DOE/NV/25946--894

2010 SOIL CHARACTERIZATION REPORT FOR THE AREA 11 EXPLOSIVE ORDNANCE DISPOSAL UNIT NEVADA TEST SITE

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

Prepared by
National Security Technologies, LLC

February 2010

DISCLAIMER

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
DOE/NV	U.S. Department of Energy, Nevada Operations Office
EMS	Environmental Management System
EODU	Explosive Ordnance Disposal Unit
EPA	Environmental Protection Agency
HMX	Cyclotetramethylenetetranitramine
NDEP	Nevada Division of Environmental Protection
NTS	Nevada Test Site
PETN	Pentaerythritol Tetranitrate
RCRA	Resource Conservation and Recovery Act
RDX	Cyclotrimethylenetrinitramine
TCLP	Toxicity Characterization Leaching Procedure
TNT	Trinitrotoluene

1.0 Introduction

The Explosive Ordnance Disposal Unit (EODU), located in Area 11 of the Nevada Test Site (NTS), is an explosive detonation unit for the treatment of onsite generated waste explosives that are hazardous waste as defined under Title 40 Code of Federal Regulations (CFR) Part 261.23(a) (6), (7), and (8), and also 40 CFR 265.382.

The EODU began operations on May 12, 1965, for the open burning and detonation of waste explosives. In the 1980s open burning of waste explosives was discontinued. In May 1995, the Nevada Division of Environmental Protection (NDEP) issued a Resource Conservation and Recovery Act (RCRA) Permit (NEV HW0009) to the U.S. Department of Energy, Nevada Operations Office (DOE/NV) for the thermal treatment of waste explosives at the EODU. This unit is currently operated according to the RCRA Part B Permit (NEV HW0021, November 2005), the NTS Class II Air Quality Operating Permit (AP9711-2557), U.S. Department of Energy orders, and other applicable federal and state regulations.

The controlled area containing the unit includes approximately 8.1 hectares (20 acres) of land located in the Massachusetts Mountains, between Frenchman Flat and Yucca Flat. The EODU consists of three graded areas including a detonation pit surrounded by an earthen pad approximately 20 meters (61 feet) by 30 meters (98 feet); a storage magazine, which is also used as a satellite accumulation area for waste explosives; and a firing point that is located approximately 1.4 kilometers (0.86 miles) west of the detonation pad on the access road.

Most of the explosives detonated at the EODU are water-gel (Pentaerythritol Tetranitrate [PETN]) and slurry explosives. Other explosives detonated include Trinitrotoluene (TNT), Cyclotrimethylenetrinitramine (RDX) pellets, cyclotetramethylenetetranitramine (HMX), small arms ammunition, solid rocket propellant, and black powder. Explosive waste is generated by tunneling and construction activities, high explosives testing, experimental explosives testing, special projects, and the security force firing range.

No radioactive or radioactive-contaminated materials are accepted or detonated at the EODU. The unit has an annual operations capacity of 1,870 kilograms (4,123 pounds) of waste explosive. The process design capacity of the EODU is approximately 45.4 kilograms/hour (100 pounds/hour).

In 1994, both NDEP and DOE/NV agreed that soil samples should be taken from the detonation pit to determine the impact to soils from historic operations. In January 1995, DOE/NV submitted the first characterization report. This characterization indicated the presence of Toxicity Characterization Leaching Procedure (TCLP) metals and explosive residues. The RCRA Permit issued in May 1995 required that this characterization be repeated on a five-year cycle.

2.0 Purpose

This soil characterization report summarizes sampling activities and analytical results, provides copies of laboratory data reports, and meets the requirements of Section IV.G.2 of the Permit (NEV HW0021, November 2005) and Sections P.3.d.7.b and P.3.n of the Permit Application (DOE/NV--1053-VOL 4, May 2005).

3.0 Scope

The objective of soil characterization is to attempt to establish baseline conditions and to determine if the continued operations of the EODU are adversely impacting the environment adjacent to the unit. The characterization data may also provide supporting data for the eventual closure of the unit. Four areas were identified for sampling: (1) the detonation pad, (2) the detonation pit, (3) the area designated as downwind, and (4) the area designated as background.

4.0 Monitoring Activities

The soil sampling was conducted on November 3, 2009. Personnel conducting the sampling were briefed on unit conditions and operations safety by the EODU Operations Supervisor prior to entering the unit. Sampling locations are noted in Figure 1. The background location selected was approximately 31 meters (100 feet) northwest of the detonation pit.

The surface and subsurface samples were collected from each location in a systematic manner. After surface gravel and debris were removed, clean stainless steel trowels were used to gather the surface sample from approximately 0 to 15 centimeters (0–6 inches) below the surface. Each subsurface sample was collected from approximately 15 to 30 centimeters (6–12 inches) below the surface in the same manner as the surface sample. All samples were immediately containerized, labeled, and placed in a cooler with ice. Chain of custody procedures were followed as prescribed by Environmental Protection Agency (EPA) Publication SW-846.

Samples from each location were analyzed for the following constituents using EPA-approved methods. The background location was not required to be sampled for explosives residue.

Constituent	Analytical Method
Explosive Residues (nitroglycerin)	8332
PETN, RDX, HMX, TNT	8330
TCLP Metals	6010
Ignitability (flashpoint)	1010
Nitrates	300.0
Total Petroleum Hydrocarbon (diesel range)	8015M

5.0 Analytical Results

A summary of the sample results are provided in Table 1. Variations in the sample results from previous sampling events are indicative of re-grading of the detonation pad every one to two years. Non-detect concentrations recorded on laboratory documentation indicate the analytical method's reporting limit.

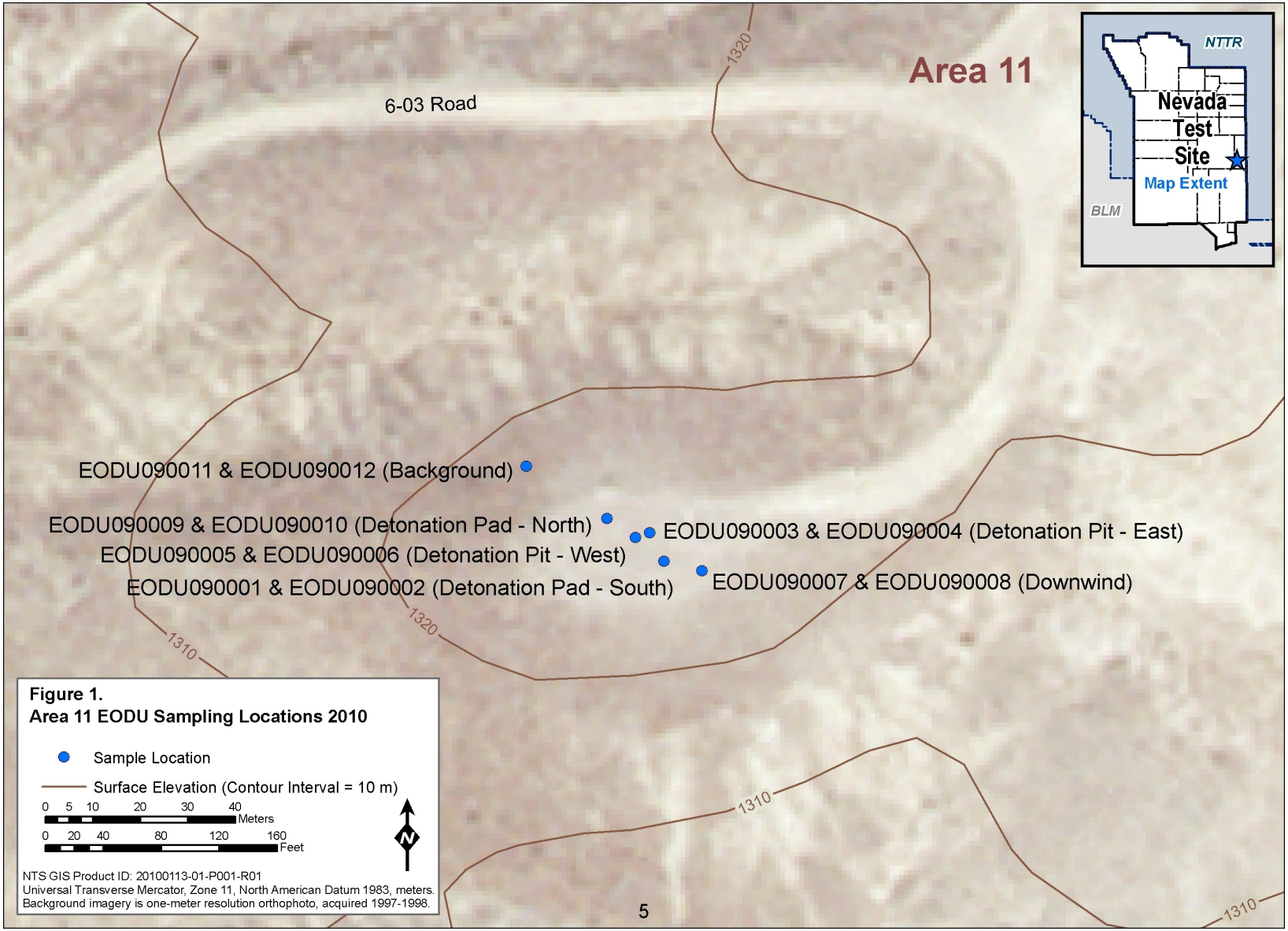

Figure 1. Area 11 EODU Sampling Locations 2010

Table 1. Area 11 EODU Analytical Results

Sample Date: November 3, 2009

Method	Analyte	Unit	Sample Concentrations											
			Background		Downwind		Detonation Pad (North)		Detonation Pad (South)		Detonation Pit (West)		Detonation Pit (East)	
			Surface	Subsurface	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface	Surface	Subsurface
Sample No: EODU0400##			11	12	7	8	9	10	1	2	5	6	3	4
8330	HMX	ug/kg	NS	NS	ND	ND	1,280	915	ND	ND	732	1,100	808	628
	RDX	ug/kg	NS	NS	ND	ND	10,700	5,580	ND	ND	3,670	5,000	2,140	2,450
	PETN	ug/kg	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	12,300	ND
	TNT	ug/kg	NS	NS	ND	ND	ND	ND	ND	ND	ND(J)	ND(J)	370	ND
8332	Nitroglycerin	ug/kg	NS	NS	ND	ND	ND	ND	ND	ND	ND	790	7,950	3,240
8015M	TPH (Diesel)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND(J)	ND(J)	6,550	ND (J)
6010	Arsenic	ug/L	ND	ND	32.9(JD)	32.1(JD)	68(JD)	51.3(JD)	78.7(JD)	110(D)	83.9(JD)	84.4(JD)	466(JD)	38.3(JD)
	Barium	ug/L	225(D)	215(D)	125(D)	224(D)	128(D)	93.8(D)	25(D)	32(D)	110(D)	110(D)	126(D)	114(D)
	Cadmium	ug/L	ND	ND	ND	ND	3.4(JD)	ND	ND	ND	ND	10.7(JD)	4.2(JD)	7.3(JD)
	Chromium	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	8.1(JD)	8.5(JD)	ND	7.7(JD)
	Lead	ug/L	42.7(D)	ND	ND	ND	103(D)	364(D)	ND	ND	95.5(D)	179(D)	1,100(D)	1,580(D)
	Mercury	ug/L	ND	ND	ND	0.08(J)	ND	ND	ND	ND	ND	34.2(D)	31(JD)	ND
	Selenium	ug/L	ND	ND	ND	ND	53.8(JD)	36.2(JD)	ND	ND	ND	ND	ND	ND
	Silver	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1010	Ignitability	°F	All samples were heated to 200°F and did not ignite.											
300.0	Nitrates	mg/kg	12.3	4.2	14.9	10.3	747	320	10.3	9.1	122	96.9	57.9	35.1

NS - Not Sampled

ND - None Detected

J - Present below detection limit (estimated value)

D - Identified as a secondary dilution factor

Notes - Surface/subsurface samples from locations other than “Background” were analyzed for explosive residues, which resulted in two sample designations for these locations.

6.0 Conclusions

In accordance with Section P.3.d.7.b.3 of Volume 4 of the Permit Application, the data has been organized and evaluated in terms of the following:

1. **The Presence of Contaminated Soils on Site** – Soil contamination has been identified in the four sampling events (1995, 2000, 2005, and 2009).
2. **The Chemical Nature of Identified Contaminants in the Soil** – Explosive residues, TCLP metals, nitrates, and nitroglycerin were detected in the samples. The background sample contained barium and lead, while arsenic and chromium (detected in 2005) were absent. Cadmium was detected in fewer samples and at lower levels than in 2005. The detonation pit samples as a group exhibited the highest concentrations of explosive residue as expected. Variability between previous sampling events and the 2009 results can be attributed to re-grading of the detonation pad, a normal maintenance activity.
3. **Physical Properties of the Shallow Subsurface Material in the Unit Vicinity** – The shallow subsurface material is colluvium.
4. **The Need for Additional Characterization of the Site** – Additional characterization of the site is not needed at this time. Sampling under the Part B Permit will continue on a five-year schedule until closure.