of closure of all hazardous waste disposal units, in accordance with the applicable portions of 40 CFR § 264.119(b).

The Permittee shall record, in accordance with U.S Department of Interior rules, a notation on the instrument that is normally examined during property transfer research that will in perpetuity identify that:

1. The land has been used to manage hazardous wastes.

2. Its use is restricted under 40 CFR Part 264 Subpart G regulations.

3. The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the Facility have been filed with the NMED and the U.S Department of Interior.

7.4.1.1 Removal of Waste after Closure

If the Permittee or any subsequent owner or operator of the land upon which a hazardous waste disposal unit is located wishes to remove any hazardous wastes, hazardous constituents or any associated materials, the Permittee or any subsequent owner or operator must conduct such actions in accordance with 40 CFR § 264.119(c).

7.4.2 Contamination Source Removal

If NMED determines that the releases of the hazardous waste or hazardous constituents from the regulated units detected during implementation of the requirements of Permit Section 7.3.3 (i.e., corrective action investigation) constitute a source or potential source of groundwater contamination, then the Permittee shall conduct corrective action to remove sources of contamination. Proposed remedies for such a removal shall be evaluated and submitted to NMED in the Corrective Measures Evaluation format in Permit Part 6. The NMED will select a remedy based on the Corrective Measures Evaluation and other available information. Upon selection of a remedy by NMED, the Permittee shall submit a plan, for NMED approval, to implement the selected remedy that includes descriptions of the specific actions to be implemented, remedy design plans and specifications, proposed monitoring activities, and a schedule for implementation. By removing contaminated sources, the Permittee may become a generator of hazardous waste and must manage it in accordance with all applicable RCRA and HWA requirements. NMED may require a revised Post-Closure Plan based on contamination source removal activities.

7.5 Post-Closure Permit Modification

The Permittee shall request a permit modification to authorize a change in the approved Post-Closure Plan. This request must be in accordance with applicable requirements of 40 CFR Part 124, 20.4.1.900 and 901 NMAC, and 40 CFR § 270.42, and must include a copy of the proposed amended Post-Closure Plan for approval by the NMED. The Permittee shall request a permit modification whenever changes in operating plans or Facility design affect the approved Post-Closure Plan, there is a change in the expected year of final closure, or other events occur during the active life or post-closure period of the Facility that affect the approved Post-closure Plan. The Permittee must submit a written request for a permit modification at least 60 days prior to the proposed change in Facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the Post-Closure Plan in accordance with the requirements of 40 CFR § 264.118(d).

7.6 Completion of Post-Closure Requirements

No later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, the Permittee shall submit to the NMED, by registered mail, a certification that the post-closure care for the hazardous waste disposal unit was performed in accordance with the specifications in the approved Post-Closure Plan. The certification must be signed by the Permittee and an independent, registered professional engineer. Documentation

supporting the independent, registered professional engineer's certification must be provided to the NMED upon request.

PERMIT ATTACHMENTS

PERMIT ATTACHMENTS

ATTACHMENT 1: General Facility Description

ATTACHMENT 2: Facility Maps

ATTACHMENT 3: Compliance Schedule

ATTACHMENT 4: Corrective Action Status Tables

ATTACHMENT 5: Hazardous Waste Management Unit Post-Closure Care

ATTACHMENT 1
General Facility Description

ATTACHMENT 1: General Facility Description

Site Location

The White Sands Test Facility (WSTF) occupies over 60,000 acres and is located along the western flank of the San Andres Mountains, one of the most prominent north-south ranges in southwestern New Mexico. Geographic coordinates of WSTF are 32°30'30" north latitude and 106°36'30" west longitude. The Facility is located in Doña Ana County, 18 miles northeast of Las Cruces, New Mexico and 65 miles north of El Paso, Texas. Attachment 2 includes the WSTF location maps. Access to the site is provided by a paved road, which intersects U.S. Highway 70 one mile west of Organ, New Mexico. The main entrance to the facility is 6 miles north of the intersection of NASA Road and U.S. Highway 70. See Figure 1.

WSTF's primary activities are in support of the national space program and include:

- Development, qualification, refurbishment, and testing of spacecraft propulsion systems, subsystems, and ground support equipment;
- Investigation of flight hardware anomalies;
- Testing of materials and components; and
- Performance of hazard and failure analyses.

History of WSTF

Construction

WSTF began operation on July 6, 1962, when NASA headquarters announced the site selection. From the date of the official announcement until January 1965, the site was officially known as the Propulsion System Development Facility (PSDF). From January until June 1965, the official designation was White Sands Operation (WSO). On June 16, 1965, the official name of the installation was changed to White Sands Test Facility.

Actual construction at the site began in May 1963, with construction of the access road from U.S. Highway 70. The road was completed in October 1963. The first permanent personnel move-in was accomplished in April 1964, and the official WSTF dedication occurred in June 1964.

Propulsion Testing

Propulsion systems testing began in September 1964 in the "300" Area Test Stand (TS) 301, with firings of the Apollo Service Propulsion Subsystem (SPS) engine in a heavyweight rig labeled F-2. A Block 2 configuration SPS test article (F-2A) was installed and tested at TS-301 from early 1966 until mid-1969, followed by development and qualification testing until mid-1971 of the Command and Service module (CSM) Reaction Control System (RCS) engines used for the Skylab project.

Test Stand 302 was originally constructed as an ambient test stand and was first used for SPS firings of the SC 001 test rig during 1965. In 1966, the stand was significantly modified by removing the ambient thrust structure, and installing a tall vacuum chamber, similar to those at TS 401 and 403. In 1972, TS 302 was further modified by lengthening the vacuum chamber by

20 feet. This test stand was equipped with mechanical vacuum pumps, and was used to characterize the start transient and minimum-impulse performance of the Lunar Module (LM) ascent engine at higher simulated altitudes (240,000 ft) than could be obtained with the steam ejector system in the "400" Area. The effects of different rocket engine configurations on soil erosion, displacement, and contamination by exhaust products were evaluated during these tests, resulting in recommendations for design changes incorporated into the flight article.

Other "300" Area tests through the mid-1970's included Navy solid rocket plume/microwave interaction tests, characterization of filters for gasses, hypergolic propellants, and cryogenic liquids, and evaluation of effects of dumping residual Apollo command module propellants on the recovery parachute risers before splashdown (Apollo 15 parachute failure).

Following the Apollo-Skylab era, the facilities in the 300 Area were modified, including propellant supply systems, environmental control, improved electrical and data systems, articulated thrust structures, and moveable shelters to accommodate extensive testing of the primary and vernier reaction control systems of the Space Shuttle Orbiter.

Exhaustive testing of the Aft Reaction Control System (ARCS), from development through operational qualification, took place at TS-301 from early 1978 through 1982, with emphasis on evaluating ARCS and Orbital Maneuvering System (OMS) interactions and thruster duty cycle effects, as well as characterization of the RCS tank propellant acquisition devices (screens) and development of checkout and servicing procedures.

Similarly, rigorous testing of the Forward ARCS was conducted at TS-328 (adjacent to TS-302) during the same time period (1978-1982) as ARCS testing. Both the 870-lb thrust primary engines and the 25-lb thrust vernier engines on each ARCS and Forward Reaction Control System (FRCS) test article were thoroughly investigated during the development and qualification tests.

Facilities in the "400" Area were originally designed around testing the Apollo LM propulsion system, and the two vacuum test chambers could contain a full-size mated LM while performing simulated vacuum firing of the descent, ascent, and RCS engines. Initial testing of the LM Ascent Propulsion Subsystem was conducted at the ambient TS-402 using the HA-3 rig beginning in 1965. Subsequent LM APS and RCS testing was conducted mostly in the TS-403, using a flight-representative test article dubbed PA-1, and encompassing the period from 1966 through late 1970. A LM ascent stage thermal test rig TM-2 and the LM descent test rig LTA-5 were also tested at the TS-403 during this period.

Vacuum Test Stand 401 (TS-401) was dedicated to testing the LM descent propulsion subsystem, using several configurations of heavyweight and flight test articles such as HD-1, PD-1, PD-2, and LTA-5. These tests were conducted from early 1966 through late 1970.

During the transition years between the Apollo and Shuttle eras, an extensive series of tests of a second stage satellite booster engine was conducted in 1972 for the Japanese Space Agency, and a pair of planetary probe insertion solid rocket motors was fired at TS-401. A program to

develop rocket engine extendable nozzle technology was also conducted during this period at TS-403.

Testing of Shuttle Orbital Maneuvering Engine (OME) technology and prototype engines began in mid-1973, and all candidate OMS engines from several manufacturers were tested at TS-401 to select the OME manufacturer and define baseline data in the official OME design. The selected Aerojet engine was subject to extensive prototype, development, and qualification testing from 1974 through 1980, undergoing numerous design and operational modifications along the way.

A simulated OMS "pod" containing flight weight and configuration OMS propulsion system (but only simulated RCS) underwent development and early qualification tests at TS-403 between 1978 and mid-1979. This OMS pod was then revised to reflect correct configuration and retested at WSTF from 1981 through 1982 to the more stringent operational flight conditions of Qual II.

Other programs conducted in the "400" Area during the Shuttle era include several high-altitude tests of the primary and vernier RCS engines. These tests include helium bubble ingestion and simulated propellant leakage, tests of a DOD technology demonstration warhead intercept propulsion system, extensive characterization of the solubility of iron (from steel storage vessels and transport lines) in an oxidizer, and evaluation of methods like molecular sieves for removal of the iron nitrate from oxidizer.

In the early 1990s, WSTF performed development testing of the proposed Space Station Freedom propulsion modules. Additionally, WSTF is an Orbiter and International Space Station Depot Repair Facility and performs flight hardware assembly, repair, and acceptance testing for private aerospace manufacturers. Six test stands provide vacuum test capability, and three test stands provide ambient testing; 5,000 feet (1,100 meters) above sea level, that have been used for the Space Shuttle, International Space Station, or government agencies.

Materials Testing

Beginning in 1967, the WSTF laboratories developed a basic capability to evaluate the flammability and toxicity characteristics of non-metallic materials used in the Apollo spacecraft. This program expanded rapidly in the following years to include the measurement of properties such as total organics, odor, comparability in propellants, and mechanical and pneumatic impact. Test pressures were initially at Apollo cabin pressures with 100% oxygen. The testing is presently performed with any oxygen mixture up to 20,000 pounds per square inch absolute (psia). Standardized test fixtures, test procedures, and acceptance criteria have been developed for these environments. The need for materials testing continued from the Apollo program through Skylab, ASTP, and the Space Shuttle.

In order to provide standard facilities, efficiency, and fast response to the many materials test requirements, the many scattered facilities were consolidated into a single materials test facility that was built in 1974. Twelve permanent remote test cells were provided for conducting tests using hazardous fuels and oxidizers. Eight additional cells were provided to perform standard high pressure oxygen tests and other tasks that are hazardous to perform due to pressure, fire, and other hazards, but do not use hazardous fluids. The most recent addition to the materials testing

capability consists of a high temperature, high flow rate oxygen facility that allows testing of high flow rate components and performance of particle impact investigations at elevated temperature.

In 1967, the WSTF precision cleaning laboratory began the cleaning of tools, sample collection devices, packages, and related materials for the Lunar Receiving Laboratory at Johnson Space Center (JSC). In 1973, at the request of the Lunar Curator, an intensive effort was initiated to upgrade the precision cleaning and control capabilities of this laboratory. This effort led to cleaning the Viking Lander soil samples hardware to very low levels of organic contaminants.

The WSTF laboratories have also performed a wide variety of special tests for all of the manned space efforts under many different conditions. These special tests include microelectronic circuit screen and burn-in testing, component evaluations, qualification testing of electrical and mechanical components and subsystems, failure analysis, chemical and metallurgical investigations, plus many more such activities.

Permit History

WSTF is a former treatment, storage, and disposal (TSD) facility. A Resource Conservation and Recovery Act (RCRA) Operating Permit was issued in February 1993 and Post-closure Permit for five hazardous waste management units requiring post-closure care (200, 300, 400, and 600 Area Closures) was issued in September 1994. The 2009 RCRA Permit allowed for the treatment of hazardous waste generated during Facility operations at the Evaporation Treatment Unit (ETU) and Fuel Treatment Unit (FTU). The ETU and the FTU are no longer in use and were "clean-closed" in 2014 and 2019, respectively. Corrective action at various solid waste management units (SWMUs), areas of concern (AOCs), and closed hazardous waste management units (HWMUs) was also a component of the 2009 Permit.

NASA WSTF currently manages hazardous waste generated during routine operations as a large quantity generator. Hazardous waste storage is conducted at various less than 90-day accumulation areas and does not require permitting. All hazardous waste is shipped off-site to an appropriate disposal facility. WSTF operates its hazardous waste management activities under the Environmental Protection Agency (EPA) identification number NM8800019434.

Historic releases of hazardous waste and hazardous constituents generated at WSTF in association with testing and evaluation operations at the Facility is believed to have primarily occurred at surface impoundments and storage tanks located at the 200, 300, 400, and 600 Areas. Available historical information indicates the release of contaminants to the environment likely occurred during the early 1960's through the mid-1980's. The releases resulted in soil and groundwater contamination at the Facility and surrounding areas. Primary contaminants of concern released to the environment at WSTF include N-nitrosodimethylamine (NDMA), which is believed to have originated from test evaluation operations and treatment of generated waste in the 300 and 400 Areas surface impoundment structures. The release of the halogenated volatile contaminants trichloroethene (TCE), tetrachloroethene (PCE), trichlorofluoromethane (Freon 11), 1,1,2-trichloro-1,2,2-trifluoroethene (Freon 113), and chloroform are believed to have primarily originated from the 200 Area, and potentially, to a lesser extent, from the 100, 300,

400, and 600 Areas as a result of the use and release of solvents and other chemicals at these WSTF operation areas.

Corrective action is required at identified SWMUs, AOCs, and HWMUs under post-closure care. SWMU, AOC, and HWMU location information is provided in Permit Attachment 2, including the units listed in Permit Attachments 4 (SWMUs and AOCs) and Permit Attachment 5 (HWMUs under post-closure care). This Permit requires continued corrective action at Facility SWMUs, AOCs, and five closed HWMUs under post-closure care.

Geology

WSTF is in the Mexican Highland Section of the Basin and Range Province and within a major tectonic feature – the Rio Grande Rift Zone. North trending mountain ranges and intermountain basins characterize the Rift Zone, which extends from southern Colorado to northern Mexico. WSTF is located along the western flank of the San Andres Mountains. The elevation of the adjacent plains is about 4000 feet above mean sea level.

The uppermost alluvial layers upon which WSTF is located consist of silt, sand, gravel, boulders, and locally-cemented conglomerates, and range from 400 to 700 feet thick adjacent to the mountains to 100 to 200 feet thick in the basin floor. The surface of the uppermost alluvium layer is a sandy silt containing some gravel and occasional boulders, with the gravel and boulder content gradually increasing with depth.

Hydrology

The primary water supply in the area for potable, industrial, and agricultural use is from underground water resources. Immediately adjacent to the Rio Grande, water for agricultural use is diverted to fields from the river via irrigation canals. The quantity of water from this source, however, is a minor amount of the total water consumption.

In the WSTF area, all water is from underground sources. Recharge of the ground water aquifers of the Jornada del Muerto Basin is primarily runoff from the adjacent San Andres Mountains. Approximately 75 percent of total rainfall migrates off-site as surface runoff. The runoff that does not evaporate or transpire after it reaches the alluvial fans at the base of the mountains, infiltrates and constitutes ground water recharge. Although the volume of this recharge is small and sporadic in nature, it is a continuing source of recharge.

ATTACHMENT 2

Figures

Figure A2-1. WSTF Location Map

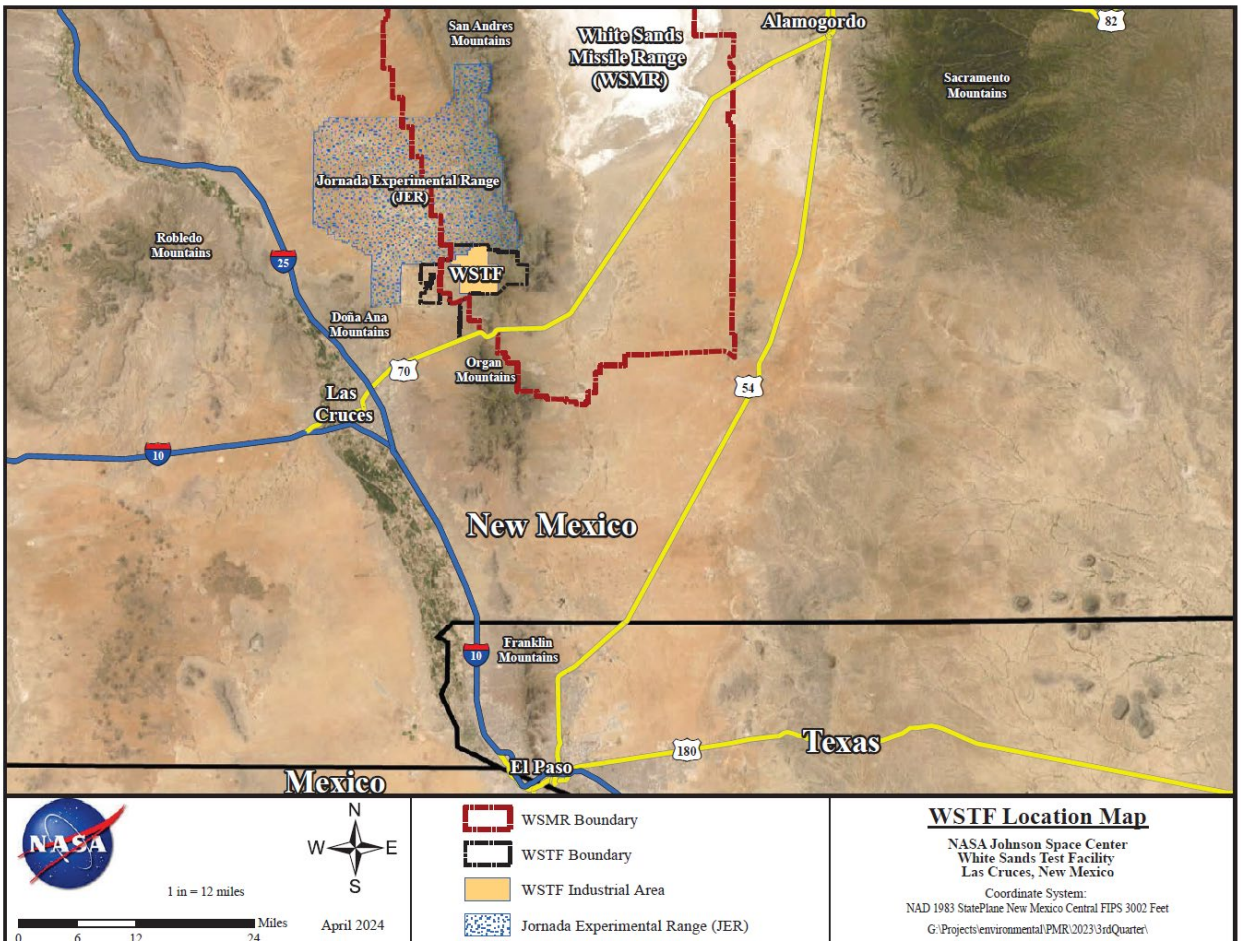


Figure A2-2. WSTF Site Map

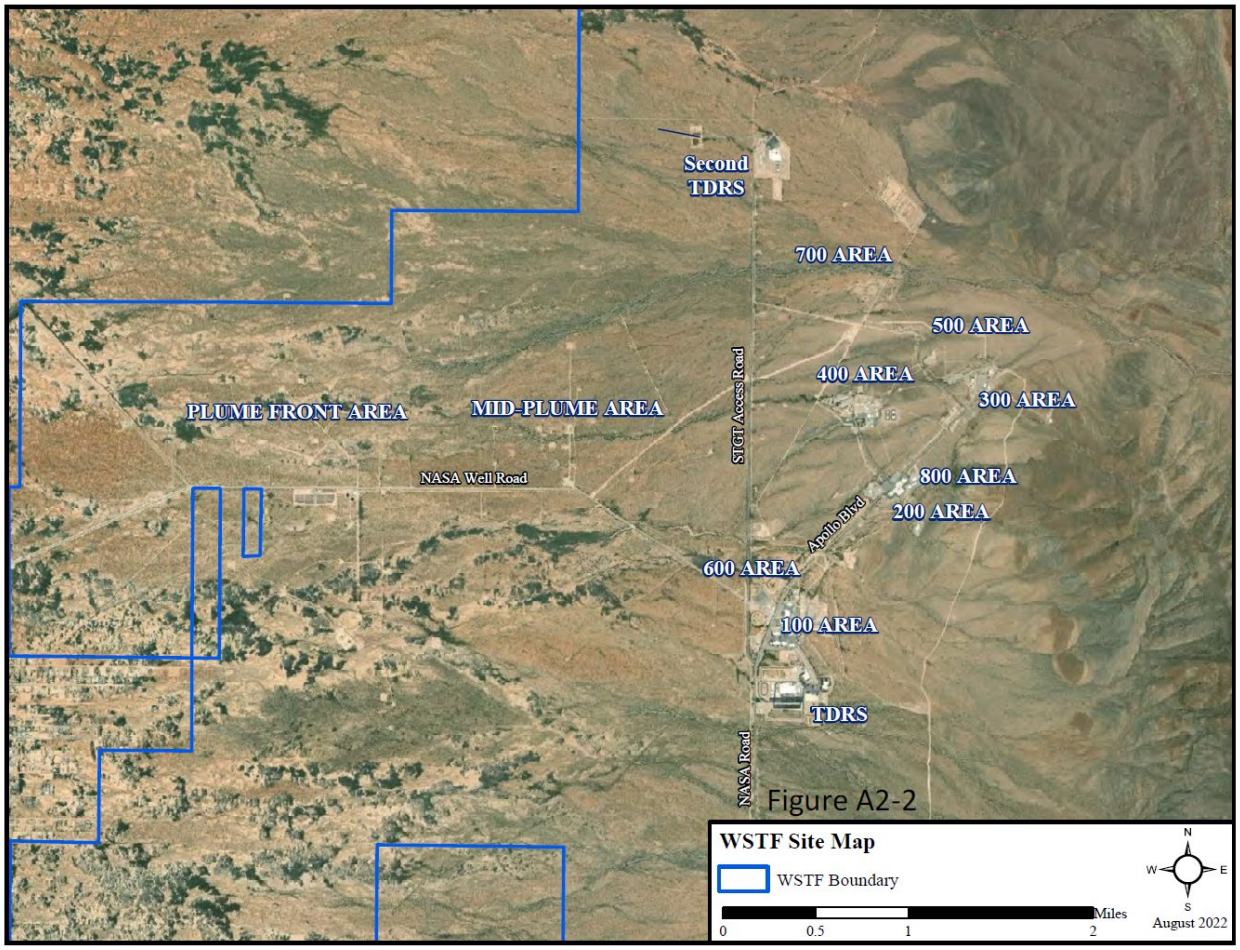


Figure A2-3. WSTF Topographic Map

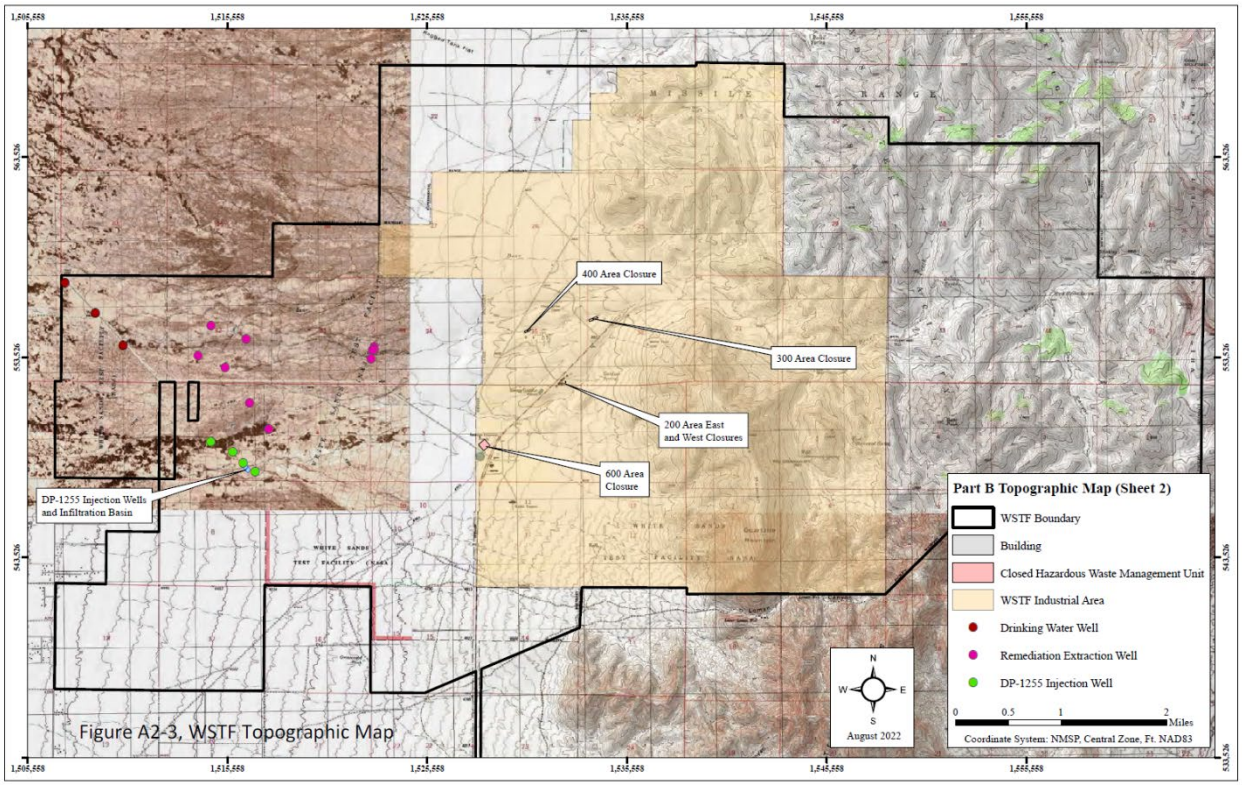


Figure A2-4. WSTF Land Use Map

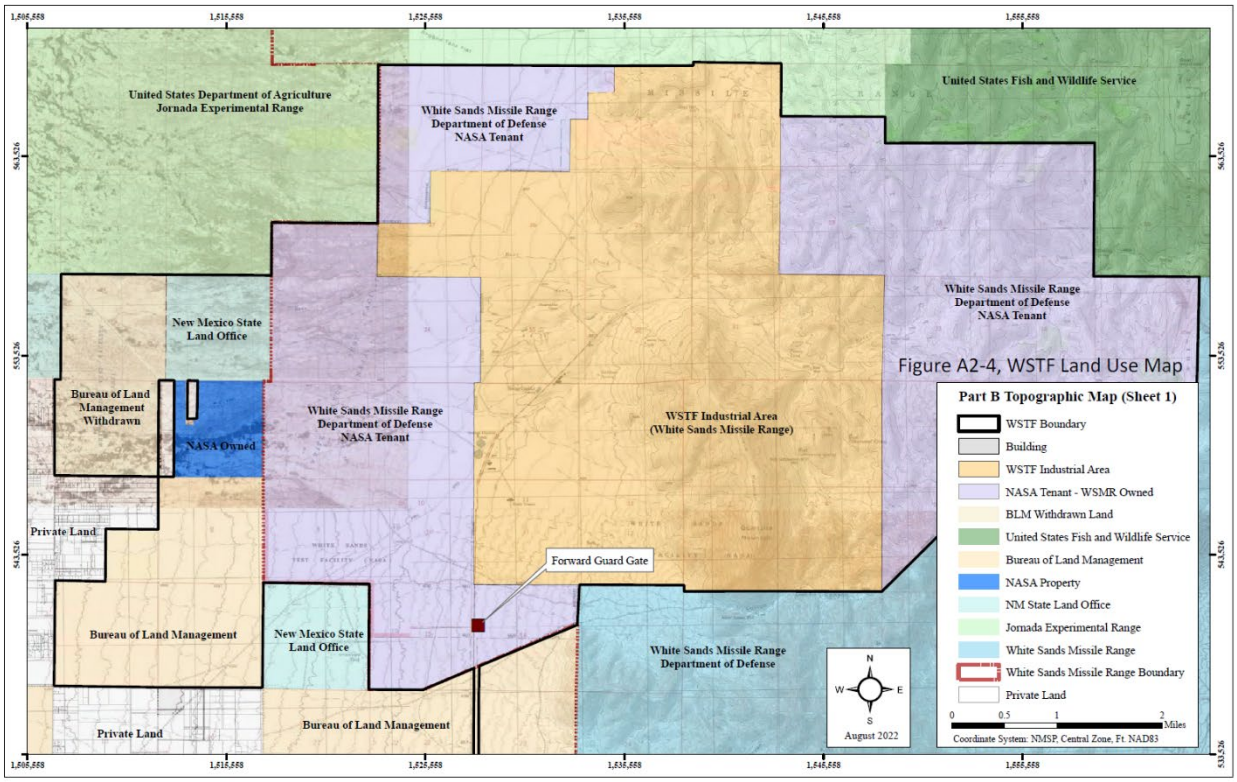


Figure A2-5. WSTF Map of SWMUs, AOC, Closed SWMUs and Closed HWMUs

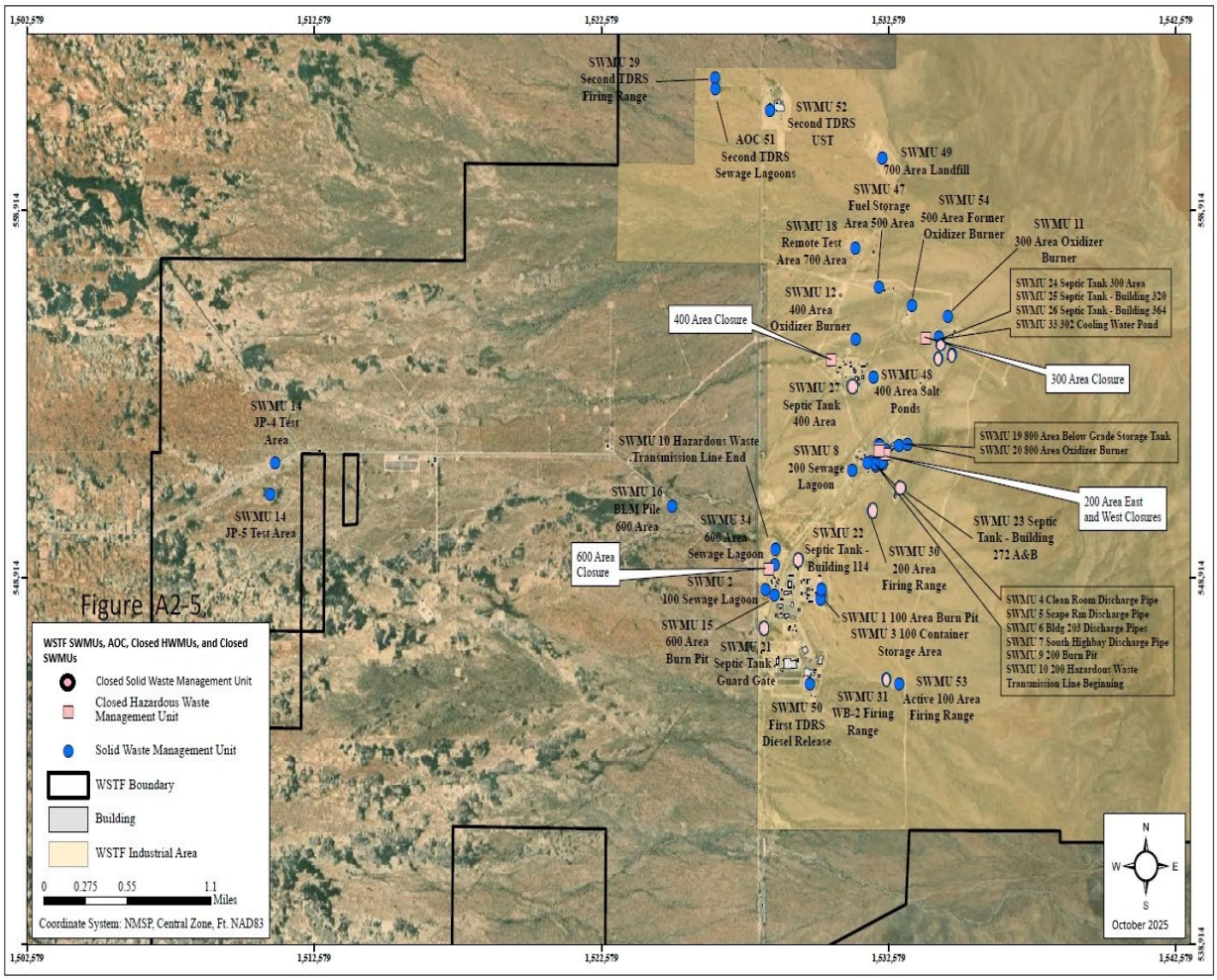
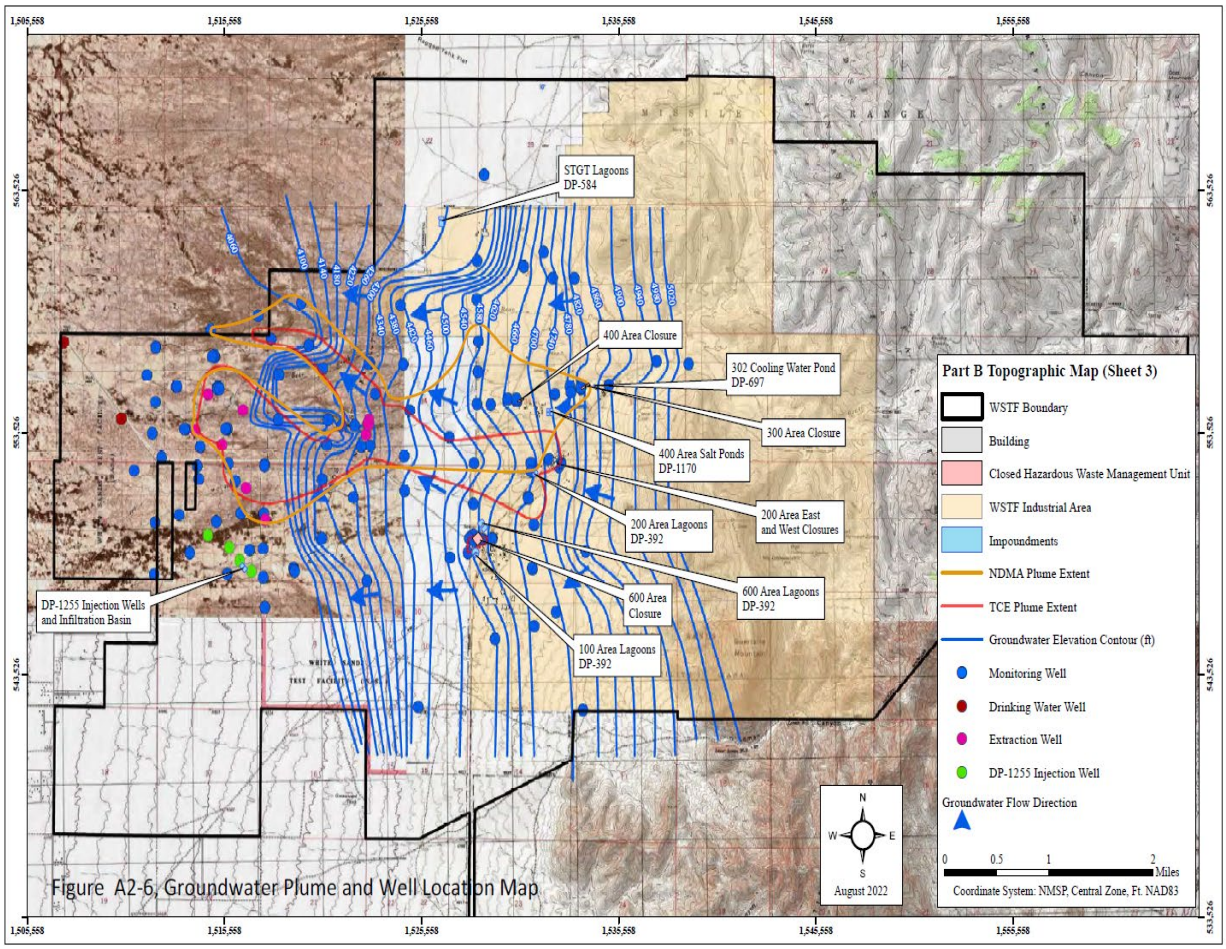


Figure A2-6. Groundwater Plume and Well Location Map



ATTACHMENT 3
Compliance Schedule

ATTACHMENT 3

Compliance Schedule

Table 3-1: Compliance Schedule

Permit Section	Requirement	Due Date
Submittals Due After Permit Issuance		
1.9.5	Permit Renewal	180 calendar days before expiration date
2.1	Hazardous Waste Generation Locations Map	January 30th of each year
2.8.5	Biennial Report	March 1st of even numbered years
3.3.1	Facility-Wide Groundwater Monitoring Plan	April 30th of each year
3.3.7	Quarterly Periodic Groundwater Monitoring Reports	April 30th, July 30th, October 30th, and January 31 of each year
3.4	Remediation System Monitoring Plan	August 1st of each year

ATTACHMENT 4
Corrective Action Status Tables

ATTACHMENT 4

Corrective Action Status Tables

Table 4-1: SWMUs and AOCs Requiring Corrective Action

Unit ID	Unit Description	Work Plan Submittal Date
SWMU 1	100 Area Burn Pit	Submitted 7/30/14
SWMU 2	100 Area Sewage Lagoon	Submitted 10/15/12
SWMU 3	100 Area Container Storage Area	Submitted 7/30/14
SWMU 4	200 Area Clean Room Discharge Pipe	Submitted 3/28/12
SWMU 5	200 Area Scape Room Discharge Pipe	Submitted 3/28/12
SWMU 6	200 Area Building 203 Discharge Pipe	Submitted 3/28/12
SWMU 7	200 Area South Highbay Discharge Pipe	Submitted 3/28/12
SWMU 8	200 Area Sewage Lagoons	Submitted 10/15/12
SWMU 9	200 Area Burn Pit	Submitted 3/28/12
SWMU 10	200 Area Hazardous Waste Transmission Lines	Submitted 6/29/15
SWMU 11	300 Area Oxidizer Burner	90 days prior to initiation of corrective action
SWMU 12	400 Area Oxidizer Burner	90 days prior to initiation of corrective action
SWMU 14	600 Area JP Remote Test Area	Submitted 8/26/13
SWMU 15	600 Area Burn Pit	Submitted 7/30/14
SWMU 16	600 Area BLM Off-Site Pile	Submitted 12/29/14
SWMU 18	700 Area High Energy Blast Facility	90 days prior to initiation of corrective action
SWMU 19	800 Area Below Grade Storage Tank	Submitted 6/25/15
SWMU 20	800 Area Oxidizer Burner	90 days prior to initiation of corrective action
SWMU 29	Small Arms Range at second TDRSS Ground Terminal (STGT)	Submitted 2/26/15
SWMU 33	300 Area Test Stand 302 Cooling Water Pond	Submitted 8/17/20
SWMU 34	600 Area Sewage Overflow Lagoons	Submitted 10/15/12
SWMU 47	500 Area Fuel Storage Area	Submitted 9/26/18
SWMU 48	400 Area Salt Ponds	90 days prior to initiation of corrective action
SWMU 49	700 Area Landfill	Submitted 12/28/17
SWMU 50	First TDRSS Diesel Release	Submitted 6/29/16
AOC 51	Second TDRSS Sewage Lagoons	Submitted 10/15/12

Unit ID	Unit Description	Work Plan Submittal Date
SWMU 52	Second TDRSS UST	90 days prior to initiation of corrective action
SWMU 53	Active Firing Range	90 days prior to initiation of corrective action
SWMU 54	500 Area Former Oxidizer Burner	August 31, 2022

Table 4-2: SWMUs and AOCs with Corrective Action Complete with Controls

Unit ID	Unit Description	Comments

Table 4-3: SWMUs and AOCs with Corrective Action Complete without Controls

Unit ID	Unit Description	Comments
SWMU 13	400 Area Aspirator Discharge Pipe	Submitted 9/21/11
SWMU 21	100 Area Septic Tank at Guard Shack	Submitted 6/27/13
SWMU 22	100 Area Septic Tank at Bldg. 114	Submitted 6/27/13
SWMU 23	200 Area Septic Tank at Bldg. 272	Submitted 6/27/13
SWMU 24	300 Area Septic Tank at Main Parking Lot	Submitted 6/27/13
SWMU 25	300 Area Septic Tank at Bldg. 320	Submitted 6/27/13
SWMU 26	300 Area Septic Tank at Bldg. 364	Submitted 6/27/13
SWMU 27	400 Area Septic Tank at Main Parking Lot	Submitted 6/27/13
SWMU 30	200 Area Small Arms Range	Submitted 2/26/15
SWMU 31	WB 2 Small Arms Firing Range	Submitted 2/26/15

Table 4-4: Hazardous Waste HWMUs

Unit ID	Unit Description	Comments
ETU	Evaporation Treatment Unit	Clean Closed
FTU	Fuel Treatment Unit	Clean Closed
700 Area OD Unit	Open Detonation Treatment Unit	Clean Closed
200 Area East Closure (Chemistry Lab Tank)	UST	Post Closure Care

200 Area West Closure (Clean Room Tanks)	USTs	Post Closure Care
300 Area Closure	Surface impoundment	Post Closure Care
400 Area Closure	Surface impoundment	Post Closure Care
600 Area Closure	Surface impoundments	Post Closure Care

ATTACHMENT 5

Hazardous Waste Management Unit Post-Closure Care

ATTACHMENT 5: Hazardous Waste Management Post-Closure Care

Table 5-1: Hazardous Waste Management Units Requiring Post- Closure Care

Unit ID	Unit Description	Inspection Schedule
200 Area East Closure (Chemistry Lab Tank)	The closed HWMU in the 200 Area consisted of two underground storage tanks, one concrete and one steel tank. The closure of the area was finalized in 1989, and the environmental closure cap cover is asphalt.	Once monthly for any closure cap erosion, cracks, potholes, settling, other damage, and general tidiness (e.g., removal of weeds). (see Permit Section 7.3.5.3)
200 Area West Closure (Clean Room Tanks)	The closed unit in the 200 Area consisted of two steel underground storage tanks. The closure of the area was finalized in 1989, and the environmental closure cap cover is a concrete floor beneath an existing building.	Once monthly for any closure cap cracks, settling, other damage, and general tidiness of closure area. (see Permit Section 7.3.5.3)
300 Area Closure	The closed units in the 300 Area consisted of two above-ground surface impoundments and a multi-chamber concrete mixing tank. The closure was finalized in 1989, and the environmental closure cap cover is an asphalt emulsion-sealed concrete bottom of the surface impoundments and a concrete cover for the mixing tank.	Once monthly for any closure cap erosion, cracks, potholes, settling, animal burrows, other damage, and general tidiness (e.g., removal of weeds and litter). (see Permit Section 7.3.5.3)

400 Area Closure	The closed units in the 400 Area are similar to the units in the 300 Area. The hazardous waste area consisted of two above ground surface impoundments and a multi-chamber concrete mixing tank. The closure was finalized in 1989, and the environmental closure cap cover is an asphalt emulsion-sealed concrete bottom of the surface impoundments and a concrete cover for the mixing tank.	Once monthly for any closure cap erosion, cracks, potholes, settling, animal burrows, other damage, and general tidiness (e.g., removal of weeds and litter). (see Permit Section 7.3.5.3)
600 Area Closure	The closed units in the 600 Area consisted of two surface impoundments. The units were closed under one cover, and the closure was finalized in 1989. The environmental closure cap cover is constructed of low permeability clay.	Once monthly for any closure cap erosion, cracks, potholes, settling, animal burrows, other damage, and general tidiness (e.g., removal of weeds and litter). (see Permit Section 7.3.5.3)