

DUGWAY PERMIT

MODULE VII

ATTACHMENT 32

**SWMU 201
POST-CLOSURE PLAN**

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

ABP	Agent Breakdown Products
bgs	below ground surface
CFR	Code of Federal Regulations
CWA	Chemical Warfare Agents
DPG	Dugway Proving Ground
DSHW	Divisions of Solid and Hazardous Waste
ft	feet
HD	mustard
HWMU	Hazardous Waste Management Unit
mg/L	milligrams per liter
NFA	No Further Action
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SWMU	Solid Waste Management Unit
UAC	Utah Administrative Code
UDEQ	Utah Department of Environmental Quality
USGS	U.S Geological Survey
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound

1.0 INTRODUCTION

The objectives of this Post-Closure Plan (PCP) are to ensure that Dugway Proving Ground (DPG or Dugway) complies with the Post-Closure Permit issued by the State of Utah in accordance with Title 40 Code of Federal Regulations (CFR) §265.117, with respect to post-closure inspection requirements and to document tracking and inspections to ensure industrial site use. To meet these objectives, this PCP provides detailed information regarding the location, regulatory criteria, and post-closure inspections at Solid Waste Management Unit (SWMU) 201. Post-closure requirements will continue for a minimum of 30 years after closure of SWMU 201. The post-closure care period may be extended or shortened, as deemed necessary (40 CFR §265.117(a)(2)).

Based on the approved Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) there are no uncontrolled sources of contamination (R315-101-2 and 3) present at DPG-201. The nature and extent of potential contamination has been characterized in soil in accordance with R315-101-4 and the site risks have been assessed in accordance with R315-101-5. The site consists of a cave located on the west side of Camel's Back Ridge. Soil outside the cave entrances qualifies for no further action (NFA). Soil inside the cave does not qualify for NFA due to a detection of mustard (chemical warfare agent designated HD) in surface soil in the northern chamber. Soil-to-groundwater analysis indicates that potential future impacts to groundwater from soil are not expected at DPG-201.

The installation of permanent fence enclosures was proposed by DPG and accepted by the Utah Department of Environmental Quality (UDEQ) as both a voluntary interim corrective measure and as a final remedial action to prevent further human access to the cave interior. The installation of these fence enclosures addresses the requirements of Utah Administrative Code (UAC) R315-101-1(4) for sites where risk-based closure cannot be granted because site risks are assumed to exceed regulated exposure limits. The cave closure action was performed in May, 2006. Future site management is based on the characterization in the approved RFI.

In accordance with Title 40 CFR §270.28 and UAC R315-3-2.19, the Post-Closure Plan is required to include specific information for a closed facility. As applicable to DPG-201, 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 locations in this Post-Closure Plan where the specific information is presented.

**Table 1: Summary of DPG-201 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 4.0
40 CFR §270.14(b)(6) UAC R315-3-2.5(b)(6)	Preparedness and Prevention	Section 3.0.
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	There are no active faults in the vicinity of DPG-201.
40 CFR §270.14(b)(11) (iii-v) UAC R315-3-2.5(b)(11) (iii-v)	Facility Location Information 100-year floodplain	DPG-201 is not located within a verified 100-year floodplain area.
40CFR §270.14(b)(13) UAC R315-3-2.5(b)(13)	Copy of the Closure Proposal	The Final Phase II RCRA Facility Investigation (RFI) Report was issued in August, 2007 and approved on September 27, 2007. 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.
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 2 (1 inch = 1000 feet (ft)).
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (ii)	Topographic Map 100-year floodplain area	DPG-201 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 2.

Table 1 (Continued): Summary of DPG-201 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)(19) UAC R315-3-2.5(b)(19) (iv)	Topographic Map Surrounding land uses	DPG-201 is within a military base. There are no nearby operations in the vicinity of DPG-201.
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-201. The closest residential area is English Village (approximately 12 miles away). A wind rose is not deemed necessary for DPG-201.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (vi)	Topographic Map Orientation of Map, North Arrow	Figure 2.
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 2.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (viii)	Topographic Map Access control, fence, gates	Figure 2.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (ix)	Topographic Map Injection and withdrawal wells	Figure 2.
40 CFR §270.14(b)(19) UAC R315-3-2.5(b)(19) (xi)	Topographic Map Barriers for drainage or flood control	Figure 2. There are no barriers to drainage or flood control in the vicinity of DPG-201.
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-201 is not required.
40 CFR §270.14(c)	Groundwater Monitoring	Post-closure groundwater

Table 1 (Continued): Summary of DPG-201 Post-Closure Information Requirements Under 40 CFR 270.14, and UAC R315-3-2.5

Regulation Citation	Requirement Description	Location Requirement is Addressed
UAC R315-3-2.5(c)(6)(i)	Information Proposed List of Parameters	monitoring at DPG-201 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-201 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-201 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-201 is not required.

2.0 FACILITY DESCRIPTION

The following provides a general description of DPG-201, as required by UAC R315-3-2.5(b)(1) (Figures 1 and 2).

2.1 DPG-201 LOCATION AND HISTORY

DPG-201, Camel’s Back Cave, is a 0.7-acre site on Camel’s Back Ridge in the Tower Grid area. The site consists of a two-chambered cave connected by a man-made tunnel. The cave was reportedly used to study the effects of chemical weapon systems on tunnel fortifications. Numerous chemical weapons were tested at the site. Munitions fragments, smoke canisters, wiring, scrap wood, and other debris was encountered scattered across the site during the RCRA facility investigations. There are four openings to the cave. The ground at all cave openings is characterized by a natural parapet of rock-fall debris and the ground surface in the interior of the cave sits approximately 15 to 20 feet (ft) below the grade of the ground surface at the cave openings. A vertical shaft is present extending from an opening in the cave roof.

Explosives, agent breakdown products (ABPs), and metals were detected in shallow soil samples collected during Phase I and Phase II activities. Extensive rodent droppings are present in the cave. A concern over hanta virus in the environmental samples resulted in chemical analysis of Phase II samples collected within the cave to be limited to analysis of chemical warfare agents (CWA). In addition, a low level detection of mustard was identified during the Phase II RFI investigation.

2.2 PAST OPERATIONS

DPG-201 was active from 1945 to the 1950s and was reportedly used to study the effects of chemical weapon systems on tunnel fortifications.

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-201 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-201 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	DPG00007
Parsons, 2007. <i>Final Phase II RCRA Facility Investigation Report, SWMU-201 Addendum</i> . August.	08/07	

2.4 CLOSURE ACTIVITIES

Documentation in the approved RFI Report indicates that conditions at DPG-201 meet the closure performance standards under UAC R315-7-14 (by reference 40 CFR Part 265, Subpart G, §265.111). Exposure to risks and hazards associated with potential exposure to soil inside the cave has been mitigated by constructing barriers across all of the cave openings. Soil outside the barriers qualifies for NFA. Land use controls are required to prevent residential use of the site and access to the soil inside the cave.

The major closure activities completed at DPG-201 included:

- Preventing human access to the cave by constructing fences across the cave entrances;
- Covering the vertical opening to the surface present in the northern chamber with a metal grate bolted to the surrounding rock; and
- Demonstrating that degradation of groundwater was unlikely.

The equipment used for covering this opening was transported from the staging area up the hill to the cave entrances using the existing pulley cables with a capstan winch attached to the vehicle trailer hitch. The fencing at the southern entrance was different than the other two cave entrances due to the potential of rockfall damaging the fence. The cave entrance was covered with wire mesh overlying vertical metal bars. Initially, a safety cable was anchored above the workers for protection. A series of vertical metal bars were then anchored into the rock face. The wire mesh was then placed over the metal bars and anchored using horizontal stabilizers. The central and northern openings were each closed with a chain-link fence with a three strand barbed wire above the fence. Both of these fences have locked gates. The locations of the post-holes for the vertical posts were pre-cleared by an unexploded ordnance (UXO) technician using a Schonstedt magnetometer. The vertical shaft was closed with a metal grating. After cleaning the existing wooden framing, the metal grating was placed overlapping the opening and then bolted to the bedrock. Photographs taken to document the installation and are contained in Appendix F of the RFI Report (Parsons, 2007).

These measures prevent human contact with potentially contaminated media. The characteristics of the cave including the roof and the vertical distance of at least 170 ft between the cave floor and groundwater provide for protection of groundwater. An inspection checklist designed to insure that these objectives are maintained is presented in Module VII (Form A).

2.5 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

Human health and ecological risk assessments were conducted for DPG-201. The risk assessments concluded that the soil at DPG-201 Area 1 meets the requirements for NFA under UAC R315-101-6(c) (DSHW, 2001). This conclusion was made because residential screening-level cumulative cancer risk and hazard index estimates were below target risk and noncancer levels, respectively. Also, inhalation of volatile organic compounds (VOCs) volatilized from subsurface media and ingestion of homegrown produce by hypothetical residents were incomplete exposure pathways. Further risk and hazard calculations were not necessary for an industrial land-use scenario because industrial risk and hazard estimates would be less than residential screening-level estimates. The assumption that exposure to soil located within the cave by all human receptors should be prevented has been addressed by the installation of permanent fence enclosures as a state-approved final remedial action.

2.6 SURFACE WATER AND GROUNDWATER

There was no surface water or temporary ponding of water at this cliff face site. Also, no surface water has been observed inside the cave. The bedrock and adjacent colluvial deposits of the Camel's Back area have been identified as a local groundwater recharge zone. In these areas, recharge to basin aquifers can occur on a rare and very limited scale during severe thunderstorms or periods of prolonged precipitation or snow melt (Parsons, 2007). The character of groundwater at DPG-201, including depth, quality, flow direction, aquifer yield, and degree of confinement is largely unknown. Flow is likely northwest, following the local topographic and hydrologic gradient of the basin floor below. It is highly unlikely that any groundwater recharge occurs at DPG-201, because the site sits near the top of a small, isolated ridge and therefore would receive very little precipitation or other sources of water. Additionally, the site is naturally capped by the roof of the cave, further hindering infiltration of water to the site. The estimated depth to groundwater at DPG-201 is approximately 170 ft below ground surface (bgs), based on the elevation of the cave at DPG-201 and groundwater measurements from the water wells north of DPG-201 and the wells at DPG-021. Based on these observations, groundwater below the DPG-201 site occurs in fractured bedrock and is likely potable, Class II water (DWQ, 2002). However, it is likely that this water rapidly transitions into a brackish water environment as it flows northwest from the Camel's Back area to the basin floor. Groundwater samples were not collected at this site. Future impacts to groundwater are not expected based on soil-to-groundwater screening using results from soil samples collected at DPG-201, the roof over the cave and the depth of groundwater below the cave floor (approximately 170 ft).

2.7 CLOSURE NOTIFICATIONS

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-201:

DPG-201 is located within a federal, military installation (DPG). As such, the installation is restricted for the common population.

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.

4.0 POST-CLOSURE OPERATIONS AND INSPECTIONS

4.1 INTRODUCTION

DPG-201 has been closed under a continued industrial use scenario, which prohibits residential use in the area formerly occupied by the site. The site has been closed under the DPG RCRA part B Permit requirements. 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-201 site shall be conducted annually by November 1st to ensure that the former site remains under industrial use and to ensure the Dugway Dig Permit Process (Module VII.I) has been followed. The frequency of inspections can be modified in accordance with amendments submitted in the form of proposed permit modifications.

Site inspections will consist of visual inspection of the site. A general site inspection checklist is included in Module VII (Form A). 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:

1. There is no evidence of land use other than for industrial purposes within the former site boundary; and
2. There is no evidence of soil disturbance.

Table 3 summarizes the Post-Closure Inspection Schedule for DPG 201, and lists the items to be inspected and potential problems. Inspection personnel shall note any problems found and shall inform appropriate Dugway representatives.

Table 3: DPG- 201 Post-Closure Inspection Schedule

Inspection/ Monitoring Item	Method of Documentation	Frequency of Inspection
Land Use	Industrial Use Inspection Checklist (Form A of Module VII)	Annual inspections shall be conducted before <u>November 1st</u> , of each year.
Soil Disturbance	Industrial Use Inspection Checklist (Form A of Module VII)	Annual inspections shall be conducted before <u>November 1st</u> , of each year.

4.3 INSPECTION FOLLOW-UP

Copies of completed site inspection checklists (Module VII, Form A) 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 RFI for DPG-201 (Parsons, 2007), post-closure inspection is required. Groundwater monitoring for DPG-201 is not needed.

5.1 NON-COMPLIANCE REPORTING

The conditions at DPG-201 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 Hazardous Waste Management Units (HWMUs) and SWMUs undergoing post-closure care by March 1, of the reporting year. The first Post-Closure report for DPG-201 shall be due no later than March 1, 2010. Specifically for DPG-201, the Biennial Post-Closure Report shall include, at a minimum, the following:

- General site description and conditions; and
- Inspection records.

5.3 REQUIRED SUBMITTALS

Table 4 summarizes the requirements for the Biennial Post-Closure Report for DPG-201 and reporting for any non-compliance.

Table 4: 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 2010, 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

DSHW (Division of Solid and Hazardous Waste), 2001. *Administrative Rules for Cleanup Action and Risk-Based Closure Standards*. Utah Department of Environmental Quality. R315-101, Utah Administrative Code.

Division of Water Quality (DWQ), 2002. *Division of Water Quality Administrative Rules for Groundwater Quality Protection R317-6 Utah Administrative Code*.

Parsons Environmental Science, Inc. (Parsons), 2007. *Final Phase II RCRA Facility Investigation Report, SWMU-201 Addendum*. August.

Parsons, 1999. *Final Phase I RCRA Facility Investigation, Investigation Report, Revision 1*. September.