

**DUGWAY PERMIT**

**MODULE VII**

**ATTACHMENT 12**

**SWMU 021  
POST-CLOSURE PLAN**

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## LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

bgs	Below Ground Surface
CFR	Code of Federal Regulations
CMI	Corrective Measures Implementation Plan
CMIR	Corrective Measures Implementation Report
CWM	Chemical Warfare Material
DPG	Dugway Proving Ground
DSHW	Divisions of Solid and Hazardous Waste
Dugway	Dugway Proving Ground
DWQ	Division of Water Quality
ft	Feet
GCL	Geosynthetic Clay Liner
GMA	Groundwater Management Area
µg/l	micrograms per liter
mg/l	milligrams per liter
msl	Mean Sea Level
OE	Ordnance and Explosive
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
Shaw	Shaw Environmental, Inc.
SWMU	Solid Waste Management Unit
TDS	Total Dissolved Solids
UAC	Utah Administrative Code
UDEQ	Utah Department of Environmental Quality
USGS	United States Geological Survey
UXO	Unexploded Ordnance

## 1.0 INTRODUCTION

The two objectives of this Post-Closure Plan are; 1) to ensure that Dugway Proving Grounds (DPG or Dugway) complies with the Post-Closure Permit issued by the State of Utah in accordance with 40 Code of Federal Regulations (CFR) §264.117, with respect to post-closure inspection requirements; and, 2) outline the requirements needed to prevent exposure or contact with waste left in place at this landfill site. To meet these objectives, this Post-Closure Plan provides detailed information regarding the location, regulatory criteria, and post-closure inspections at Solid Waste Management Unit (SWMU) 021, herein referred to as DPG-021. Post-closure requirements will continue for a minimum of 30 years after closure of DPG-021. The post-closure care period may be extended or shortened, as deemed necessary (40 CFR §264.117(a)(2)).

In accordance with Title 40 CFR §270.28 and Utah Administrative Code (UAC) R315-3-2.19, the Post-Closure Plan is required to include specific information for a closed facility. As applicable to DPG-021, the information requirements include:

- General description of the facility;
- Description of security procedures;
- General inspection schedule;
- Preparedness and Prevention Plan;
- Facility location information (including seismic and flood plain considerations);
- Closure Plan or Closure Proposal;
- Certificate of Closure;
- Topographic map, with specific scale;
- Summary of groundwater monitoring data; and
- Identification of uppermost aquifer and interconnected aquifers.

Table 1 provides the regulatory citations for the general information requirements and the specific locations in this Post-Closure Plan where the specific information is presented.

**Table 1: Summary of DPG-021 Post-Closure Information Requirements  
 Under 40 CFR §270.14, and UAC R315-3-2.5**

<b>Regulation Citation</b>	<b>Requirement Description</b>	<b>Location Requirement is Addressed</b>
40 CFR §270.14(b)(1) UAC R315-3-2.5(b)(1)	General Description of the Facility	Section 2.0
40 CFR §270.14(b)(4) UAC R315-3-2.5(b)(4)	Description of Security Procedures	Section 3.0
40 CFR §270.14(b)(5) UAC R315-3-2.5(b)(5)	General Inspection Schedule	Section 6.0, Module VII Table VII-3, and Module VII Form B
40 CFR §270.14(b)(6) UAC R315-3-2.5(b)(6)	Preparedness and Prevention	Section 3.0

**Table 1 (Continued): Summary of DPG-021 Post-Closure Information Requirements Under 40 CFR §270.14, UAC R315-3-2.19, and UAC R315-3-2.5**

<b>Regulation Citation</b>	<b>Requirement Description</b>	<b>Location Requirement is Addressed</b>
40 CFR §§270.14(b)(11)(i-ii, v) UAC R315-3-2.5(b)(11) (i-ii, v)	Facility Location Information Applicable seismic standard	Section 4.0
40 CFR §§270.14(b)(11) (iii-v) UAC R315-3-2.5(b)(11) (iii-v)	Facility Location Information 100-year floodplain	Section 5.0
40CFR §270.14(b)(13) UAC R315-3-2.5(b)(13)	Copy of the Closure Proposal	RCRA Phase II RFI was approved on 04/28/2005. No public comments were received.
40 CFR §270.14(b)(14) UAC R315-3-2.5(b)(14)	Closure Certification and Notification	Section 2.7 and Appendix A.
40 CFR §270.14(b)(16) UAC R315-3-2.5(b)(16)	Post-Closure Cost Estimate	Federal Facilities are exempt from this requirement.
40 CFR §270.14(b)(18) UAC R315-3-2.5(b)(18)	Proof of Financial Coverage	Federal Facilities are exempt from this requirement.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (i)	Topographic Map Map Scale and Date	Figure 3 (1 inch = 1000 feet).
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (ii)	Topographic Map 100-year floodplain area	Section 5.0; DPG-021 is not located within a verified 100-year floodplain area.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (iii)	Topographic Map Surface waters including intermittent streams	Figure 3
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (iv)	Topographic Map Surrounding land uses	DPG-021 is within a military base. There are no nearby operations in the vicinity of DPG-021.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (v)	Topographic Map A wind rose (i.e., prevailing windspeed and direction)	There are no residential populations abutting DPG-021. The closest residential area is English Village (approximately 13 miles away). A wind rose is not deemed necessary for DPG-021.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (vi)	Topographic Map Orientation of Map, North Arrow	Figure 3
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (vii)	Topographic Map Legal boundaries of the hazardous waste management facility	Figure 3
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (viii)	Topographic Map Access control, fence, gates	Figure 3. The site is not enclosed by a fence.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (ix)	Topographic Map Injection and withdrawal wells	Figures 2 and 3
40 CFR §270.14(b)(19)	Topographic Map	Figure 4. DPG-021 is graded to

**Table 1 (Continued): Summary of DPG-021 Post-Closure Information Requirements  
Under 40 CFR §270.14, UAC R315-3-2.19, and UAC R315-3-2.5**

<b>Regulation Citation</b>	<b>Requirement Description</b>	<b>Location Requirement is Addressed</b>
UAC R315-3-2.5(b)(19) (xi)	Barriers for drainage or flood control	drain surface water away from the engineered covers. There are no barriers to drainage or flood control.
40 CFR §270.14(c) UAC R315-3-2.5(c)(1)	Groundwater Monitoring Information Summary of Groundwater Data	Final Phase II Resource Conservation and Recovery Act Facility Investigation (RFI) Report, Section 2.2.4
40 CFR §270.14(c) UAC R315-3-2.5(c)(2)	Groundwater Monitoring Information Identification of uppermost aquifer	Final Phase II RFI Report, Section 2.2.1
40 CFR §270.14(c) UAC R315-3-2.5(c)(3)	Groundwater Monitoring Information Delineation of the Waste Management Area	Figure 3
40 CFR §270.14(c) UAC R315-3-2.5(c)(4)	Groundwater Monitoring Information Extent of Plume	Final Phase II RFI Report, Section 2.2.4
40 CFR §270.14(c) UAC R315-3-2.5(c)(5)	Groundwater Monitoring Information Detailed Plans/Engineering Report for Proposed Groundwater Program	Post-closure groundwater monitoring at DPG-021 is not required.
40 CFR §270.14(c) UAC R315-3-2.5(c)(6)(i)	Groundwater Monitoring Information Proposed List of Parameters	Post-closure groundwater monitoring at DPG-021 is not required.
40 CFR §270.14(c) UAC R315-3-2.5(c)(6)(ii)	Groundwater Monitoring Information Proposed Groundwater Monitoring System	Post-closure groundwater monitoring at DPG-021 is not required.
40 CFR §270.14(c) UAC R315-3-2.5(c)(6)(iii)	Groundwater Monitoring Information Background Values	Post-closure groundwater monitoring at DPG-021 is not required.
40 CFR §270.14(c) UAC R315-3-2.5(c)(6)(iv)	Groundwater Monitoring Information A description of the Proposed Sampling	Post-closure groundwater monitoring at DPG-021 is not required.

## 2.0 FACILITY DESCRIPTION

The following provides a general description of DPG-021, also known as the Disposal Site at North Camelsback Ridge at DPG, as required by UAC R315-3-2.5(b)(1) (Figures 1 and 2).

## **2.1 DPG-021 LOCATION AND HISTORY**

DPG-021 is a landfill site located north of Camel's Back Mountain, approximately 2.8 miles southwest of the Ditto Technical Center (Figure 1). In 1993, warning signs were placed in the area for site control purposes. Wells were installed into the shallow groundwater adjacent to the burial trenches. Four detonation craters were located to the south of the fenced area. The fenced area combined with the area of the detonation craters covered a total affected area (the portion of the DPG site where soil was potentially disturbed or otherwise affected by site activities) of 3.95 acres. The topography of this site has an average elevation of 4,330 feet (ft) above mean sea level (msl), sloping gently to the north. The disturbed area of the site included a large trench covered by a mound with several cave-in areas. Outside of the disturbed area were a metal debris pile and scattered wood, metal, glass, and plastic scrap material.

DPG-021 was divided into two subsections. Area 1 was designated as the fenced area at the northern end of the site, and encompasses the four backfilled trenches, two debris piles, and two areas where ordnance and explosive (OE) debris had been piled after range cleanup. Area 2 contained the four detonation craters at the southern end of the site.

## **2.2 PAST OPERATIONS**

Past activities at DPG-021 were related to disposal operations potentially from grid activities and may have included the disposal of range clearance materials, OE debris, sampling devices, and other debris (Parsons, 1999). The Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) stated that the landfill was used to dispose of chemical munitions during the 1950s (UDEQ, 1992). According to DPG personnel involved in disposal activities at this site, target grid agent samplers and lead acid batteries were decontaminated and disposed of at this site in the 1960s (Parsons, 1999). Remnants of OE were found on the ground surface, and the burial of ordnance and chemical munitions is believed to have occurred at this location. This site contained several features related to burial of waste. Two of the four backfilled trenches had depressions related to settling and caving.

## **2.3 PREVIOUS INVESTIGATIONS DOCUMENTATION**

The detailed results of previous soil and groundwater sampling and closure information including the risk assessment are available for DPG-021 in the Division of Solid and Hazardous Waste (DSHW) public documents listed below in Table 2 (UAC R315-3-2.5(b)(13)).

**Table 2: DSHW Library Documents Detailing DPG-021 Investigations**

Document Title	Received Date	DSHW Library No.
Parsons, 1999. <i>Final Phase I RCRA Facility Investigation, Investigation Report, Revision 1.</i> September.	09/99	
Parsons, 2004. <i>Final Phase II RCRA Facility Investigation Report, SWMU-21 Addendum.</i> June.	06/04	
Shaw Environmental, 2006a. <i>Corrective Measures Study Report, Firm Fixed-Price Remediation at Landfill Sites, Dugway Proving Ground, Dugway, Utah.</i> July.	07/06	
Shaw Environmental, 2006b. <i>Corrective Measures Implementation Plan, Firm Fixed-Price Remediation at Landfill Sites, Dugway Proving Ground, Dugway, Utah.</i> November.	11/06	
Shaw Environmental, Inc., 2007. <i>Final Corrective Measures Implementation Report (CMIR) For DPG-021.</i>	02/07	

**2.4 CLOSURE ACTIVITIES**

In accordance with UAC R315-7-21 and the CMIP (Shaw, 2006b), closure at DPG-021 has been completed with the construction of an engineered cover system consisting of a geomembrane-supported geosynthetic clay liner (GCL) placed over the identified waste trenches. The closure activities are described in the CMIR (Shaw, 2007). Appendix A includes a copy of the DPG-021 Closure Certification signed and stamped by a Utah-licensed Professional Engineer.

The final cover system as designed and constructed satisfies the requirements of UAC R315-7-14 and R315-7-21 (by reference 40 CFR §264, Subpart N, 264.310) for the closure and post-closure of DPG-021, namely:

- Provide long-term minimization of migration of liquids through the closed landfill;
- Function with minimum maintenance;
- Promote drainage and minimize erosion or abrasion of the cover;
- Accommodate settling and subsidence so that the integrity of the cover is maintained; and
- Achieve a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

In meeting the above performance standards, the major closure activities completed at DPG-021 included:

- Installation of the final engineered cover system; and
- Final grading of the site, including enhancement of drainage features, to help control erosion and minimize long-term maintenance requirements.

These measures will prevent human contact with the waste and provide for protection of groundwater, which are the long term or post closure objective for this site. An inspection checklist designed to insure that these objectives are maintained is presented in Module VII Form B.

## **2.5 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT**

Human health and ecological risk assessments were conducted and indicated that no subsurface contamination was detected in soil (outside of the trenches). Low concentration contamination was detected in the groundwater at SWMU 21 but does not pose an unacceptable risk as defined in UAC R315-101. The risk assessment for soil focused on areas outside the constructed cover, but did take into consideration airborne particulates emanating from the landfill surface prior to remediation. Direct sampling of the contents of waste burial features TR-1 through TR-4 could not be conducted due to the potential presence of unexploded ordnance (UXO), chemical warfare material (CWM), and/or other OE debris. Despite the absence of direct sampling results, risks to intrusive site workers and burrowing ecological receptors associated with uncharacterized buried wastes are assumed to be unacceptable based on the types of materials potentially present. The industrial cancer risk based on sampling outside the covered trench areas is less than 1E-06 and the Hazard Index is less than 1.0. Ecological risks are expected to be minimal. Due to the risks associated with direct exposure to the waste, intrusive activities into the buried wastes must be avoided. The human and ecological risk assessments as presented in the Final Phase II RCRA Facility Investigation Report, DPG-021 Addendum (Parsons, 2004), are included in Appendix B of the DPG-021 CMIR.

## **2.6 SURFACE WATER AND GROUNDWATER**

There are no defined surface water features within or near DPG-021. The general direction of surface water drainage in the area surrounding this unit is to the northwest, toward the Great Salt Lake Desert.

Low concentrations of volatile organic contamination are present in the groundwater, however groundwater monitoring is not required at this site.

## **2.7 CLOSURE NOTIFICATIONS**

The Certification of Closure (Appendix A) was received and verified by the Executive Secretary of the Utah Solid and Hazardous Waste Control Board on July 2007.

Federal facilities are exempt from submitting notifications to the local zoning authority as required by 40 CFR §§264.116 and 264.119, which are incorporated by reference in UAC R315-8-7.

## **3.0 SECURITY REQUIREMENTS**

The following security conditions are applicable to DPG-021:

1. DPG-021 is located within a federal, military installation (DPG). As such, the installation is restricted for the common population.
2. At DPG-021, signs are present warning against unauthorized entry.
3. Security facilities are to be maintained and inspected throughout the post-closure care period. The security facilities (i.e., posted signs) will be inspected and the frequency of inspection is sated in Table 4. Dugway shall report to the DSHW any decrease of Dugway's Base Security, which could affect the security conditions as applicable to DPG-021.
4. Damaged or missing security facilities shall be noted in the inspection checklist. Repairs shall be completed as soon as practicable after the problem is discovered, in compliance with UAC R315-8-2.6(c).

## **4.0 POST-CLOSURE OPERATIONS AND INSPECTIONS**

### **4.1 INTRODUCTION**

DPG-021 has been closed under the DPG RCRA part B Permit requirements and specifications of the Corrective Measures Implementation (CMI) Plan for Landfill Sites (Shaw, 2006). Disturbance of the waste will not be allowed. To ensure that the area is not reused or developed, annual site inspections and a biennial post-closure report shall be required.

### **4.2 ROUTINE SITE INSPECTIONS**

During its Post-Closure period general inspections of the former DPG-021 site shall be conducted annually by November 1<sup>st</sup> to ensure that the integrity of the engineered cap is maintained and to verify the Dugway Dig Permit process as described in Module VII.I has been followed. Any modifications to the frequency of inspections will be in accordance with amendments submitted in the form of proposed permit modifications.

Site inspections will consist of a complete walkthrough and visual inspection of the covered areas as well as surface water drainage features. A general post-closure site inspection checklist for landfill sites is included in Module VII as Form B. Completed inspection forms shall be filed with the Dugway Environmental Office.

#### **4.2.1 Protective Soil Layer Inspections**

Maintenance of the protective soil layer is an essential step in ensuring that the integrity of the final cover system is preserved. During each site visit, observations will be made to ensure that the protective soil layer is functioning as designed (i.e., protecting the underlying GCL). Repairs to the protective soil layer may include removal of vegetation species having top roots greater than 12 inches, regrading through the placement of fill in areas where a potential for ponding water on the cover exists due to settlement, or repair and stabilization of areas that have been eroded.

If signs of soil erosion are excessive (for example, cracks or rills greater than 2-inches wide) or continual (recurring in the same area), corrective action may be necessary. Significant cracks or rills that have the potential to impact the functionality of the cover system will be documented on the inspection forms. Corrective action may include filling in the eroded or cracked area, regrading slopes, establishing vegetation (if soil salinity is favorable) or adding mulch to the soil surface. Soil samples will be collected in accordance with Field Work Variance 119350-02-006 (August 6, 2007) and analyzed for salinity as a contingency in case erosion control is necessary in the future.

For most routine repairs, corrective action should be initiated as soon as possible after identifying the problem or as directed by DPG. If the corrective action requires substantial effort and/or a technical plan, a brief plan will be prepared to summarize the problem, the potential impacts, and the time-frame in which corrective action will be implemented and the planning involved.

#### **4.2.2 Settlement Marker Inspections**

During each visit, the settlement marker installed during remediation (Figure 4) will be inspected to determine if any damage has made its use questionable as a reference point. If missing or badly damaged, it will be replaced as soon as possible after discovery of the problem.

As part of the routine inspection, settlement marker location and elevation (denoted as SM-021 in Table 3) will be surveyed at least once per year for the first two years after construction. Once a settlement of 0.1 foot or less has been measured for two consecutive years, surveys can be scaled back to once every five years. The baseline northing, easting, and elevation of the DPG-021 settlement marker (SM-021) has been summarized in Table 3. In addition, the survey coordinates for locations around the perimeter of the cover system are presented for future reference.

**Table 3: DPG-021 Survey Coordinates**

<b>Description</b>	<b>Northing (ft)</b>	<b>Easting (ft)</b>	<b>Elevation<sup>a</sup> (ft above msl)</b>
Settlement Marker (SM-021)	7,230,366.10	1,230,451.84	4,335.0
2000	7,230,179.54	1,230,384.80	4,333.3
2001	7,230,093.41	1,230,461.81	4,333.8
2002	7,230,202.60	1,230,595.84	4,333.3
2003	7,230,295.53	1,230,616.76	4,334.0
2004	7,230,416.95	1,230,563.85	4,333.0
2005	7,230,449.32	1,230,606.36	4,333.0
2006	7,230,259.31	1,230,740.40	4,333.3
2007	7,229,990.89	1,230,434.76	4,333.0
2008	7,230,153.02	1,230,343.90	4,333.0
2009	7,230,115.91	1,230,489.43	4,333.3
2010	7,230,141.78	1,230,486.91	4,332.8
2011	7,230,157.16	1,230,508.88	4,333.0
2012	7,230,133.62	1,230,511.17	4,333.5

<sup>a</sup> The locations and elevations are design locations. The final location is provided in the 2008 Biennial report.

Table 4 summarizes the Post-Closure Inspection Schedule for DPG-021, and lists the items to be inspected. Inspection personnel shall note any problems found and shall inform appropriate Dugway representatives.

### **4.3 CONTINGENCY INSPECTIONS**

This section provides information about emergency response inspection procedures to be implemented in the event of any natural disaster in the DPG area that may affect the soil cover at DPG-021. Module VII Table VII-3 summarizes the type of closure and the required inspection form for DPG-021. The general post-closure site inspection checklist for landfill sites (Form B) should be used and is provided in Module VII.

The Dugway Emergency Response and Contingency Plan (Part B Permit), where applicable to this site, shall be used to announce and respond to emergency conditions. At a minimum, the site inspector should have a radio or phone and a First Aid kit available during inspections.

#### **4.3.1 Earthquakes**

Dugway Proving Ground is located in Seismic Zone 2 with a maximum acceleration of 0.2 gravity force (Hunt, 1984). DPG-021 is not located within 200 ft of any active faults. Although Utah is tectonically active, most of the earthquake activity occurs about 65 miles to the east along the Wasatch Range Foothills.

A geologic map completed in a 1988 study by the United States Geological Survey (USGS) (Barnhard and Dodge, 1988), was used to determine the distribution, relative age, and amount and extent of surface rupture on Quaternary fault scarps, in the area of DPG-021.

The USGS study (Barnhard and Dodge, 1988) concluded that morphologic and geologic data collected along the fault scarps in the area indicate that all were formed during the later Pleistocene era and there is not any clear evidence of Holocene surface rupture. Several faults inferred on geophysical evidence are located at DPG; however, there is no evidence of displacement during Holocene time.

In the event of a 6.5-magnitude or higher earthquake centered within 50 miles of the site, qualified personnel will visually inspect the landfill cap for signs of damage as soon as it is safe and practical to do so. Any damage to the landfill cap will be repaired to ensure the integrity of the cap. If the landfill cap has sustained extensive damage, Dugway will implement corrective actions to ensure that contaminants are contained and human health is protected. Post-earthquake site inspection records will be submitted to the Dugway Environmental Department.

Following an earthquake, the landfill and landfill cap will also be inspected for lateral shifting of debris. Settlement markers will be resurveyed to determine any horizontal or vertical movement of the cap.

#### **4.3.2 Floods or Major Storms**

DPG-021 is not located within a 100-year verified floodplain. The National Flood Insurance Rate Map, identifying the boundary of the 100-year flood, does not include DPG. There are no permanent streams or other surface water bodies on DPG.

During the capping of DPG-021, the site was graded so that surface water from precipitation flows away from the capped area and to the northwest in the direction of the natural drainage flow. Most of the surface water evaporates rather than percolating into the ground. Like other arid regions, DPG is subject to flash flooding following high-precipitation events. Flash floods have occurred only four times in the history of the installation, in 1944, 1952, 1973, and 1983. The major area affected during flash floods has been the Government Creek drainage channel, which has overflowed and caused minor inundation of roads at the Ditto Technical Center.

In the event of a flood or major storm, Dugway will inspect the landfill cap to ensure its integrity within 72 business hours of the event. A general post-closure site inspection checklist for landfill sites (Form B) is included in Module VII. A major storm is defined in this plan as a storm with one inch of precipitation or more over a 24-hour period. Any damage to the landfill cap will be repaired as soon as possible to ensure the integrity of the cap.

#### **4.3.3 Fires**

In the event of a surface fire near the landfill cap, the Dugway fire department will be notified and the Dugway integrated contingency plan will be implemented. In the event of a landfill fire, if the cap is observed to have been breached, firefighting methods such as using foam or smothering with soil will be considered and used, as appropriate. Following the incident, Dugway will perform a thorough inspection

of the landfill cap using the general post-closure site inspection checklist for landfill sites (Form B) included in Module VII, to ensure that the integrity of the soil cover has not been compromised and waste has not been exposed. If there is fire damage, DPG will implement corrective actions to ensure that contaminants are contained and human health is protected.

**Table 4: DPG-021 Post-Closure Inspection Schedule**

<b>Inspection/ Monitoring Item</b>	<b>Method of Documentation</b>	<b>Frequency of Inspection</b>
Landfill Caps	General Post-Closure Site Inspection Checklist for Landfill Sites(Form B, Module VII)	Annual
Salinity Testing	General Post-Closure Site Inspection Checklist for Landfill Sites(Form B, Module VII)	Per Field Work Variance 119350-02-006 (August 6, 2007)
Settlement Markers	General Post-Closure Site Inspection Checklist for Landfill Sites(Form B, Module VII)	Annual / 5 year intervals
Signs	General Post-Closure Site Inspection Checklist for Landfill Sites(Form B, Module VII)	Annual
Drainage	General Post-Closure Site Inspection Checklist for Landfill Sites(Form B, Module VII)	Annual

**4.4 INSPECTION FOLLOW-UP**

Copies of completed general post-closure site inspection checklists for landfill sites (Form B, Module VII) shall be forwarded to the Dugway Environmental Office. The Point-of-Contact for the Dugway Environmental Office is as follows:

Environmental Programs Compliance Representative  
 Dugway Proving Ground Environmental Program Office  
 Dugway Proving Ground, UT 84022  
 Telephone: (435) 831-3560

The Dugway Environmental Office shall notify the appropriate personnel to implement corrective action as needed.

Corrective action shall be initiated as soon as practical after identifying the problem, or as directed by Dugway. If the corrective action requires substantial effort, a technical plan shall be prepared to summarize the problem, the potential impacts, the proposed plan for action, and the time-frame in which corrective action will be implemented as required under this Permit. This plan shall be approved by the Executive Secretary prior to implementing corrective action.

**5.0 SUBMITTALS/REPORTING**

Based on the evaluation presented in the Final CMIR for DPG-021 (Shaw, 2007), post-closure inspection is required. Groundwater monitoring is not required for DPG-021.

## **5.1 NON-COMPLIANCE REPORTING**

The conditions at DPG-021 are such that the impact to human health and the environment is very unlikely. Hazardous wastes are no longer managed at the site. Nonetheless, if there is any type of non-compliance with any condition of this Permit, notifications shall be submitted per permit condition VII.C.5.

## **5.2 BIENNIAL POST-CLOSURE REPORT**

In accordance with UAC R315-3-3.1(1)(9), a Biennial Post-Closure Report shall be prepared for all Dugway closed HWMUs and SWMUs undergoing post-closure care by March 1, of the reporting year. The first Post-Closure report for DPG-021 shall be due no later than March 1, 2008. Specifically for DPG-021, the Biennial Post-Closure Report shall include, at a minimum, the following:

- General site description and conditions;
- Areas of cap repair; and
- Inspection records.

## **5.3 REQUIRED SUBMITTALS**

Table 5 summarizes the requirements for the Biennial Post-Closure Report for DPG-021 and reporting for any non-compliance.

**Table 5: Summary Table of Required Submittals**

<b>Required Submittals</b>	<b>Frequency and Submittal Date</b>
<u>Biennial Post-Closure Report</u>	Post-Closure Reports shall be submitted to the DSHW no later than March, of the year the report is due. Reporting years are even numbered years beginning with March 2008, for the duration of the Post-Closure Monitoring Period.
<u>Non-Compliance Reporting</u>  Anticipated Non-Compliance  24-hour Notification for information concerning the non-compliance, which may endanger public drinking water supplies or human health or the environment.  Five-day written notification for information concerning the non-compliance, which may endanger public drinking water supplies or human health or the environment including evidence of groundwater contamination, significant data quality issues, or a request for reduced monitoring frequency. The Executive Secretary may waive the 5-day notice, in favor of a 15-day notice.  Written notification for information concerning the non-compliance, which does not endanger human health or the environment.	30 days advance notice of any change which may result in noncompliance  Orally within 24 hours of discovery  Within 5 days of discovery  Submitted when the Biennial Post Closure Reports are submitted.

**6.0 POST-CLOSURE CERTIFICATION**

No later than 60 days after post-closure activities are completed and approved by the Executive Secretary, Dugway representatives shall submit a certification to the Board, signed by Dugway and an independent professional engineer registered in the State of Utah, stating why post-closure care is no longer needed.

## 7.0 REFERENCES

- Barnhard, T.P. and R.L. Dodge, 1988. *Map of Fault Scarps Formed on Unconsolidated Sediments, Tooele 1° x 2° quadrangle, Northwestern Utah*, United States Geological Survey.
- Hunt, Roy E, 1984. *Geotechnical Engineering Investigation Manual*. New York, McGraw-Hill.
- Parsons, in preparation, 2007. *Final Hydrogeological Assessment and Regional Groundwater Management Plan, Volume III, Downrange Groundwater Management Area, Dugway Proving Ground, Dugway, Utah*.
- Parsons, 2004. *Final Phase II RCRA Facility Investigation Report, SWMU-21 Addendum*. June.
- Parsons, 1999. *Final Phase I RCRA Facility Investigation, Investigation Report, Revision 1*. September.
- Shaw Environmental, 2006b. *Corrective Measures Implementation Plan, Firm Fixed-Price Remediation at Landfill Sites, Dugway Proving Ground, Dugway, Utah*. November.
- Shaw, 2007. *Final Corrective Measures Implementation Report, for DPG-021, Dugway Proving Ground, Utah*.
- U.S. Army, 1994. *Old Chemical Weapons: Munitions Specification Report*. September.

# **FIGURES**

**APPENDIX A**

**COPY OF  
CERTIFICATION OF CLOSURE**

## **CERTIFICATION OF CLOSURE**

The Closure Certification Report for DPG-021 at Dugway Proving Ground, Utah has been prepared by Shaw Environmental in accordance with the closure requirements specified under the DPG Part B RCRA Permit and the CMI Plan. The requirements of UAC R315-101 form the basis for the risk-based criteria in the closure of DPG-021. The site has been managed in accordance with the specifications in the approved CMIP, except for re-vegetation (Section 2.4.5).

In accordance with the DPG Part B RCRA Permit, the signature and seal certify that a licensed professional has reviewed the Corrective Measures Implementation Report in accordance with the above referenced regulatory requirements.

Respectfully submitted,

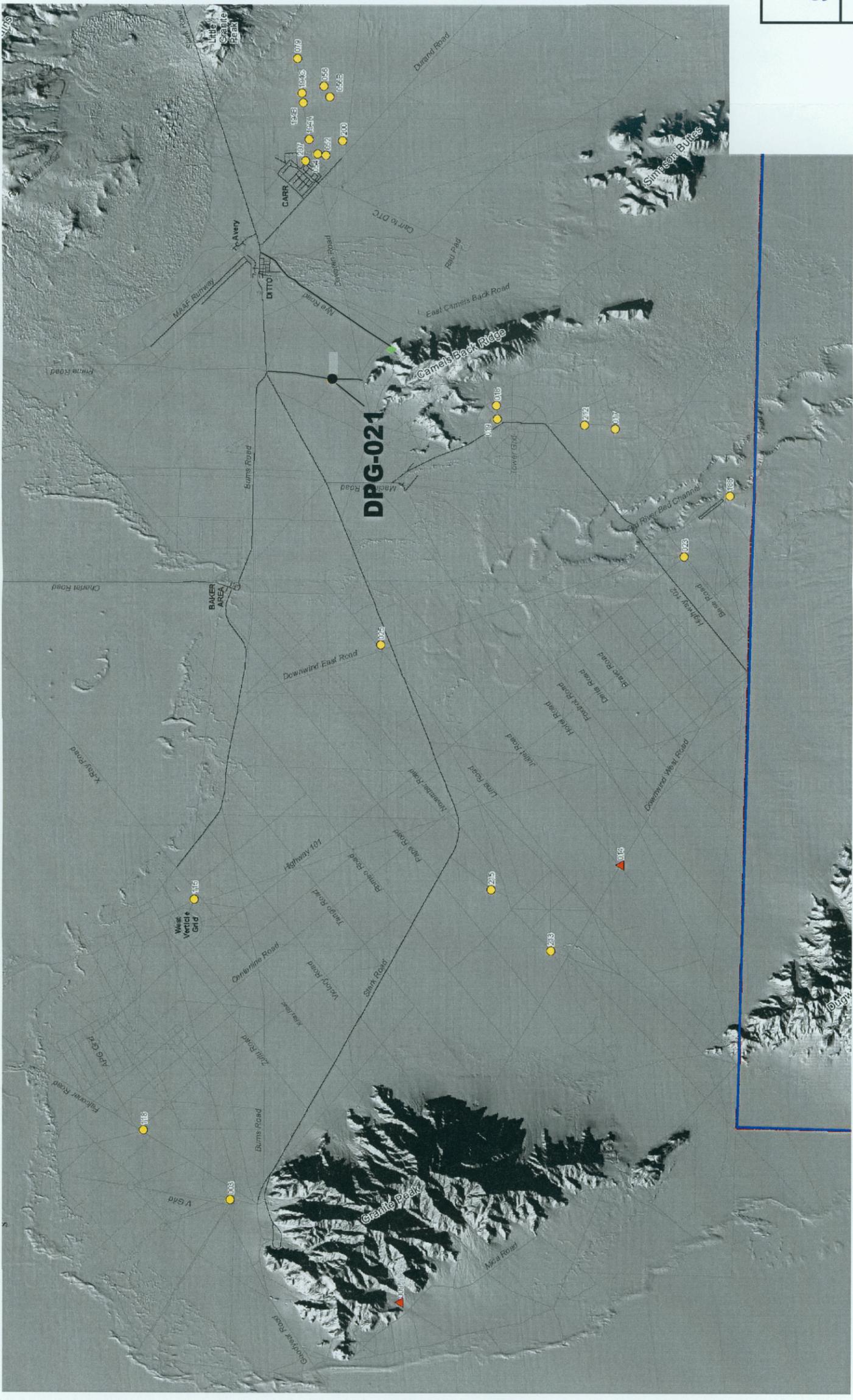
---

Scott Reed  
Directorate of Environmental Programs  
Dugway Proving Ground

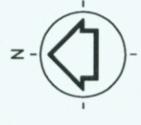
---

Sunil Kishnani, P.E.  
Utah Registered Civil Engineer No. 6027103  
Shaw Environmental, Inc.

IMAGE	---	---	---	---	---	---	---
X-REF	---	---	---	---	---	---	---
OFFICE	CONC	R. LANGSTON	12/8/2006	T.erin	03/01/2007	K.Davis	03/06/2007
DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER	119350-B198			



- Legend**
- ▲ HWMU
  - SWMU
- DPG Roads**
- paved
  - runway
  - gravel
  - dirt
  - two-track
  - DPG boundary
  - ◆ Nye Canyon Borrow Pit



**Shaw** Shaw Environmental, Inc.

ACSIM MARC

Contract Number: W91ZLK-05-D-0017

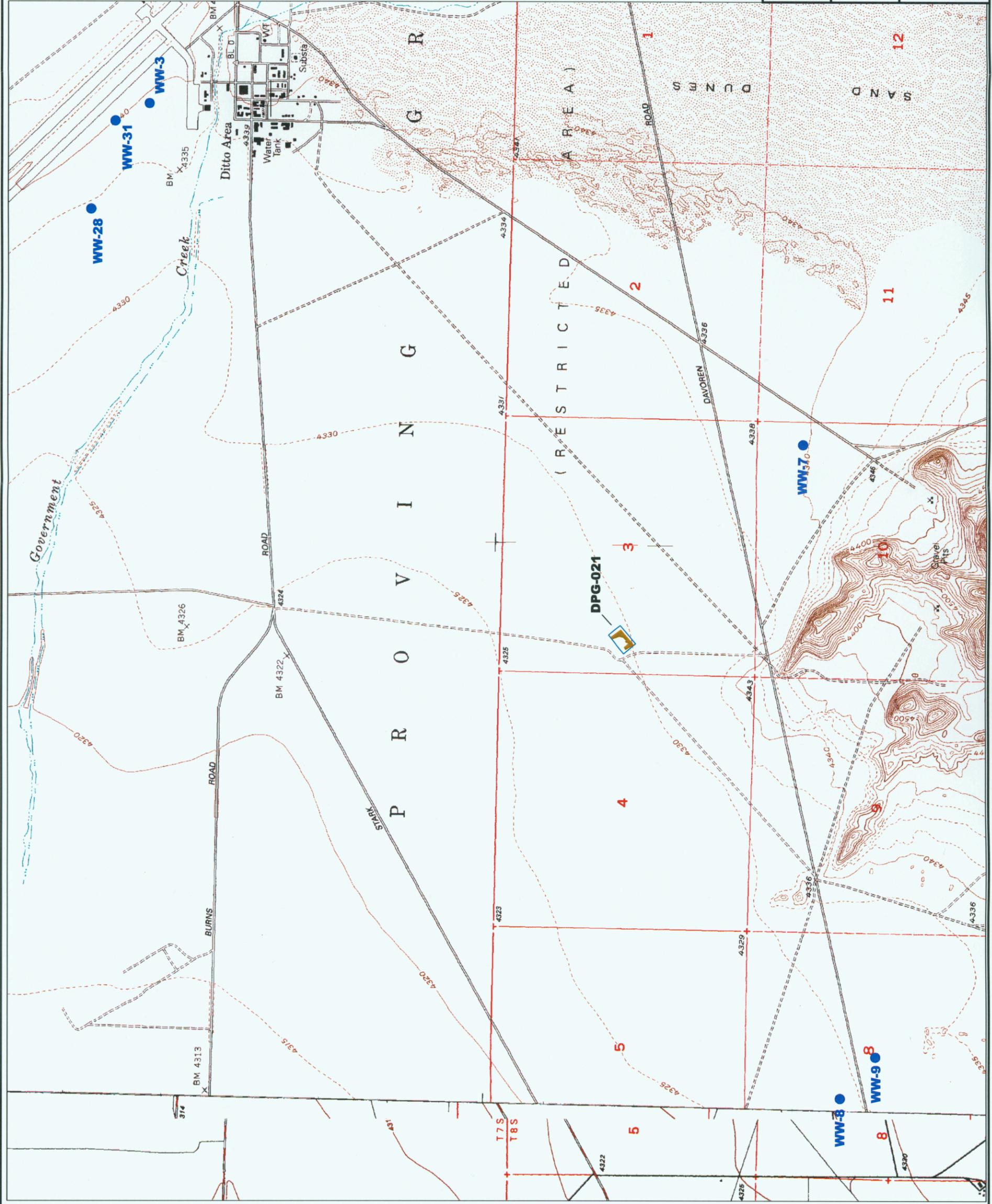
Task Order: 0002

FIGURE 1

DPG-021  
LOCATION MAP

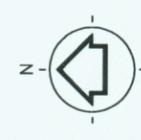
DUGWAY PROVING GROUND  
DUGWAY, UTAH

IMAGE	---	---	---	---	---
X-REF	---	---	---	---	---
OFFICE	CONC	Sven S-L	03/01/2007	03/01/2007	03/01/2007
DRAWN BY	CONC	03/01/2007	03/01/2007	03/01/2007	03/01/2007
CHECKED BY	CONC	03/01/2007	03/01/2007	03/01/2007	03/01/2007
APPROVED BY	CONC	03/01/2007	03/01/2007	03/01/2007	03/01/2007
DRAWING	119350-B199	119350-B199	119350-B199	119350-B199	119350-B199



**LEGEND**

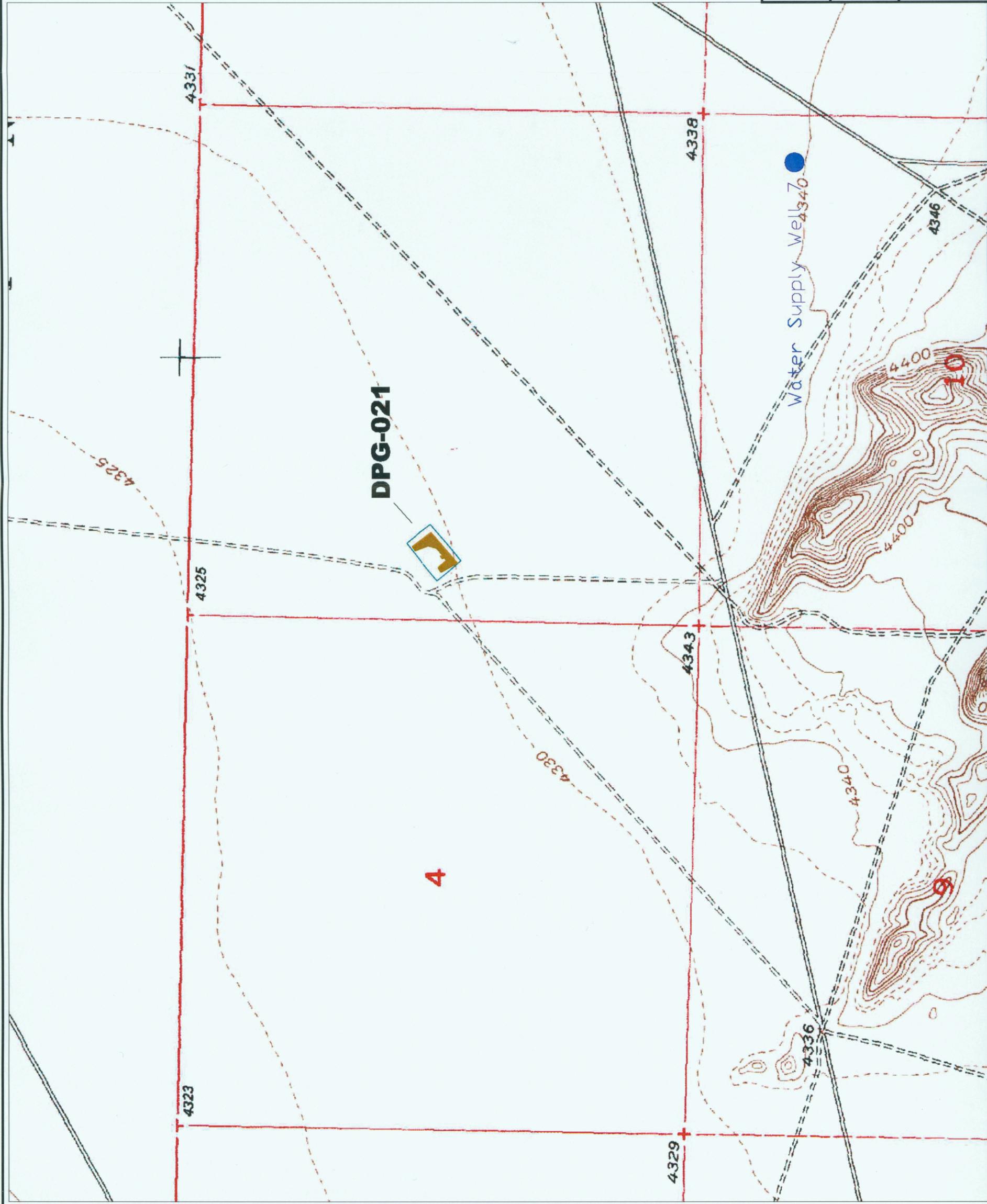
- Water Well
- ◊ Site Outline



**Shaw Environmental, Inc.**

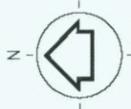
ACSIM MARC  
 Contract Number: W91ZLK-05-D-0017  
 Task Order: 0004

FIGURE 2  
 DPG-021  
 REGIONAL TOPOGRAPHY  
 DUGWAY PROVING GROUND  
 DUGWAY, UTAH



**LEGEND**

- Water Well
- ◊ Site Outline



**Shaw** Shaw Environmental, Inc.

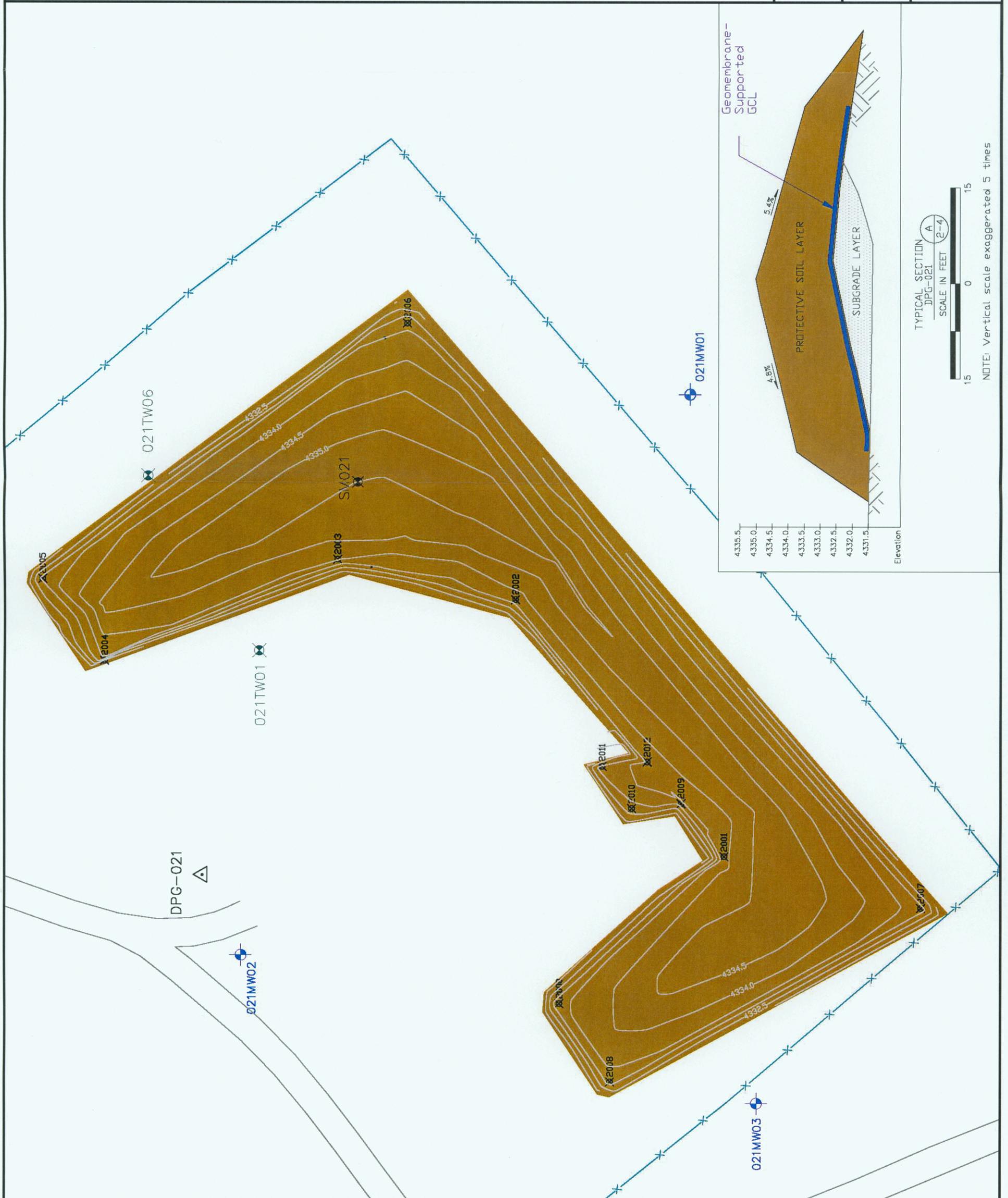
ACSIM MARC  
 Contract Number: W91ZLK-05-D-0017  
 Task Order: 0004

FIGURE 3

TOPOGRAPHIC MAP OF NORTH END OF CAMEL'S  
 BACK RIDGE SHOWING DPG-021 VICINITY  
 DUGWAY PROVING GROUND  
 DUGWAY, UTAH

IMAGE	---
X-REF	---
OFFICE	CONC
DRAWN BY	Sven S-L 03/01/2007
CHECKED BY	Termin 03/01/2007
APPROVED BY	K.Davis 03/01/2007
DRAWING 119350-B197	

IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
---	DPG Roads	Concord	Sven S-L	T.Ervin	K.Davis	119350-B196
			11/14/2006	03/01/2007	03/01/2007	



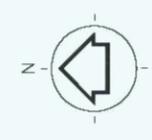
**LEGEND**

- Monitoring Well
- Site Monument
- Settlement Marker
- Temporary Wells (Remaining)
- Access road
- Topography of Protective Soil Layer
- Remaining Site Fence
- 2000 Cap Edge Survey Coordinate

**NOTES:**

TOPOGRAPHIC CONTOURS WITHIN CAP BOUNDARIES REPRESENT THE TOP OF THE PROTECTIVE SOIL LAYER.  
 CONTOURS AT 0.5 FOOT INTERVAL

Prepared for:  
 U.S. Army Dugway Proving Ground  
 Topography by: Shaw Environmental, Inc.  
 Date of Survey: 10/18/2006



**Shaw** Shaw Environmental, Inc.

**ACSIM MARC**  
 Contract Number: W91ZLK-05-D-0017  
 Task Order: 0002

FIGURE 4  
 FINAL CONSTRUCTION TOPOGRAPHY  
 DPG-021  
 DUGWAY PROVING GROUND  
 DUGWAY, UTAH

TYPICAL SECTION  
 DPG-021  
 SCALE IN FEET  
 2-4



NOTE: Vertical scale exaggerated 5 times

**DUGWAY PERMIT**

**MODULE VII**

**ATTACHMENT 14**

**SWMU 021  
POST-CLOSURE PLAN**

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## LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

bgs	Below Ground Surface
CFR	Code of Federal Regulations
CMI	Corrective Measures Implementation Plan
CMIR	Corrective Measures Implementation Report
CWM	Chemical Warfare Materiel
DPG	Dugway Proving Ground
DSHW	Divisions of Solid and Hazardous Waste
DWQ	Division of Water Quality
ft	Feet
GCL	Geosynthetic Clay Liner
GMA	Groundwater Management Area
LUTP	Land Use Tracking Plan
µg/L	micrograms per liter
mg/L	milligrams per liter
msl	Mean Sea Level
OE	Ordnance and Explosive
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
Shaw	Shaw Environmental, Inc.
SWMU	Solid Waste Management Unit
TDS	Total Dissolved Solids
UAC	Utah Administrative Code
UDEQ	Utah Department of Environmental Quality
USGS	U.S Geological Survey
UXO	Unexploded Ordnance

## 1.0 INTRODUCTION

The objective of this Post-Closure Plan is to ensure that Dugway Proving Grounds (DPG) complies with the Post-Closure Permit issued by the State of Utah in accordance with 40 Code of Federal Regulations (CFR) 264.117, with respect to post-closure inspection requirements. To meet this objective, this Post-Closure Plan provides detailed information regarding the location, regulatory criteria, and post-closure inspections at Solid Waste Management Unit (SWMU) 021, herein referred to as DPG-021. Post-closure requirements will continue for a minimum of 30 years after closure of DPG-021. The post-closure care period may be extended or shortened, as deemed necessary (40 CFR 264.117(a)(2)).

In accordance with Title 40 CFR 270.28 and Utah Administrative Code (UAC) R315-3-2.19, the Post-Closure Plan is required to include specific information for a closed facility. As applicable to DPG-021, the information requirements include:

- General description of the facility;
- Description of security procedures;
- General inspection schedule;
- Preparedness and Prevention Plan;
- Facility location information (including seismic and flood plain considerations);
- Closure Plan or Closure Proposal;
- Certificate of Closure;
- Topographic map, with specific scale;
- Summary of groundwater monitoring data; and
- Identification of uppermost aquifer and interconnected aquifers.

Table 1 provides the regulatory citations for the general information requirements and the specific locations in this Post-Closure Plan where the specific information is presented.

**Table 1: Summary of DPG-021 Post-Closure Information Requirements Under 40 CFR 270.14, and UAC R315-3-2.5**

Regulation Citation	Requirement Description	Location Requirement is Addressed
40 CFR 270.14(b)(1) UAC R315-3-2.5(b)(1)	General Description of the Facility	Section 2.0
40 CFR 270.14(b)(4) UAC R315-3-2.5(b)(4)	Description of Security Procedures	Section 3.0
40 CFR 270.14(b)(5) UAC R315-3-2.5(b)(5)	General Inspection Schedule	Section 6.0 and Appendix B
40 CFR 270.14(b)(6) UAC R315-3-2.5(b)(6)	Preparedness and Prevention	Section 3.0

**Table 1 (Continued): Summary of DPG-021 Post-Closure Information Requirements Under 40 CFR 270.14, UAC R315-3-2.19, and UAC R315-3-2.5**

Regulation Citation	Requirement Description	Location Requirement is Addressed
40 CFR 270.14(b)(11)(i-ii, v) UAC R315-3-2.5(b)(11) (i-ii, v)	Facility Location Information Applicable seismic standard	Section 4.0
40 CFR 270.14(b)(11) (iii-v) UAC R315-3-2.5(b)(11) (iii-v)	Facility Location Information 100-year floodplain	Section 5.0
40CFR 270.14(b)(13) UAC R315-3-2.5(b)(13)	Copy of the Closure Proposal	Phase II RCRA Facility Investigation (RFI) was approved on 04/28/2005. No public comments were received.
40 CFR 270.14(b)(14) UAC R315-3-2.5(b)(14)	Closure Certification and Notification	Section 2.7 and Appendix A.
40 CFR 270.14(b)(16) UAC R315-3-2.5(b)(16)	Post-Closure Cost Estimate	Federal Facilities are exempt from this requirement.
40 CFR 270.14(b)(18) UAC R315-3-2.5(b)(18)	Proof of Financial Coverage	Federal Facilities are exempt from this requirement.
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (i)	Topographic Map Map Scale and Date	Figure 3 (1 inch = 1000 feet).
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (ii)	Topographic Map 100-year floodplain area	Section 5.0; DPG-021 is not located within a verified 100-year floodplain area.
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (iii)	Topographic Map Surface waters including intermittent streams	Figure 3
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (iv)	Topographic Map Surrounding land uses	DPG-021 is within a military base. There are no nearby operations in the vicinity of DPG-021.
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (v)	Topographic Map A wind rose (i.e., prevailing windspeed and direction)	There are no residential populations abutting DPG-021. The closest residential area is English Village (approximately 13 miles away). A wind rose is not deemed necessary for DPG-021.
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (vi)	Topographic Map Orientation of Map, North	Figure 3

**Table 1 (Continued): Summary of DPG-021 Post-Closure Information Requirements Under 40 CFR 270.14, UAC R315-3-2.19, and UAC R315-3-2.5**

Regulation Citation	Requirement Description	Location Requirement is Addressed
	Arrow	
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (vii)	Topographic Map Legal boundaries of the hazardous waste management facility	Figure 3
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (viii)	Topographic Map Access control, fence, gates	Figure 3. The site is not enclosed by a fence.
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (ix)	Topographic Map Injection and withdrawal wells	Figures 2 and 3
40 CFR 270.14(b)(19) UAC R315-3-2.5(b)(19) (xi)	Topographic Map Barriers for drainage or flood control	Figure 4. DPG-021 is graded to drain surface water away from the engineered covers. There are no barriers to drainage or flood control.
40 CFR 270.14(c) UAC R315-3-2.5(c)(1)	Groundwater Monitoring Information Summary of Groundwater Data	Final Phase II RFI Report, Section 2.2.4
40 CFR 270.14(c) UAC R315-3-2.5(c)(2)	Groundwater Monitoring Information Identification of uppermost aquifer	Final Phase II RFI Report, Section 2.2.1
40 CFR 270.14(c) UAC R315-3-2.5(c)(3)	Groundwater Monitoring Information Delineation of the Waste Management Area	Figure 3
40 CFR 270.14(c) UAC R315-3-2.5(c)(4)	Groundwater Monitoring Information Extent of Plume	Final Phase II RFI Report, Section 2.2.4
40 CFR 270.14(c) UAC R315-3-2.5(c)(5)	Groundwater Monitoring Information Detailed Plans/Engineering Report for Proposed Groundwater Program	Post-closure groundwater monitoring at DPG-021 is not required.
40 CFR 270.14(c) UAC R315-3-2.5(c)(6)(i)	Groundwater Monitoring Information Proposed List of Parameters	Post-closure groundwater monitoring at DPG-021 is not required.
40 CFR 270.14(c) UAC R315-3-2.5(c)(6)(ii)	Groundwater Monitoring Information Proposed Groundwater	Post-closure groundwater monitoring at DPG-021 is not required.

**Table 1 (Continued): Summary of DPG-021 Post-Closure Information Requirements Under 40 CFR 270.14, UAC R315-3-2.19, and UAC R315-3-2.5**

Regulation Citation	Requirement Description	Location Requirement is Addressed
	Monitoring System	
40 CFR 270.14(c) UAC R315-3-2.5(c)(6)(iii)	Groundwater Monitoring Information Background Values	Post-closure groundwater monitoring at DPG-021 is not required.
40 CFR 270.14(c) UAC R315-3-2.5(c)(6)(iv)	Groundwater Monitoring Information A description of the Proposed Sampling	Post-closure groundwater monitoring at DPG-021 is not required.

## 2.0 FACILITY DESCRIPTION

The following provides a general description of DPG-021, also known as the Disposal Site at North Camel's Back Ridge at DPG, as required by UAC R315-3-2.5(b)(1) (Figures 1 and 2).

### 2.1 DPG-021 LOCATION AND HISTORY

DPG-021 is a landfill site located north of Camel's Back Ridge, approximately 2.8 miles southwest of the Ditto Technical Center (Figure 1). In 1993, warning signs were placed in the area for site control purposes. Wells were installed into the shallow groundwater adjacent to the burial trenches. Four detonation craters were located to the south of the fenced area. The fenced area combined with the area of the detonation craters covered a total affected area (the portion of the DPG site where soil was potentially disturbed or otherwise affected by site activities) of 3.95 acres. The topography of this site has an average elevation of 4,330 feet (ft) above mean sea level (msl), sloping gently to the north. The disturbed area of the site included a large trench covered by a mound with several cave-in areas. Outside of the disturbed area were a metal debris pile and scattered wood, metal, glass, and plastic scrap material.

DPG-021 was divided into two subsections. Area 1 was designated as the fenced area at the northern end of the site, and encompasses the four backfilled trenches, two debris piles, and two areas where OE debris had been piled after range cleanup. Area 2 contained the four detonation craters at the southern end of the site.

### 2.2 PAST OPERATIONS

Past activities at DPG-021 were related to disposal operations potentially from grid activities and may have included the disposal of range clearance materials, ordnance and explosive (OE) debris, sampling devices, and other debris (Parsons, 1999). The Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) stated that the landfill was used to dispose of chemical munitions during the 1950s (Utah Department of Environmental Quality [UDEQ],

1992). According to DPG personnel involved in disposal activities at this site, target grid agent samplers and lead acid batteries were decontaminated and disposed of at this site in the 1960s (Parsons, 1999). Remnants of OE were found on the ground surface, and the burial of ordnance and chemical munitions is believed to have occurred at this location. This site contained several features related to burial of waste. Two of the four backfilled trenches had depressions related to settling and caving.

### 2.3 PREVIOUS INVESTIGATIONS DOCUMENTATION

The detailed results of previous soil and groundwater sampling and closure information including the risk assessment are available for DPG-021 in the Division of Solid and Hazardous Waste (DSHW) public documents listed below in Table 2 (UAC R315-3-2.5(b)(13)).

**Table 2: DSHW Library Documents Detailing DPG-021 Investigations**

Document Title	Received Date	DSHW Library No.
Parsons, 1999. <i>Final Phase I RCRA Facility Investigation, Investigation Report, Revision 1</i> . September.	09/99	
Parsons, 2004. <i>Final Phase II RCRA Facility Investigation Report, SWMU-21 Addendum</i> . June.	06/04	
Shaw Environmental, 2006a. <i>Corrective Measures Study Report, Firm Fixed-Price Remediation at Landfill Sites, Dugway Proving Ground, Dugway, Utah</i> . July.	07/06	
Shaw Environmental, 2006b. <i>Corrective Measures Implementation Plan, Firm Fixed-Price Remediation at Landfill Sites, Dugway Proving Ground, Dugway, Utah</i> . November.	11/06	
Shaw Environmental, Inc., 2007. <i>Final Corrective Measures Implementation Report (CMIR) For DPG-021</i> .	02/07	

### 2.4 CLOSURE ACTIVITIES

In accordance with UAC R315-7-21 and the Corrective Measures Implementation (CMI) Plan (Shaw, 2006b), closure at DPG-021 has been completed with the construction of an engineered cover system consisting of a geomembrane-supported geosynthetic clay liner (GCL) placed over the identified waste trenches. The closure activities are described in the CMIR (Shaw, 2007). Appendix A includes a copy of the DPG-021 Closure Certification signed and stamped by a Utah-licensed Professional Engineer.

The final cover system as designed and constructed satisfies the requirements of UAC R315-7-14 and R315-7-21 (by reference 40 CFR 264, Subpart N, 264.310) for the closure and post-closure of DPG-021, namely:

- Provide long-term minimization of migration of liquids through the closed landfill;
- Function with minimum maintenance;
- Promote drainage and minimize erosion or abrasion of the cover;
- Accommodate settling and subsidence so that the integrity of the cover is maintained; and
- Achieve a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

In meeting the above performance standards, the major closure activities completed at DPG-021 included:

- Installation of the final engineered cover system; and
- Final grading of the site, including enhancement of drainage features, to help control erosion and minimize long-term maintenance requirements.

These measures will prevent human contact with the waste and provide for protection of groundwater. An inspection checklist designed to insure that these objectives are maintained is presented in Appendix B.

## **2.5 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT**

Human health and ecological risk assessments were conducted and indicated that no subsurface contamination was detected in soil (outside of the trenches). Groundwater at DPG-021 is not impacted and does not pose an unacceptable risk as defined in UAC R315-101. The risk assessment focused on areas outside the constructed cover, but did take into consideration airborne particulates emanating from the landfill surface prior to remediation. Direct sampling of the contents of waste burial features TR-1 through TR-4 could not be conducted due to the potential presence of unexploded ordnance (UXO), chemical warfare materiel (CWM), and/or other OE debris. Despite the absence of direct sampling results, risks to intrusive site workers and burrowing ecological receptors associated with uncharacterized buried wastes are assumed to be unacceptable based on the types of materials potentially present. The industrial cancer risk is less than  $1E-06$  and the Hazard Index is less than 1.0. Ecological risks are expected to be minimal. Due to the risks associated with direct exposure to the waste, intrusive activities into the buried wastes must be avoided. The human and ecological risk assessments as presented in the Final Phase II RCRA Facility Investigation Report, DPG-021 Addendum (Parsons, 2004), are included in Appendix B of the DPG-021 CMIR.

## **2.6 SURFACE WATER AND GROUNDWATER**

There are no defined surface water features within or near DPG-021. The general direction of surface water drainage in the area surrounding this unit is to the northwest, toward the Great Salt Lake Desert.

Groundwater flow at DPG-021 is to the northwest, and hydraulic gradients are nearly flat based on previously measured groundwater elevations at the site. The groundwater gradient is approximately  $2.4 \times 10^{-3}$  ft/ft based on water levels observed in the three monitor wells at the site.

Groundwater was encountered at an average depth of 15.4 ft below ground surface (bgs) during drilling, and the potentiometric surface at this site is at approximately 12 ft bgs. Temporary wells at DPG-021 were installed using 3-ft screens located at depths ranging from approximately 15 to 19 ft bgs. Overlying the screened interval is a clay unit which does not yield sufficient quantities of water for performing groundwater sampling.

Groundwater total dissolved solids (TDS) values at this site range from 16,039 to 67,877 milligrams per liter (mg/L), averaging 44,136 mg/L. Based on the concentration of TDS, groundwater at DPG-021 is classified as Class IV (saline) water quality, per UAC R317-6-3 (Division of Water Quality [DWQ], 2002). Groundwater from the shallow water-bearing zone is highly saline, and therefore, is not used for drinking water, irrigation, or other purposes.

Active water wells WW-3, WW-28, and WW-31 are located in the Ditto area approximately 2.5 miles northeast of DPG-021 (Figure 2). These wells are screened in the deep potable aquifer under confined conditions at depths ranging from 235-333 ft bgs. Inactive water wells WW7 and WW8 are located approximately 550 feet southeast and 850 feet southwest, respectively, of DPG-021 (Figures 2 and 3). These wells are also screened into the deeper, potable aquifer with screen intervals ranging from 120 to 230 ft bgs. Inactive well WW-9 is screened in the shallow water bearing zone. Based on regional interpretations, it is likely that the shallow water-bearing zone is not hydraulically connected to the underlying, deep potable aquifer in the vicinity of DPG-021.

DPG is in the process of developing a Downrange Groundwater Management Area (GMA) approach to ensure continuity of monitoring requirements across all sites west of the Ditto Technical Center. Based on guidance provided by UDEQ, long-term monitoring requirements at DPG-021 are expected to be very limited.

## 2.7 CLOSURE NOTIFICATIONS

The Certification of Closure (Appendix A) was received and verified by the Executive Secretary of the Utah Solid and Hazardous Waste Control Board on XXXX.

Federal facilities are exempt from submitting notifications to the local zoning authority as required by 40 CFR 264.116 and 264.119, which are incorporated by reference in UAC R315-8-7. Dugway's Post-Closure Land Use Tracking Plan (LUTP) shall be used to monitor land use as required per Permit in Condition VII.H.

## 3.0 SECURITY REQUIREMENTS

The following security conditions are applicable to DPG-021:

1. DPG-021 is located within a federal, military installation (DPG). As such, the installation is restricted for the common population.

2. At DPG-021, signs are present warning against unauthorized entry.
3. Security facilities are to be maintained and inspected throughout the post-closure care period. The security facilities (i.e., posted signs) will be inspected and the frequency of inspection is stated in Table 4. Dugway shall report to the DSHW any decrease of Dugway's Base Security, which could affect the security conditions as applicable to DPG-021.
4. Damaged or missing security facilities shall be noted in the inspection checklist. Repairs shall be completed as soon as practicable after the problem is discovered, in compliance with R315-8-2.6(c).

## **4.0 POST-CLOSURE OPERATIONS AND INSPECTIONS**

### **4.1 INTRODUCTION**

DPG-021 has been closed under the DPG RCRA part B Permit requirements and specifications of the CMI Plan for Landfill Sites (Shaw, 2006). Disturbance of the waste will not be allowed. To ensure that the area is not reused or developed, annual site inspections and a biennial post-closure report shall be required. As specified in Section 2.7, Dugway's LUTP shall be used to monitor land use at DPG-021. Removal and reuse of soil from this site will not be allowed except as described in the LUTP. Until such time as the LUTP is approved, no soil shall be excavated or removed from this site.

### **4.2 ROUTINE SITE INSPECTIONS**

During its Post-Closure period general inspections of the former DPG-021 site shall be conducted semi-annually to ensure that the integrity of the engineered cap is maintained. The frequency of inspections can be scaled back to once per year once conditions of the landfill cap have stabilized over a minimum period of two years. Any modifications to the frequency of inspections will be in accordance with amendments submitted in the form of proposed permit modifications.

Site inspections will consist of a complete walkthrough and visual inspection of the covered areas as well as surface water drainage features. A general site inspection checklist is included in Appendix B of this report. Completed inspection forms shall be filed with the Dugway Environmental Office.

At a minimum the site shall be visually inspected to ensure the following conditions are maintained at the site:

- No noticeable sliding (slope failure);
- No noticeable damage to the soil covering from burrowing animals;
- No noticeable depressions or ponding water are present;

- No excessive soil erosion is evident on the cap surface or at the cap edges;
- No weeds or trees (with deep tap roots) are present that may penetrate the cap;
- Signs are in good condition;
- Drainage patterns and roads are functioning as planned with no significant erosion or ponding; and
- The settlement marker is undamaged and there is no significant subsidence of the landfill cap.

#### **4.2.1 Protective Soil Layer Inspections**

Maintenance of the protective soil layer is an essential step in ensuring that the integrity of the final cover system is preserved. During each site visit, observations will be made to ensure that the protective soil layer is functioning as designed (i.e., protecting the underlying GCL). Repairs to the protective soil layer may include removal of vegetation species having tap roots greater than 12 inches, regrading through the placement of fill in areas where a potential for ponding water on the cover exists due to settlement, or repair and stabilization of areas that have been eroded.

If signs of soil erosion are excessive (for example, cracks or rills greater than 2 inches wide) or continual (recurring in the same area), corrective action may be necessary. Significant cracks or rills that have the potential to impact the functionality of the cover system will be documented on the inspection forms. Corrective action may include filling in the eroded or cracked area, regrading slopes, establishing vegetation (if soil salinity is favorable) or adding mulch to the soil surface. Soil samples will be collected during each inspection for the first two years and analyzed for salinity as a contingency in case erosion control is necessary in the future.

For most routine repairs, corrective action should be initiated as soon as possible after identifying the problem or as directed by DPG. If the corrective action requires substantial effort and/or a technical plan, a brief plan will be prepared to summarize the problem, the potential impacts, and the time-frame in which corrective action will be implemented and the planning involved.

#### **4.2.2 Settlement Marker Inspections**

During each visit, the settlement marker installed during closure (Figure 4) will be inspected to determine if any damage has made its use questionable as a reference point. If missing or badly damaged, it will be replaced as soon as possible after discovery of the problem.

As part of the routine inspection, settlement marker location and elevation will be surveyed at least once per year for the first two years after construction. Once a settlement of 0.1 foot or less has been measured for two consecutive years, surveys can be scaled back to once every five years. The baseline northing, easting, and elevation of the DPG-021 settlement marker (SM-021) has been summarized in Table 3. In addition, the survey coordinates for locations around the perimeter of the cover system, shown on Figure 4, are presented for future reference.

**Table 3: DPG-021 Survey Coordinates**

<b>Description / Pt. Location</b>	<b>Northing (ft)</b>	<b>Easting (ft)</b>	<b>Elevation<sup>a</sup> (ft above msl)</b>
Settlement Marker (SM-021)	7,230,366.10	1,230,451.84	4,335.0
2000	7,230,179.54	1,230,384.80	4,333.3
2001	7,230,093.41	1,230,461.81	4,333.8
2002	7,230,202.60	1,230,595.84	4,333.3
2003	7,230,295.53	1,230,616.76	4,334.0
2004	7,230,416.95	1,230,563.85	4,333.0
2005	7,230,449.32	1,230,606.36	4,333.0
2006	7,230,259.31	1,230,740.40	4,333.3
2007	7,229,990.89	1,230,434.76	4,333.0
2008	7,230,153.02	1,230,343.90	4,333.0
2009	7,230,115.91	1,230,489.43	4,333.3
2010	7,230,141.78	1,230,486.91	4,332.8
2011	7,230,157.16	1,230,508.88	4,333.0
2012	7,230,133.62	1,230,511.17	4,333.5

<sup>a</sup>The locations and elevations represent design coordinates. The final location will be recorded with the initial baseline survey.

Table 4 summarizes the Post-Closure Inspection Schedule for DPG-021, and lists the items to be inspected. Inspection personnel shall note any problems found and shall inform appropriate Dugway representatives.

### 4.3 CONTINGENCY INSPECTIONS

This section provides information about emergency response inspection procedures to be implemented in the event of any natural disaster in the DPG area that may affect the final soil cover at DPG-021. Appendix B provides an inspection checklist.

The Dugway Emergency Response and Contingency Plan (Part B Permit), where applicable to this site, shall be used to announce and respond to emergency conditions. At a minimum, the site inspector should have a radio or phone and a First Aid kit available during inspections.

#### 4.3.1 Earthquakes

Dugway Proving Ground is located in Seismic Zone 2 with a maximum acceleration of 0.2 gravity force (Hunt, 1984). DPG-021 is not located within 200 ft of any active faults. Although Utah is tectonically active, most of the earthquake activity occurs about 65 miles to the east along the Wasatch Range Foothills.

A geologic map completed in a 1988 study by the U.S. Geological Survey (USGS) (Barnhard and Dodge, 1988), was used to determine the distribution, relative age, and amount and extent of surface rupture on Quaternary fault scarps, in the area of DPG-021.

The USGS study (Barnhard and Dodge, 1988) concluded that morphologic and geologic data collected along the fault scarps in the area indicate that all were formed during the later Pleistocene era and there is not any clear evidence of Holocene surface rupture. Several faults inferred on geophysical evidence are located at DPG; however, there is no evidence of displacement during Holocene time.

In the event of a 6.5 magnitude or higher earthquake centered within 50 miles of the site, qualified personnel will visually inspect the landfill cap for signs of damage as soon as it is safe and practical to do so. Any damage to the landfill cap will be repaired to ensure the integrity of the cap. If the landfill cap has sustained extensive damage, Dugway will implement corrective actions to ensure that contaminants are contained and human health is protected. Post-earthquake site inspection records will be submitted to the Dugway Environmental Department.

Following an earthquake, the landfill and landfill cap will also be inspected for lateral shifting of debris. Settlement markers will be resurveyed to determine any horizontal or vertical movement of the cap.

#### **4.3.2 Floods or Major Storms**

DPG-021 is not located within a 100-year verified floodplain. The National Flood Insurance Rate Map, identifying the boundary of the 100-year flood, does not include DPG. There are no permanent streams or other surface water bodies on DPG.

During the capping of DPG-021, the site was graded so that surface water from precipitation flows away from the capped area and to the northwest in the direction of the natural drainage flow. Most of the surface water evaporates rather than percolating into the ground. Like other arid regions, DPG is subject to flash flooding following high-precipitation events. Flash floods have occurred only four times in the history of the installation, in 1944, 1952, 1973, and 1983. The major area affected during flash floods has been the Government Creek drainage channel, which has overflowed and caused minor inundation of roads at the Ditto Technical Center.

In the event of a flood or major storm, Dugway will inspect the landfill cap to ensure its integrity within 72 hours of the event. A checklist is included in Appendix B. A major storm is defined in this plan as a storm with 1 inch of precipitation or more over a 24-hour period. Any damage to the landfill cap will be repaired as soon as possible to ensure the integrity of the cap.

#### **4.3.3 Fires**

In the event of a surface fire near the landfill cap, the Dugway fire department will be notified and the Dugway integrated contingency plan will be implemented. In the event of a landfill fire, if the cap is observed to have been breached, firefighting methods such as using foam or

smothering with soil will be considered and used, as appropriate. Following the incident, Dugway will perform a thorough inspection of the landfill cap using the checklist included in Appendix B, to ensure that the integrity of the soil cover has not been compromised and waste has not been exposed. If there is fire damage, DPG will implement corrective actions to ensure that contaminants are contained and human health is protected.

**Table 4: DPG-021 Post-Closure Inspection Schedule**

<b>Inspection/ Monitoring Item</b>	<b>Method of Documentation</b>	<b>Frequency of Inspection</b>
Landfill Caps	General Site Inspection Checklist (Appendix B of the Post-Closure Plan)	Semi-Annual
Salinity Testing	General Site Inspection Checklist (Appendix B of the Post-Closure Plan)	Semi-Annual for two years
Settlement Markers	General Site Inspection Checklist (Appendix B of the Post-Closure Plan)	Annual / 5 year intervals
Signs	General Site Inspection Checklist (Appendix B of the Post-Closure Plan)	Semi-Annual
Drainage	General Site Inspection Checklist (Appendix B of the Post-Closure Plan)	Semi-Annual

#### 4.4 INSPECTION FOLLOW-UP

Copies of completed site inspection checklists (Appendix B) shall be forwarded to the Dugway Environmental Office. The Point-of-Contact for the Dugway Environmental Office is as follows:

Mr. Scott Reed  
 Dugway Proving Ground Environmental Program Office  
 Dugway Proving Ground, UT 84022  
 Telephone: (435) 831-3592

The Dugway Environmental Office shall notify the appropriate personnel to implement corrective action as needed.

Corrective action shall be initiated as soon as practical after identifying the problem, or as directed by Dugway. If the corrective action requires substantial effort, a technical plan shall be prepared to summarize the problem, the potential impacts, the proposed plan for action, and the time-frame in which corrective action will be implemented as required under this Permit. This plan shall be approved by the Executive Secretary prior to implementing corrective action.

## **5.0 SUBMITTALS/REPORTING**

Based on the evaluation presented in the Final CMIR for DPG-021 (Shaw, 2007), post-closure inspection is required. Groundwater monitoring is not required for DPG-021.

### **5.1 NON-COMPLIANCE REPORTING**

The conditions at DPG-021 are such that the impact to human health and the environment is very unlikely. Hazardous wastes are no longer managed at the site. Nonetheless, if there is any type of non-compliance with any condition of this Permit, notifications shall be submitted per permit condition VII.C.5.

### **5.2 BIENNIAL POST-CLOSURE REPORT**

In accordance with UAC R315-3-3.1(l)(9), a Biennial Post-Closure Report shall be prepared for all Dugway closed HWMUs and SWMUs undergoing post-closure care by March 1, of the reporting year. The first Post-Closure report for DPG-021 shall be due no later than March 1, 2008. Specifically for DPG-021, the Biennial Post-Closure Report shall include, at a minimum, the following:

- General site description and conditions;
- Areas of cap repair; and
- Inspection records.

### **5.3 REQUIRED SUBMITTALS**

Table 5 summarizes the requirements for the Biennial Post-Closure Report for DPG-021 and reporting for any non-compliance.

**Table 5: Summary Table of Required Submittals**

Required Submittals	Frequency and Submittal Date
<u>Biennial Post-Closure Report</u>	Post-Closure Reports shall be submitted to the Division of Solid and Hazardous Waste no later than March, of the year the report is due. Reporting years are even numbered years beginning with March 2008, for the duration of the Post-Closure Monitoring Period.
<p><u>Non-Compliance Reporting</u></p> <p>Anticipated Non-Compliance</p> <p>24-hour Notification for information concerning the non-compliance, which may endanger public drinking water supplies or human health or the environment.</p> <p>Five-day written notification for information concerning the non-compliance, which may endanger public drinking water supplies or human health or the environment including evidence of groundwater contamination, significant data quality issues, or a request for reduced monitoring frequency. The Executive Secretary may waive the 5-day notice, in favor of a 15-day notice.</p> <p>Written notification for information concerning the non-compliance, which does not endanger human health or the environment.</p>	<p>30 days advance notice of any change which may result in noncompliance</p> <p>Orally within 24 hours of discovery</p> <p>Within 5 days of discovery</p> <p>Submitted when the Biennial Post Closure Reports are submitted.</p>

## 6.0 POST-CLOSURE CERTIFICATION

No later than 60 days after post-closure activities are completed and approved by the Executive Secretary, Dugway representatives shall submit a certification to the Board, signed by Dugway and an independent professional engineer registered in the State of Utah, stating why post-closure care is no longer needed.

## 7.0 REFERENCES

- Barnhard, T.P. and R.L. Dodge, 1988. *Map of Fault Scarps Formed on Unconsolidated Sediments, Tooele 1° x 2° quadrangle, Northwestern Utah*, United States Geological Survey.
- Division of Water Quality (DWQ), 2002. *Division of Water Quality Administrative Rules for Groundwater Quality Protection R317-6 Utah Administrative Code*.
- Hunt, Roy E, 1984. *Geotechnical Engineering Investigation Manual*. New York, McGraw-Hill.
- Parsons Environmental Science, Inc. (Parsons), in preparation, 2007. *Final Hydrogeological Assessment and Regional Groundwater Management Plan, Volume III, Downrange Groundwater Management Area, Dugway Proving Ground, Dugway, Utah*.
- Parsons, 2004. *Final Phase II RCRA Facility Investigation Report, SWMU-21 Addendum*. June.
- Parsons, 1999. *Final Phase I RCRA Facility Investigation, Investigation Report, Revision 1*. September.
- Shaw Environmental (Shaw), 2006. *Corrective Measures Implementation Plan, Firm Fixed-Price Remediation at Landfill Sites, Dugway Proving Ground, Dugway, Utah*. November.
- Shaw, 2007. *Final Corrective Measures Implementation Report, for DPG-021, Dugway Proving Ground, Utah*.
- Utah Department of Environmental Quality (UDEQ), 1992. *RCRA Facility Assessment of Solid Waste Management Units at Dugway*.

## **FIGURES**

**APPENDIX A**

**COPY OF  
CERTIFICATION OF CLOSURE**

## **CERTIFICATION OF CLOSURE**

The Closure Certification Report for DPG-021 at Dugway Proving Ground, Utah has been prepared by Shaw Environmental in accordance with the closure requirements specified under the DPG Part B RCRA Permit and the CMI Plan. The requirements of UAC R315-101 form the basis for the risk-based criteria in the closure of DPG-021. The site has been managed in accordance with the specifications in the approved CMI Plan, except for re-vegetation (Section 2.4.5).

In accordance with the DPG Part B RCRA Permit, the signature and seal certify that a licensed professional has reviewed the Corrective Measures Implementation Report in accordance with the above referenced regulatory requirements.

Respectfully submitted,

---

Scott Reed  
Directorate of Environmental Programs  
Dugway Proving Ground

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Sunil Kishnani, P.E.  
Utah Registered Civil Engineer No. 6027103  
Shaw Environmental, Inc.

**APPENDIX B**  
**INSPECTION CHECKLIST**

**GENERAL SITE INSPECTION CHECKLIST**  
**DPG-021 Carr Facility Open Burning Area**  
**Dugway Proving Ground, Utah**  
**Post-Closure Plan**

1. Purpose of Inspection:

- a. Routine  (Annual, Semi-annual, etc.) circle one.
- b. Contingency  (Storm Event, Fire, Earthquake, etc.) circle one.
- c. Other  \_\_\_\_\_

2. Have inspectors completed training as required by permit condition VIII.L?

- Yes  
 No

Comments: \_\_\_\_\_  
\_\_\_\_\_

3. Did inspectors review the post-closure plan prior to the inspection?

- Yes  
 No

Comments: \_\_\_\_\_  
\_\_\_\_\_

4. Are there open holes in the soil that may be caused by burrowing animals?

- Yes \*  
 No

*\*If yes, fill up the hole with clean soil and note the size of the hole on this form and the location on a map.*

Comments: \_\_\_\_\_  
\_\_\_\_\_

5. Are there noticeable depressions or ponding of surface water on the landfill cover?

- Yes \*  
 No

*\*If yes, backfill the depression with soil obtained from an approved borrow source. If signs of soil erosion are excessive (for example, cracks or rills greater than 2-inches wide and continual (recurring in the same area) corrective action may be necessary. Document significant cracks or rills that have the potential to impact the functionality of the cover system on the inspection form and attach a map showing the eroded area(s). Corrective action may include filling in the eroded or cracked area, investigation the cause of erosion, and regrading slopes. Corrective action may be needed (contact DPG Environmental Office immediately [same business day]).*

Comments: \_\_\_\_\_  
\_\_\_\_\_

6. Are there large (more than 2 inches wide) cracks or rills in the soil cover?
- Yes \*  
 No

*\* If yes, notify the DPG Environmental Office immediately (same business day). Note the orientation, location, and frequency of cracks, determine whether the cracks are due to desiccation or slope failure, and photograph areas of concern, if possible.*

Comments: \_\_\_\_\_  
\_\_\_\_\_

7. Inspect the settlement monument. Is it intact and legible?
- Yes  
 No \*

*\* If no, notify the DPG Environmental Office immediately (same business day) to determine the appropriate course of action for repair.*

Comments: \_\_\_\_\_  
\_\_\_\_\_

8. Inspect the settlement monument. Is there evidence of erosion or subsidence in the vicinity of the monument (ponding, cracks, rills, or uneven terrain)?
- Yes \*  
 No

*\* If yes, notify the DPG Environmental Office immediately (same business day) to determine the appropriate course of action for repair and resurvey the settlement monument.*

Comments: \_\_\_\_\_  
\_\_\_\_\_

9. Is settlement survey required during this inspection event based on the time since the cover was installed or the answer to question 6 above?
- Yes \*  
 No

*\*If yes, resurvey the monument and note if the settlement marker position is significantly different in any direction from the coordinates in the following table*

**Survey Monument Coordinates**

Description	Location	Northing (ft)	Easting (ft)	Elevation <sup>a</sup> (ft above msl)
Settlement Marker (SM-021)	021 SM01	7,230,366.10	1,230,451.84	4,334.20

*The location and elevation of the settlement marker is a design location. The final location will be recorded with the initial baseline survey.*

Yes \*

No

*\* If yes, contact the DPG Environmental Office immediately (same business day) to arrange resurveying to establish magnitude of movement.*

Comments: \_\_\_\_\_

10. Was a soil sample collected for salinity testing (4-point composite)?

Yes \*

No

*\* If yes, document the sampling activity, including collected sample form with GPS coordinates for the location of each sample aliquot.*

Comments: \_\_\_\_\_

11. Have any trees or shrubs grown on the landfill cover?

Yes \*

No

*\* If yes, remove the tree(s) or shrub(s).*

Comments: \_\_\_\_\_

12. Are posted signs in place and in good condition (legible)?

Yes

No \*

*\* If no, mark location(s) of damaged or missing signs and notify the DPG Environmental Office immediately (same business day) for repairs or replacements.*

Comments: \_\_\_\_\_

13. Inspect areas that channel water runoff at the site, including ditches and slope edges. Are there signs of excessive erosion (rutting 1-foot wide by 1-foot deep) from storm water runoff?

Yes \*

No

*\* If yes, notify the DPG Environmental Office immediately (same business day) to determine the appropriate course of action for repair.*

Comments: \_\_\_\_\_

14. Inspect the access road leading to the DPG-021 site. Are there significant potholes and/or erosion?

Yes \*

No

*\* If yes, notify the DPG Environmental Office immediately (same business day) to determine the appropriate course of action for repair.*

Comments: \_\_\_\_\_

15. Were all parts of the landfill inspected as required in Section 6.0 of the post-closure plan?

Yes

No

Comments: \_\_\_\_\_

16. Were there any problems obtaining access to the site?

Yes

No

Comments: \_\_\_\_\_

17. Were any orphan wastes found inside or nearby the site?

How were the wastes managed? (contact DPG Environmental Office immediately [same business day]).

Yes

No

Comments: \_\_\_\_\_

