Closure Plan Liquid Propellant Evaporation/Neutralization Pits

Solid Waste Management Units 92A/B through 100

United States Army

White Sands Missile Range

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New Mexico Environment Department – Hazardous Waste Bureau

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List of Abbreviations

ASTM	American Society for Testing and Materials
bgs	below ground surface
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
COC	Chain-of-Custody
COPC	Contaminants of Potential Concern
DAF	Dilution Attenuation Factor
DMN	dimethylnitrosamine
DoD	Department of Defense
DQO	Data Quality Objectives
DRO	Diesel Range Organics
EPA	United States Environmental Protection Agency
eV	electron volt
ft	foot/feet
ft amsl	Feet Above Mean Sea Level
gal	gallon
GPS	Global Positioning System
GRO	Gasoline Range Organics
IDW	Investigation Derived Waste
IRFNA	Inhibited Red Fuming Nitric Acid
ITC	International Technology Corporation
L	liter
LPSA	Liquid Propellants Storage Area
MCL	Maximum Contaminant Levels
mg/kg	milligrams per kilogram
MMH	Monomethyl Hydrazine
NDMA	N-Nitrosodimethylamine
NELAC	National Environmental Laboratory Accreditation Conference
NMED	New Mexico Environment Department
NMSSL	New Mexico Soil Screening Level
NOD	Notice of Disapproval
PCB	polychlorinated biphenyls
PID	Photoionization Detector
POLs	Petroleum, Oils, and Lubricants
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SSG	Soil Screening Guidance
SL	Soil Screening Levels
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TPH	Total Petroleum Hydrocarbon

UDMH	Unsymmetrical Dimethyl Hydrazine
USCS	Unified Soil Classification System
USGS	U.S. Geological Survey
VOC	Volatile Organic Compounds
WSMR	White Sands Missile Range
WTS	White Sands Technical Services

1. Introduction

This Closure Plan is intended to complete the requirements for Resource Conservation and Recovery Act (RCRA) clean closure of the Liquid Propellant Evaporation/Neutralization Pits, designated as Solid Waste Management Units (SWMUs) 92A/B through 100, located in the Liquid Propellant Storage Area (LPSA) at the U.S. Army White Sands Missile Range (WSMR or Facility). The units managed hazardous waste after July 26, 1982 and therefore are hazardous waste management units that require closure in accordance with the applicable requirements of 40 CFR 265 subpart G.

The Facility is located in south central New Mexico, about thirty miles east of Las Cruces, New Mexico. WSMR is a federal facility under the command of the U.S. Army Testing and Evaluation Command (TECOM). WSMR was established in July 1945 as the White Sands Proving Ground. The property is used to test rocket, missile, and laser weapon systems. As such, the facility provides support for programs of the Army, Air Force, Navy, National Aeronautics and Space Administrations (NASA), and other government agencies.

This Closure Plan was prepared in general accordance with Permit Appendix 7 Section 7.2 of the WSMR RCRA Permit. The primary objectives of the proposed activities are to confirm that the surface and underlying soils at the ten Evaporation/Neutralization Pits do not contain hazardous constituents at concentrations greater than the NMED residential SSLs. The U.S. Army White Sands Missile Range (the Permittee) proposes the collection of confirmation samples to verify that closure performance standards were achieved.

2 Background

The 63-acre LPSA is located approximately three miles east of the Main Post area, south of Route 2 (also known as Nike Avenue) is shown in Figure 1. The ten Evaporation/Neutralization Pits, SWMUs 92A/B through 100, were constructed in the mid- to late1950s at the LPSA. Each SWMU was an unlined earthen pit, which was approximately 20 ft in diameter and 10 ft deep, that provided secondary containment for a specific product storage area (i.e., a storage pad or building). In the event of a spill in a storage area, the associated pit would collect the spilled material via a drain and pipe leading from the storage area (IT Corp., 1992, p. 2-29 to 2-30). An aerial photograph showing the former pit locations is included in Figure 2. Historically, the pits were associated with storage areas that contained Inhibited Red Fuming Nitric Acid (IRFNA); liquid propellants such as monomethyl hydrazine (MMH), unsymmetrical dimethyl hydrazine (UDMH), ammonia; and petroleum, oil, and lubricants (POLs) (AT Kearney, 1988, p. 5-93). The pit associated with the IRFNA tanks was covered with a layer of lime. In the event of a spill, the acid was intended to be flushed to the pit with water and neutralized as it percolated through the lime layer (Kearney, 1988, p.5-92).

According to drawings dated 1954 and 1955 (Clark, Drawing 16-06-142, Plates 2 and 3), the pits were associated with buildings or storage pads that may have been used to store the following substances:

92A: Nitric Acid	96: Oxidizer
92B: Empty Drums	97: Oxidizer
93: Aniline	98: Not identified
94: Empty Drums	99: Not identified
95: Nitric Acid	100: Aniline

The substances identified on the drawings could not be confirmed. No other documentation could be located identifying the substances that may have been stored in the buildings or on the pads associated with the SWMUs.

2.1 Historical Description of HWMU Site Conditions

Historical aerial photographs from 1948, 1963, 1996, 2005, and 2009 were reviewed. The pits and associated buildings or pads had not yet been constructed in 1948. The pits and the associated buildings or pads are visible on the 1963, 1996, and 2005 aerial photographs and appear relatively unchanged during this time period. In the 2009 aerial photograph, the boundaries of some of the closed pits are faintly visible and others are not visible at all.

2.2 Previous Investigations

A Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted at the LPSA pits in 1988, followed by two RCRA Facility Investigations (RFIs) and one removal action conducted between 1992 and 1995. In addition, a supplemental sampling event was conducted at SWMUs 92B and 94 in 2010 to address the NMED's specific comments on the investigation results for these two SWMUs. The close-out activities conducted in 1995 are described in the 1996 Close-out Report (Dow Environmental, 1996). The results of these activities are summarized below.

2.2.1 Facility Assessment

The 1988 RFA report documented three historical releases at SWMUs 92A/B through 100, as follows: 3,420 liters (L) of IRFNA in 1956, 19 L of UDMH in 1975, and 12 to 15 gallons (gal) of IRFNA in 1987 while filling drums from a storage tank. The 1987 spill was flushed to the containment pit, diluted, and neutralized. In addition, the RFA stated that the pit associated with the IRFNA tanks was used occasionally to neutralize nitric acid spills. This pit was covered with a layer of lime so any spilled acid would be pumped to the pit and neutralized as it percolated through the lime layer. The RFA did not provide specific information on the locations of the spills or pits used to neutralize the acid. (Kearney, 1988 p. 5-92 through 5-94).

2.2.2 Facility Investigation –Phase I

The 1992 Phase I RFI was conducted by IT Corporation at SWMUs 92A, 92B and 93 through 100. Each SWMU was evaluated independently of the others. The field activities included the following: a five-point soil vapor survey (5-7 ft below grade), a 30 ft soil boring in the center of each pit (soil samples were collected every 5 ft), and surface soil composite samples were collected from each of the ten earthen pits in conjunction with visual observations for contamination. Organic vapor measurements also were obtained from soil samples with a PID. In addition, a 25 ft deep background boring was drilled and soil samples were collected at depths of 5, 15 and 25 ft bgs. All soil samples were submitted to a chemical analytical laboratory for analysis for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and corrosivity (pH).

Evidence of past releases was not detected based on data from chemical analysis of soil samples collected from SWMUs 92A, 93, or 97 through 100. The report also stated that no significant past releases had occurred at SWMUs 92B, 95, or 96. At SWMU 94, Benzidine and N-Nitrosodimethylamine (NMDA) were detected at concentrations greater than their respective 2015 NMED residential soil screening levels. To address the contaminants observed at SWMU 94, a Phase II facility investigation was conducted as discussed below.

2.2.3 Facility Investigation – Phase II

The 1994 Phase II RFI was conducted exclusively at SWMU 94. Five soil borings were advanced (one in the center and one in each corner of the pit). Twenty-two soil samples were analyzed for VOCs, SVOCs, total petroleum hydrocarbons (TPH), pesticides/polychlorinated biphenyls (PCBs), and RCRA metals. Concentrations less than the proposed 1990 Subpart S action levels of VOCs (chloroform, total xylenes, methylene chloride, acetone, and 1, 2, 3 trichloropropane) were detected in soil samples collected from the borings. None of the detected VOC concentrations exceeded the current NMED residential SSLs. Detected concentrations of 1, 2, 3-trichloropropane and chloroform exceeded the current NMED dilution attenuation factor (DAF) 20 standard. Detection limits for various constituents exceeded the current SSLs and/or DAF 20 values.

Total petroleum hydrocarbons (TPH) were detected in all soil samples collected from the ground surface to one ft bgs at concentrations ranging from 3,400 to 22,200 milligrams per kilogram (mg/kg). Detectable concentrations of TPH were also identified in the samples collected from deeper intervals. All five of the surface soil samples and one sample obtained from a depth of four ft bgs contained TPH concentrations that exceeded the current NMED residential SSLs.

Groundwater was detected in the 30 ft deep center boring. A groundwater sample was collected from the boring and submitted for laboratory analysis. No organic constituents were detected in the groundwater sample and dissolved metals concentrations were less than their corresponding MCLs.

The WSMR contractor (Sverdrup) recommended conducting a Corrective Measures Study (CMS) to evaluate the removal of the contaminated soil. No further action was recommended for groundwater. The NMED (Kelley, 1996) and EPA (Honker, 1995) both requested further investigation of the groundwater at SWMU 94. The NMED also requested an explanation related to the detection of benzidine and NDMA during the Phase I RFI, which were not detected during the Phase II RFI.

2.2.4 Removal Action

Dow Environmental conducted a removal action and remediation at SWMUs 92A/B through 100 in 1995 (Dow Environmental, 1996). The storage area drains, piping, and shallow soils around the drain lines and unlined pits were removed. The excavated soils were sampled and analyzed for VOCs, TPH, and SVOCs. TPH was detected at a concentration greater than the applicable soil cleanup level in one sample collected from SWMU 96 at a depth of two ft bgs. The impacted soil and surrounding soil was segregated and disposed at the WSMR Landfill. The remaining soil from the SWMUs that was determined to be clean was used to backfill the trenches. Dow Environmental recommended no further action for the SWMUs.

The EPA issued a Statement of Basis in 1995 (Harris, 1995). The EPA approved a Class III Permit Modification for 24 SWMUs, which included SWMUs 92A, 93, and 95 through 100 to remove the SWMUs from the Corrective Action Permit. In the document, the EPA stated that "no hazardous constituents were detected above regulatory standards. Consequently no further action is required." An April 2000 letter from the EPA (Neleigh, 2000) stated that the notice of decision included in the Statement of Basis became effective December 29, 1995.

In a letter dated June 6, 2000 (Dinwiddie, 2000), NMED stated, "Excluding SWMU 92B and SWMU 94, NMED is not in agreement with the NFA determination and requires confirmatory sampling for nitrosoamines NDMA and DMN." NDMA and DMN are synonyms for the same compound.

2.2.5 Supplemental Sampling -2010

On May 11, 2010 supplemental soil sampling was conducted in response to the letter from NMED dated June 6, 2000 regarding SWMUs 92B and 94. Soil samples were collected from one central boring at SWMUs 92B and 94.

Soil samples were collected continuously to the total depth drilled at each location. The boring at SWMU 92B (92BSB001) was advanced to a total depth of 15 ft, and the boring at SWMU 94 was advanced to a total depth of 40 ft. Groundwater was not encountered during the supplemental sampling activities.

A total of five soil samples (including one duplicate) were collected from the boring at SWMU 92B (LPSA-92B-SB001) at depths of 0 to 1, 4 to 5, 9 to 10, and 14 to15 ft bgs. The boring at SWMU 94 (LPSA-0094-SB001) was planned to be a 35 ft deep soil boring; however, because an odor was noted in the soil from the 30 to 35 ft bgs depth interval, the boring was advanced an additional five feet to 40 ft bgs and an additional sample was collected. A total of ten soil samples (including one duplicate) were collected from the boring at SWMU 94 at depths of 0 to1, 4 to 5, 9 to 10, 14 to15, 19 to 20, 24 to 25, 29 to 30, 34 to 35, and 39 to 40 ft bgs.

The samples were submitted to a chemical analytical laboratory for analysis for gasoline range organics (GRO) and diesel range organics (DRO) by modified EPA Method 8015, and NDMA by EPA Method 8270C.

NDMA was not detected in any of the soil samples GRO was not detected in any samples obtained from boring 94SB001. Relatively low concentrations of DRO were detected in the soil samples collected from boring 94SB001 from the ground surface to one ft (5.83J mg/kg) and 9 to 10 ft (90.3J mg/kg). These concentrations less than the applicable NMED SSL for unknown oil (200 mg/kg).

3 Site Conditions

The majority of WSMR property, including most test facilities, is located within the Tularosa Basin. The Tularosa Basin is a north-south oriented, closed basin at an average elevation of 4,000 feet (ft) above mean sea level (msl). The valley floor has minimal topographic relief and surface features consist of flat sandy areas, sand dunes, basalt flows, and playas (dry lake beds). The LPSA is located near the Main Post in the southwestern corner of the installation, approximately 27 miles east-northeast of Las Cruces, New Mexico and 45 miles north of El Paso, Texas (Figure 1) (ARCADIS, 2010, p. 25). The Tularosa Basin is bounded on west side by the San Andres Mountains, San Augustin, and Oscura Mountains and on the east side by the Sacramento Mountains. WSMR covers an area that includes parts of Doña Ana, Socorro, Lincoln, Otero, and Sierra Counties, New Mexico. The Jarilla Mountains occur as minor topographic uplift on the southeastern side of the basin floor. Peaks on the eastern side of the basin reach elevations of nearly 12,000 ft above msl (Sierra Blanca Peak) and peaks on the western side of the basin reach elevations of approximately 9,000 ft above msl (Salinas Peak). A topographic divide separates the Tularosa Basin from the Hueco Basin to the south (ARCADIS, 2010, pp. 25-26).

The Tularosa Basin is internally drained with no surface water outlets. Ephemeral streams (arroyos) drain from the west into the Tularosa Basin and generally only exhibit meaningful flow after heavy precipitation events. Perennial streams predominantly drain from the east into the Tularosa Basin. Most surface drainage is toward the center of the basin (ARCADIS, 2010, p. 26). Very little permanent surface water exists at WSMR due to the low annual precipitation, high evapotranspiration rates, and high infiltration characteristics of the soil. During the summer season, when thunderstorm activity is most common, playas within the basin may contain standing water.

3.1 Surface Conditions

The site-specific topography map is shown in Figure 3. Based on this map and as-built drawings for the facility (Clark, 1954-1955), the ground surface within the fenced area of the facility where the pits were located slopes downward to the east-southeast from an elevation of approximately 3996 to 3975 ft above msl. Vegetation is sparse and the ground surface is generally covered with windblown sand.

3.2 Subsurface Conditions

3.2.1 Geology

WSMR lies within the Mexican Highland Section of the Basin and Range Province, which is characterized by a series of tilted blocks forming longitudinal, asymmetric ridges or mountains and broad intervening basins. The geology of WSMR consists predominantly of the Tularosa Basin and surrounding mountain ranges. The Tularosa Basin contains thick sequences of Tertiary and Quaternary age alluvial and bolson-fill deposits, which are coarse- to fine-grained unconsolidated sediments. These sediments, more than 5,000-ft thick in some areas, consist mainly of silt, sand, gypsum and clay weathered from the surrounding mountain ranges (ARCADIS, 2010, p. 26).

The nature of the bolson-fill deposits varies both laterally and vertically throughout the Tularosa Basin. Coarse-grained, poorly-sorted sediments deposited near mountain fronts grade into fine-grained, well sorted sediments toward the center of the basin. Sediments further from the mountain fronts also contain a greater percentage of clay and gypsum. Vertically, the sediments are reported to become finer-grained and more consolidated until reaching a laterally continuous clay unit at about 1,000 ft bgs (WTS, 2006, p. 19).

The LPSA is situated on the western edge of the Tularosa Basin on the distal portion of the alluvial fan complex extending to the west from the Organ Mountains. In general, the stratigraphy is represented by unconsolidated to partially consolidated, fine to medium-grained sand with varying amounts of silt and clay. Caliche is present as discrete layers and nodules throughout the stratigraphic section. Deposits observed in the vicinity of the LPSA are generally comprised of poorly sorted, unconsolidated coarse- to fine-grained sands and silt with caliche nodules and interbedded clay.

3.2.2 Hydrogeology

The shallow subsurface (to depths up to 40 ft bgs) at the LPSA facility was generally characterized by soil borings advanced during Phase I RFI (ITC, 1992) and 2010 supplemental soil sampling activities. Sediments in the upper 40 ft at the Site consist of sand, silt, and lean clay. The boring log for test well T-27 documented sediments consisting of clay and silty clay with caliche from the surface to a depth of 260 ft bgs (USGS, 1985).

3.2.3 Ground Water

Groundwater flow in the vicinity of the site is generally toward the basin center from the basin margins with an axial pattern of southward flow along the western, deepest side of the basin.

On September 14, 2010, water levels in nearby Test Wells T-27 and T-28A (Figure 2) were measured at 164.20 and 157.05 ft bgs, respectively. Based on ground level elevations provided in the 1999 groundwater survey, the elevation of the potentiometric surface in the vicinity of the LPSA is approximately 3,811 ft above msl. The groundwater flow in the area of the LPSA is easterly to southeasterly (MEVATEC, 2000, Figure 3-1). Although groundwater was unexpectedly discovered during soil sampling activities at SWMU 94 in 1993 (SEI, 1994, pp. 6.21-1 through 6.22-1), no groundwater was encountered during the supplemental soil sampling activities conducted in 2010.

4 Scope of Activities

The purpose of the closure investigation is to obtain the data necessary to demonstrate clean closure. The following activities are designed to confirm that the clean closure performance standard has been achieved at the site:

1. Determine the locations of each pit and mark the approximate center of each pit.
2. Conduct a survey to evaluate for the presence of underground utilities to clear each boring location.
3. Survey the location and ground surface elevation of each soil boring.

4. Advance one soil boring at the center of each pit (SWMUs 92A/B through 100) to depths of approximately 15 feet bgs, or deeper if evidence of contamination is observed, using either direct-push or hollow-stem auger drilling equipment.
5. Collect soil cores continuously or at two-ft intervals to the total depth drilled at each location.
6. Prepare a detailed log of the soils observed in each boring in the field.
7. Field screen each soil sample for visual and olfactory evidence of contamination and for the presence of volatile organic compounds using headspace vapor measurements in general accordance with Permit Attachment 5 Section 5.2.2.d.
8. Submit soil samples for selected chemical analyses as described in Section 5 below.
9. If groundwater is encountered in any boring, collect a sample, if possible, for chemical analysis as described in Section 5 below.
10. Abandon each soil boring using hydrated bentonite or a cement-bentonite slurry.

5 Investigation Methods

Prior to commencing the sampling activities, the Permittee shall determine the locations of the former pits using aerial photographs, historical site plans and LPSA as-built plot plan drawings (Clark, 1954-1955), physically identify the approximate center of each pit and mark the centers of each pit with a flag or stake. Each SWMU location and the associated boring locations shall be surveyed using a registered New Mexico professional land surveyor in accordance with the State Plane Coordinate System in accordance with Permit Appendix 5 Section 5.2.2f (Sample Point and Structure Location Surveying). The boring locations will be cleared of all utilities prior to drilling.

All field work will be conducted in accordance with a Health and Safety Plan prepared by a qualified industrial hygienist or other qualified individual and will conform to WSMR health and safety protocols.

One soil boring shall be advanced in the center of each pit. The borings will be advanced using either direct-push or hollow-stem auger drilling equipment. Soil cores will be collected continuously to the total depth drilled at each location. The soil cores will be examined visually and the soils shall be described according to the Unified Soil Classification System (USCS), American Society of Testing and Materials (ASTM) Standard D 2487 and D2488. A detailed log of each boring shall be recorded in the field by a qualified geologist or engineer.

Once total depth has been attained and soil samples have been collected, the soil borings will be plugged to within six inches of the ground surface using hydrated bentonite or a cement-bentonite slurry. The final six inches of the borings will be filled with compacted soil.

5.1 Soil Sampling

Soil samples will be collected from each boring for field screening and chemical analysis at depth intervals of 0 - 1 ft, 2 - 3 ft, 6 - 7 ft, 9 - 10 ft, and 14 - 15 ft bgs or until contact is made with native soil. If field screening evidence of contamination is observed that indicates that the vertical extent of contamination has not been defined in any boring, the boring will be advanced until field screening indicates that clean soil has been encountered. Additional soil samples will be collected for laboratory analyses at a minimum of five-ft intervals to the total depth of the boring, if the depth of any boring is increased. A soil sample collected from the total depth of each boring shall be submitted for laboratory analyses.

A portion of each soil sample will be screened in the field for visual and olfactory evidence of contamination and for the presence of volatile organic compounds using headspace vapor measurements. Headspace vapor screening will be conducted by placing the soil sample in a plastic sample bag or a foil-sealed container allowing space for ambient air. The container will be sealed and then shaken gently to expose the soil to the air trapped in the container. The sealed container will be allowed to rest for a minimum of five minutes while vapors equilibrate. Vapors present within the sample bag headspace will then be measured using a photoionization detector (PID) equipped with a 10.2 or 10.6 electron volt lamp. The probe of the instrument will be inserted into a small opening in the bag or directly through the foil. The maximum value measured in each sample and the ambient air temperature shall be recorded on the boring log for each sample.

Nitrile or other protective gloves will be worn when collecting all samples. New disposable gloves shall be used to collect each sample. Soil samples shall be transferred directly from the sampling device into appropriate clean laboratory-supplied sample containers, with the exception of samples for volatiles analysis, which shall be collected directly from the sampling device using an Encore® or equivalent sampler. The samples will be immediately placed in a cooler with ice and kept cool during storage and shipment. Chain-of-custody procedures shall be followed when storing and shipping the samples to the analytical laboratory. Sample collection and handling procedures will be conducted in accordance with Permit Attachment 5 Section 5.2.2j.

All soil samples will be submitted to a NELAC certified laboratory for chemical analyses as described below:

1. NDMA using EPA Method 8270C except the samples collected from the SWMU 92B and 94 borings.
2. Fluoride and nitrate/nitrite using EPA Method 9056A.
3. GRO, DRO and oil-range organics (ORO) using modified EPA Method 8015 except the samples collected from SWMU 94.
4. RCRA metals using EPA Methods 6020A and 7471B (mercury). The samples collected from SWMU 94 will not be analyzed for metals.
5. Benzidine using EPA Method 8325.

Exceptions to soil sample chemical analyses are based on the results of soil sampling conducted in 2010.

If ground water is encountered in any boring during drilling a groundwater sample will be collected, if possible, using either a disposable polyethylene bailer or a peristaltic pump. The samples shall be transferred from the sampling device directly to laboratory-supplied, appropriately preserved sample containers. The samples will be immediately placed in a cooler with ice and kept cool during storage and shipment. Chain-of-custody procedures shall be followed when storing and shipping the samples to the analytical laboratory. Sample collection and handling procedures will be conducted in accordance with Permit Attachment 5 Section 5.2.2j.

All groundwater samples will be analyzed for the following constituents in the following order of priority, based on the volume of available water; 1) volatile organic compounds (VOCs) by EPA Method 8260B, 2) DRO and ORO by modified EPA Method 8015, 3) NDMA by EPA Method 8270C and 4) nitrate/nitrite by EPA Method 9056A.

All analytical laboratory detection and reporting limits for soil and groundwater analyses must be less than the corresponding NMED SSL for each analytical method-specific analyte.

5.2 Quality Assurance/Quality Control Sampling

Field QA/QC samples shall be collected at the frequencies described below in general accordance with Section 5.2.2.e.

Duplicate soil samples will be collected at a frequency of ten percent or a minimum of one per day. The duplicate samples shall be collected by splitting the samples along the same depth interval to the extent possible.

Equipment blanks will be collected at a frequency of five percent or a minimum of one per day. The equipment blanks will be collected by pouring distilled water over previously decontaminated sampling equipment (such as a split-spoon) and catching the rinsate in a laboratory container. The equipment blank will be analyzed for the same parameters as the primary soil samples.

One field blank will be collected each day by pouring distilled water directly into sample containers, at the site while work is in progress. The field blank is intended to detect any air-borne constituents that might affect sampling results. The field blank will be analyzed for the same parameters as the primary soil samples.

A laboratory-prepared trip blank shall accompany all shipping and storage containers intended for VOC analysis.

5.3 Decontamination Procedures

All down-hole boring equipment and all reusable sampling equipment will be decontaminated in accordance with the procedures in Appendix 5, Section 5.2.3 of the Permit prior to use at each boring and sampling effort. Decontamination will be conducted at a designated on-site location. The decontamination area will be lined with polyethylene sheeting to contain incidental spills. Larger drilling equipment that may come in contact with the borehole will be decontaminated using high-pressure water wash. All decontamination fluids shall be contained on site pending testing for disposal.

To the extent possible, disposable sampling equipment will be used to collect soil and groundwater samples. All reusable equipment (e.g., split barrel samplers, sampling spoons) will be decontaminated using the following procedures:

1. Brush equipment with a wire or other suitable brush, if necessary, to remove large particulate matter;
2. Rinse with potable tap water;
3. Wash with nonphosphate detergent (e.g.,Liqui-Nox®);
4. Rinse with tap water
5. Double rinse with deionized water.
6. All decontamination solutions shall be collected and stored temporarily in drums
7. Decontamination procedures and the cleaning agents used will be documented in the daily field log.

5.4 Instrument Calibration

Field instruments will be calibrated to the manufacturer's specifications in accordance with Permit Appendix 5, Section 5.2.4d. Calibration checks will be conducted at a minimum of every 4 hours during field activities. If the calibration check indicates that the measurements are off by more than five percent of the gas standard's concentration, the instrument will be re-calibrated until the measurement is within five percent of the standard. All calibration data will be recorded in the field logbook. If field equipment becomes inoperable, it will no longer be used, and a properly calibrated replacement instrument will be used.

5.5 Documentation

All field activities will be recorded in the field log book and/or on appropriate forms, as required in Appendix 5, Section 5.2.6.a of the Permit. The daily record of field activities shall include:

- Site or unit description
- Date
- Time of arrival and departure
- Field sampling team members, including subcontractors and visitors
- Weather conditions
- Daily activities and times conducted
- Observations
- Record of samples collected with sample designations and locations specified
- Photographic log
- Field monitoring data, including health and safety monitoring if conditions arise that require modifications to required work
- Equipment used and calibration records
- List of additional data sheets and maps completed
- An inventory of wastes generated and the method of storage and disposal
- Signature of personnel completing the field record.

5.6 Management of Investigation Derived Wastes

IDW expected to be generated during the sampling activities include drill cuttings, decontamination fluids, and miscellaneous wastes such as used disposable sampling equipment, plastic sheeting and personal protective equipment (PPE).

All IDW will be containerized on site. Drill cuttings will be stored in drums or roll-off bins. Liquid wastes, and general refuse will be segregated and stored in drums. The drill cuttings will be disposed at an appropriate disposal facility based on the results of soil boring sample chemical analyses. Samples of the liquids will be submitted to a laboratory for chemical analyses of VOCs by EPA Method 8260B, DRO and ORO by modified EPA Method 8015, NDMA by EPA Method 8270C and RCRA metals by EPA Methods 6020A and 7471B prior to disposal at an appropriate facility. Disposable sampling equipment, plastic sheeting and PPE will be disposed as solid waste.

6 Reporting

A Closure Report summarizing the field investigation activities and the results of the investigation will be prepared in accordance with the reporting requirement outlined in Permit Appendix 7, Section 7.3. The soil chemical analytical data shall be compared to the 2015 NMED Risk Assessment Guidance (as it may be updated) residential SSLs and default DAFs. Cumulative risk also shall be evaluated in accordance with the NMED Risk Assessment Guidance, if multiple compounds are detected at any SWMU. In addition, an ecological risk evaluation shall be conducted in accordance with the NMED Risk Assessment Guidance to demonstrate that there is no unacceptable risk to ecological receptors at the site

In order to demonstrate metals are within the natural background concentration, a NMED-approved site-specific background study is required. A work-plan will be submitted for NMED review and approval prior to commencing work.

7 Certification of Closure

Within 60 days after receipt of NMED approval of the Closure Report, the Permittee shall submit a certification of closure in accordance with Permit Section II.O.6 and 40 CFR 264.115.

8 Survey Plat

The Permittee shall submit a survey plat of the hazardous waste management units (SWMUs 92A/B though 100) in accordance with Section II.O.7 of the Permit and 40 CFR 264.116 as an attachment to the certification of closure submittal.

9 Schedule

WSMR will submit the site-specific background study work plan to NMED for review and approval no later than **May 1, 2017**.

WSMR anticipates that the background and closure field investigations will be completed by **December 1, 2017**. The Permittee shall submit the Background Study Report no later than **June 30, 2018**. A Closure Report summarizing the field investigation activities and the results of the closure investigation, the Certification of Closure and the Survey Plat shall be submitted no later than **September 30, 2018**.

10 References

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