LMS/CNT/S09307

Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area Surface, Hot Creek Valley, Nevada

March 2013

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March 2013

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Contents

Figures

Appendixes

Abbreviations

bgs	below ground surface
CAU	Corrective Action Unit
cm	centimeters
CMP	Central Mud Pit
CNTA	Central Nevada Test Area
DOE	U.S. Department of Energy
FFACO	Federal Facility Agreement and Consent Order
ft	feet
in	inches
km	kilometers
LM	Office of Legacy Management
m	meters
mi	miles
mm	millimeters
NDEP	Nevada Division of Environmental Protection
SM	subsidence monument
SOARS	System Operation and Analysis at Remote Sites
TDR	time domain reflectometry
VMC	volumetric moisture content

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Executive Summary

This report presents results of data collected during the annual post-closure site inspections conducted at the Central Nevada Test Area surface Corrective Action Unit (CAU) 417 in May 2011 and July 2012. The annual post-closure site inspections included inspections of the UC-1, UC-3, and UC-4 sites in accordance with the Post-Closure Monitoring Plan provided in the CAU 417 Closure Report (NNSA/NV 2001).

The annual inspections conducted at the UC-1 Central Mud Pit (CMP) indicated that the site and soil cover were in good condition. No new fractures or extension of existing fractures were observed and no issues with the fence or gate were identified. The vegetation on the cover continues to look healthy, but the biennial vegetation survey conducted during the 2012 inspection indicated that the total foliar cover was slightly higher in 2009 than in 2012. This may be indicative of a decrease in precipitation observed during the 2-year monitoring period. The precipitation totaled 9.9 inches from July 1, 2010, through June 30, 2011, and 5 inches from July 1, 2011, through June 30, 2012. This decrease in precipitation is also evident in the soil moisture data obtained from the time domain reflectometry sensors. Soil moisture content data show that the UC-1 cover is performing as designed, and evapotranspiration is effectively removing water from the cover.

The biennial subsidence survey was conducted at the UC-1 CMP and UC-4 Mud Pit C in July 2012. The results of the subsidence surveys indicate that the covers are performing as expected, and no unusual subsidence was observed. The two UC-4 subsidence markers that have shown increases in elevation over the past couple of years now show a decrease in elevation.

The inspection at UC-3 indicated that the site is in good condition. All monuments and signs showed no displacement or damage, and none have been removed. No other issues or concerns were identified.

The inspection at UC-4 indicated that the site is in good condition. All monuments and signs showed no displacement or damage, and none have been removed.

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1.0 Introduction

This report presents data collected during the annual post-closure site inspection conducted by the U.S. Department of Energy (DOE) Office of Legacy Management (LM) at the Central Nevada Test Area (CNTA) surface Corrective Action Unit (CAU) 417. This report has been prepared in accordance with the Post-Closure Monitoring Plan contained in the CAU 417 Closure Report (NNSA/NV 2001) and Federal Facility Agreement and Consent Order (FFACO) (FFACO 1996). Responsibility for environmental site restoration of the CNTA was transferred from the DOE Office of Environmental Management to LM on October 1, 2006.

This report provides an analysis and summary of the annual site inspection and subsidence survey, meteorological information, vegetation survey, and soil moisture monitoring data collected since the last annual inspection in May 2010. In 2011, LM and the Nevada Division of Environmental Protection (NDEP) agreed that the post-closure inspections and surveying of the subsidence monuments would be performed every other year with the first biennial monitoring event to be performed in 2012. In 2011 a site inspection was conducted in conjunction with other site activities, and in 2012, the post-closure inspection was conducted to document the physical condition of the CAU 417 soil covers, monuments, signs, fencing, and restricted-use areas. Subsidence surveys of the UC-1 Central Mud Pit (CMP) and UC-4 Mud Pit C covers were also conducted during the 2012 inspection. In addition, the UC-1 CMP cover is instrumented to monitor the soil moisture conditions within the upper 1.2 meters (m) (4 feet [ft]) of the cover to determine if the cover is performing as designed.

1.1 Purpose

The purpose of the post-closure monitoring at CAU 417 is to determine if:

- The UC-1 CMP or UC-4 Mud Pit C cover, fences, or diversion channels need maintenance or repairs.
- The UC-1 CMP or UC-4 Mud Pit C cover is subsiding.
- The UC-1 CMP cover is performing as designed.
- Vegetation on the UC-1 CMP cover is healthy.
- The aboveground monuments or warning signs at UC-1, UC-3, and UC-4 need maintenance or repairs.
- The administrative controls need modifications.

1.2 Site Location and Background

CNTA is approximately 22.5 kilometers (km) (14 miles [mi]) north of U.S. Highway 6 and approximately 110 km (68 mi) northeast of Tonopah in Nye County, Nevada (Figure 1). Three emplacement boreholes, UC-1, UC-3, and UC-4, were drilled at CNTA for underground nuclear weapons testing. On January 19, 1968, the Project Faultless underground nuclear test was conducted in borehole UC-1 at a depth of 975 m (3,200 ft) below ground surface (bgs). The other two emplacement boreholes (UC-3 and UC-4) were not used, and no further testing was conducted at CNTA. Boreholes UC-1, UC-3, and UC-4 are located on three separate land withdrawals that range in size from approximately 1 to 1.5 square miles (Figure 2). All three land withdrawals are accessible to the public.

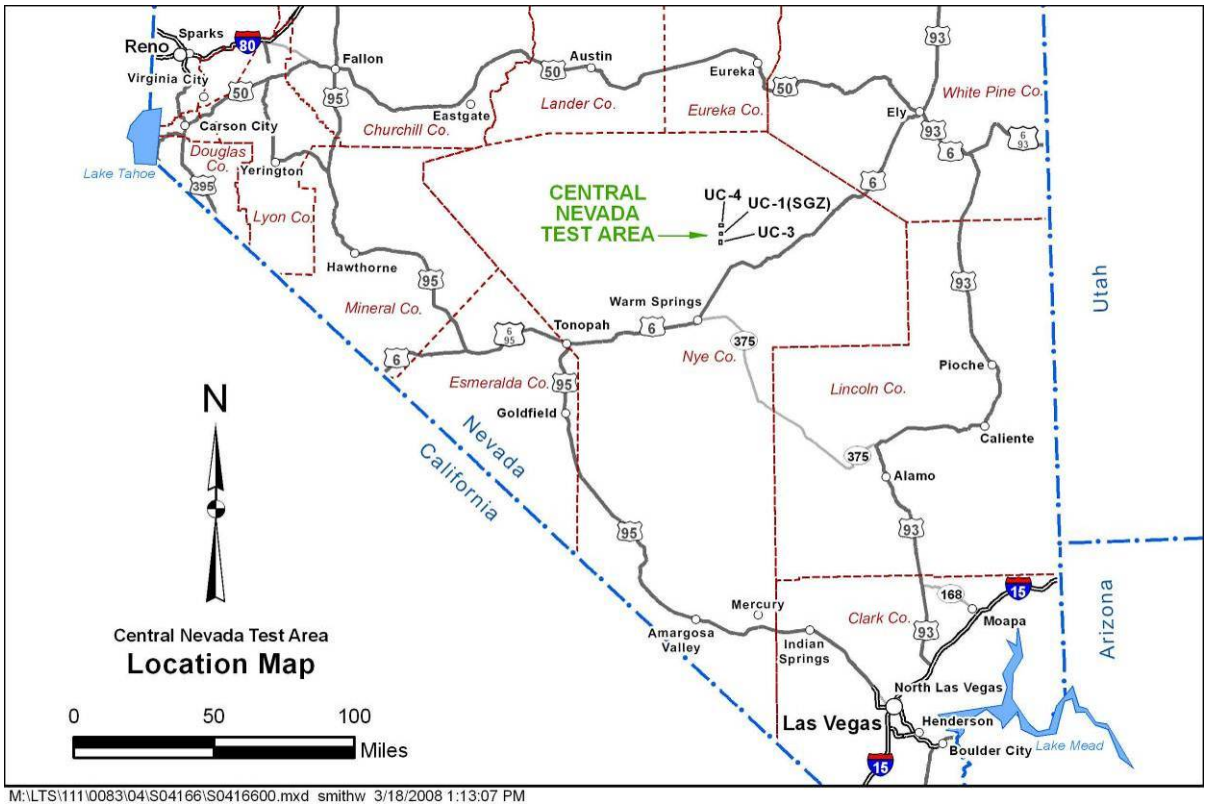

Figure 1. CNTA Location Map

1.3 Geologic Setting

CNTA is in the north-central portion of the Hot Creek Valley within the Basin and Range physiographic province. This province consists of roughly north-south-trending mountain ranges separated by alluvial valleys. The UC-1 site lies at an elevation of 1,860 m (6,100 ft) above mean sea level and is bordered by the Hot Creek Range to the west and the Pancake Range to the east. The Hot Creek Range is composed of Paleozoic sedimentary rocks and Tertiary volcanic rocks. The Paleozoic rocks consist of sandstone, quartzite, limestone, and dolomite, and the Tertiary volcanic rocks consist of welded tuff; nonwelded, bedded tuff; argillized and zeolitized tuff; conglomeratic, tuffaceous sandstone; carbonaceous siltstone; and rhyolite (Healey 1968). The alluvium at UC-1 is approximately 730 m (2,400 ft) thick and is underlain by tuffaceous sediments and zeolitized tuffs to a depth of approximately 998 m (3,275 ft) (Barnes 1968). The Morey Peak−Hot Creek Caldera is thought to be buried by deposits of tuff and alluvium beneath the northern portion of Hot Creek Valley (Healey 1968).

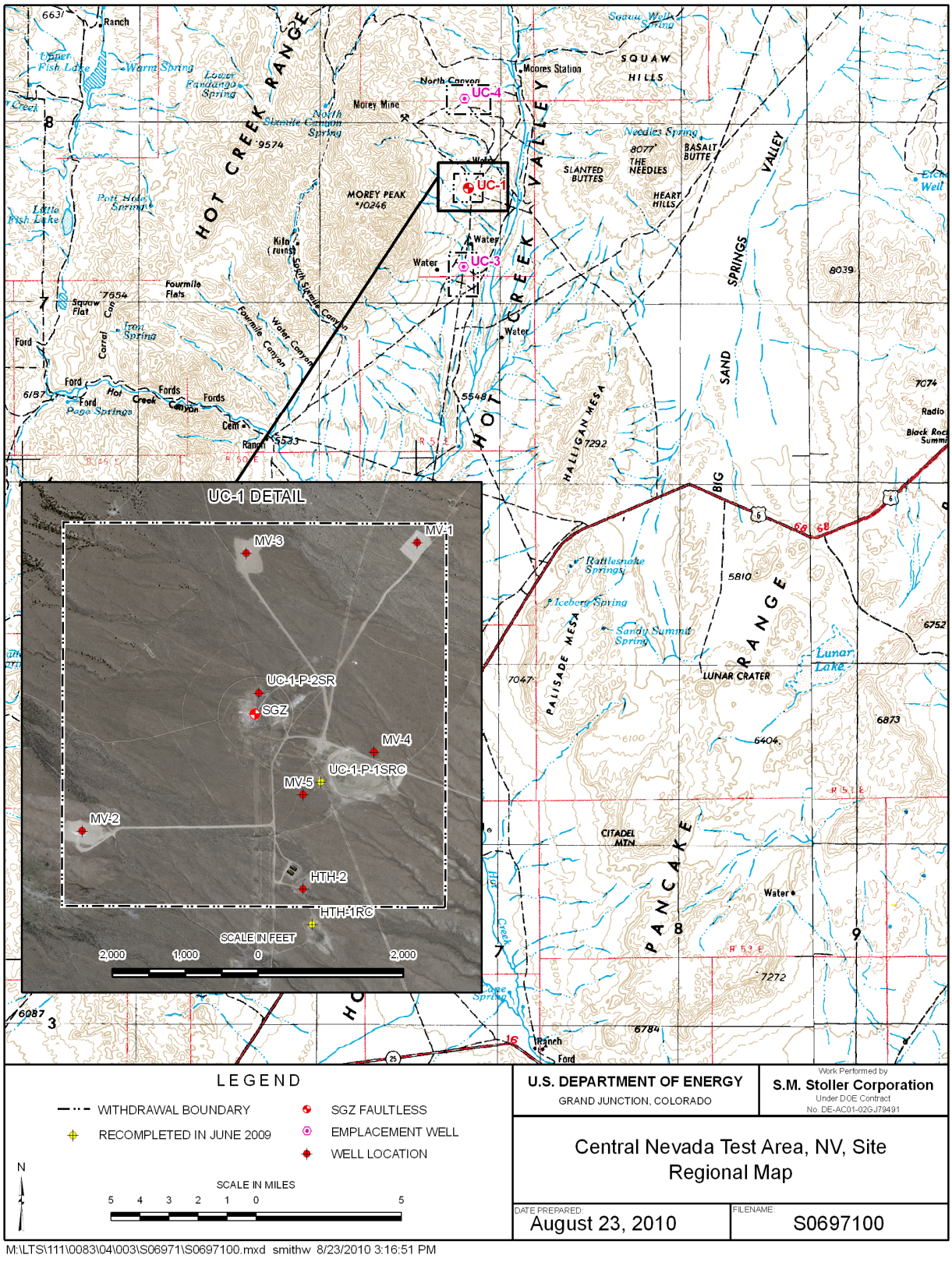

Figure 2. CAU 417, CNTA Surface Map

The Project Faultless test resulted in the subsidence of an irregularly shaped area of approximately 1.5 square kilometers (0.6 square mile). One northeast-trending fault scarp extends beneath the southeastern corner of the UC-1 CMP, with as much as 4.6 m (15 ft) vertical displacement. The formation of this scarp disrupted normal drainage patterns, so flood diversion channels were constructed to protect the cover and prevent infiltration along the fault scarp (NNSA/NV 2001). The depth to water at the UC-1 CMP is approximately 84 m (275 ft) bgs based on measurements obtained from well UC-1-P-1SRC[1] prior to and after its recompletion in June 2009 (Figure 2). Water levels measured before the recompletion of UC-1-P-1S had been suspect because difficulties were encountered during the well's drilling and construction in 1968. Historically, the reported depth to water of 550 ft bgs at the CMP was based on measurements obtained from well HTH-2. Well HTH-2 is outside the down-drop graben block, nearly 1,500 ft southwest of the CMP. Well UC-1-P-1SRC is inside the down-drop graben block, less than 200 ft west of the CMP. The differing depths to water inside and outside the graben block (northwest and southeast of the southeast bounding fault) were confirmed by the 2009 drilling program. Wells MV-4 and MV-5 drilled through the southeast graben fault and were dual completions with a piezometer inside the graben and a well outside the graben. The depth to water of the piezometers is consistent with that of well UC-1-P-1SRC, approximately 275 ft bgs. The depth to water of the wells is consistent with that of well HTH-2, approximately 550 ft bgs. Well HTH-1RC (outside the graben block) was also recompleted in 2009 with two piezometers (upper and lower alluvial aquifer) and a well (upper volcanic section). The depth to water of both HTH-1RC piezometers is approximately 550 ft bgs.

[1] RC indicates that the well has been recompleted.

2.0 Post-Closure Monitoring Requirements

2.1 Site Inspections

Quarterly inspections were conducted since the site's closure (in 2000) through 2006. From 2007 through 2010, post-closure inspections of CAU 417 were performed annually. Beginning in 2012, the post-closure inspection report is prepared biennially. This inspection report contains the information collected in 2011 and 2012. The annual site inspection is documented on an inspection checklist, with site photographs and, if applicable, field notes. The post-closure inspection consists of the following:

- Inspecting the UC-1 CMP cover and UC-4 Mud Pit C cover and fencing. This includes walking the entire perimeter of the fence and documenting the condition of the barbed-wire and chicken-wire fencing, warning signs, and entrance gate.
- Inspecting all aboveground monuments, attached warning signs, and affixed survey pins placed at the UC-1, UC-3, and UC-4 sites for signs of wear, disturbance, vandalism, animal burrows, and other damage. Repairing monuments and attached signs during site inspections or, if necessary, later in the calendar year.
- Inspecting the condition of the 2 subsidence monuments (SMs) on the UC-4 cover and 12 SMs on the UC-1 CMP cover. A subsidence survey of all SMs is conducted biennially to determine if the covers have subsided.
- Documenting any changes to the covers or fenced areas, including but not limited to the presence of trash and debris inside the fenced areas, animal burrows on the covers or under the perimeter fences, erosion features on the covers or diversion channels, and any change in the health of the UC-1 CMP cover vegetation.
- Documenting the soil water content profile of the UC-1 CMP cover to evaluate whether the cover is performing as designed.
- Biennially reporting on the health and stability of the UC-1 CMP cover vegetation.

2.2 Maintenance and Repair

If a site inspection detects that either the UC-1 CMP cover or the UC-4 Mud Pit C cover is not in compliance, if conditions requiring major repairs are noted, or if any other problems in critical areas are noted, then issues will be evaluated and reported to NDEP within 60 days of detection (in compliance with the FFACO). The following guidelines apply to CAU 417 maintenance and repairs:

- Cracks, settling features, erosion rills, and animal burrows more than 15 centimeters (cm) (6 inches [in]) deep that extend 1 m (3 ft) or more and that do not compromise the UC-1 CMP or UC-4 Mud Pit C covers will be evaluated and repaired within 90 days of detection.
- Noncritical cracks, settling features, erosion rills, and animal burrows less than 15 cm (6 in) deep that extend less than 1 m (3 ft) will be repaired during the site inspection visit.
- Damage to the fencing surrounding the UC-1 CMP cover or the UC-4 Mud Pit C cover, warning signs, or monuments will be evaluated and repaired within 90 days of detection.

- Major damage to use-restriction warning signs or monuments will be evaluated and repaired during subsequent site inspections.
- All repair work will preserve the original as-built design and will be documented in the biennial Post-Closure Inspection and Monitoring Report.

2.3 Cover Moisture Monitoring

The CNTA UC-1 CMP monolayer cover is designed to limit infiltration of moisture into the disposal unit by evapotranspiration from vegetation that was established on the cover. The cover performance is monitored using time domain reflectometry (TDR) sensor data to provide a profile of the water content in the cover. The soil water content profile determines whether the cover is performing as designed and if it complies with the closure plan and agreements.

The soil moisture content is obtained using a Campbell Scientific TDR-100 and recorded by a Campbell Scientific data logger (CR1000) and a radio housed in an instrument vault located just off the southern edge of the cover. The radio transmits data to an onsite telemetry station. Soil moisture data are being recorded twice daily, and they are imported into and saved in the System Operation and Analysis at Remote Sites (SOARS) system at LM's Grand Junction office. The post-processing software that SOARS uses automatically produces graphs, creates tables, and backs up data daily.

TDR sensors were buried in the cover at two locations (West TDR and East TDR) during cover construction. At both locations, two TDR sensors were placed below the surface of the cover at the following depths: 0.15, 0.46, 0.76, and 1.07 m (0.5, 1.5, 2.5, and 3.5 ft) (Figure 3). The TDR nests are located approximately 48 m (157 ft) northwest and 48 m (157 ft) northeast of the instrument vault.

The TDR probes were calibrated to volumetric moisture content (VMC) using a dry-down method with native soil and full-length cable. The results of the calibration indicated that a site-specific calibration equation should be used instead of the standard Topp equation (Topp et al. 1980). It was also found that long cable lengths and soil conductivities caused the TDR reflection end points to become extremely flat under saturated and near-saturated conditions, resulting in unreliable data in these regions.

A fourth-order polynomial fit of the calibration data, over the range of 5 to 35 percent VMC, yielded the following calibration equation:

$$VMC\ (\%) = -308.701 + 373.1803(L/L) - 163.644(L/L)^2 + 31.82972(L/L)^3 - 2.25548(L/L)^4$$

Where L/L is the ratio of cable length to probe length as recorded by the data logger.

2.4 Cover Moisture Compliance Criteria

The depth of the deepest TDR soil moisture probe is the point of compliance for the UC-1 CMP cover, which is approximately 1.07 m (3.5 ft) below ground surface. Cover compliance will be based on the soil moisture content of the cover once steady-state conditions are reached. Cover performance modeling presented in the CAU 417 Corrective Action Plan (DOE/NV 2000) predicted that steady-state conditions would be achieved within 10 years of cover construction, which was completed in September 2000.

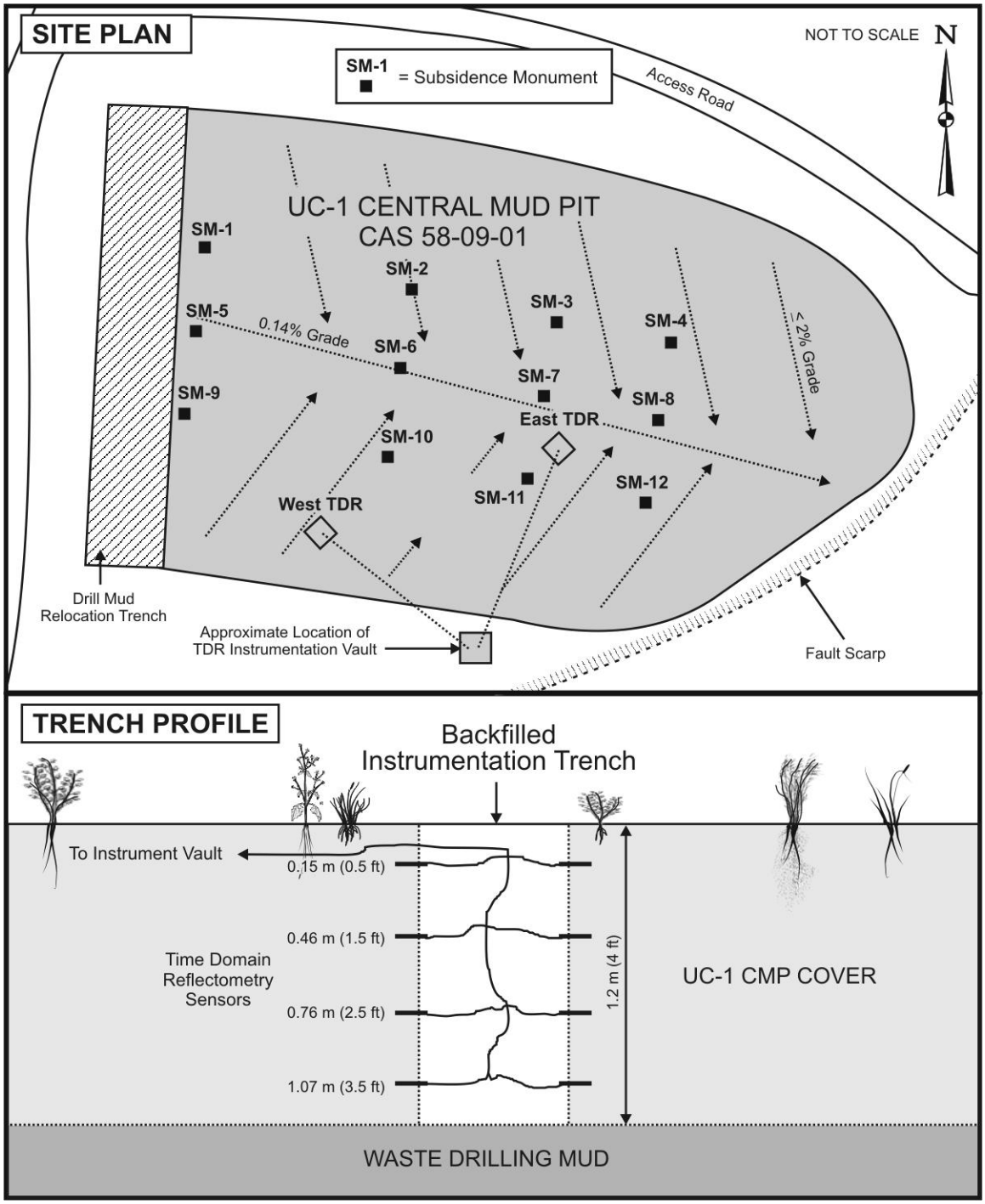

Figure 3. UC-1 CMP Cover Monitoring Instrumentation

If soil moisture data indicate that the cover is not operating according to established compliance criteria, NDEP will be notified of the noncompliance within 14 days. After NDEP has been notified of the noncompliance, LM will submit a work plan to NDEP within 90 days; the work plan will outline the proposed remediation/investigation plan. All corrective actions will be documented in the biennial Post-Closure Inspection and Monitoring Report.

2.5 Reporting Requirements

All inspection and maintenance activities conducted during the year are documented and included in the biennial Post-Closure Inspection and Monitoring Report. LM submits the report to NDEP and includes the following information:

- A brief narrative and discussion of all post-closure inspection activities and observations.
- Copies of all completed inspection checklists and maintenance records.
- UC-1 CMP soil moisture content profiles for the current monitoring period.
- Subsidence survey data.
- Specific recommendations for nonstandard maintenance or changes in post-closure requirements.

All closure and post-closure monitoring documentation is maintained in project files and is available upon request.

3.0 Site Inspections, Surveys, and Maintenance

3.1 Annual Site Inspection Results

The annual inspections of the three sites were performed on May 11, 2011, and July 31, 2012. Copies of the inspection checklists and photographs are included in Appendix A. The following sections summarize the inspection results.

3.1.1 UC-1 Inspection

The locks, fencing, SMs, and signs associated with the CMP were in good condition, with the exception of one sign that had fallen along the southern side of the fence line. The sign was reattached to the fence at the time of the 2012 inspection. No new cracks or fractures, and no extension of existing cracks or fractures, were identified in the soil cover at the time of the inspections. The vegetation on the cover continues to look healthy. All other signs and monuments at Mud Pits A and E (Figure 4) were in excellent condition.

3.1.2 UC-3 Inspection

The site was in excellent condition (Figure 5). No issues with the monuments or signs were identified at the time of the inspections, and no maintenance or repairs were recommended.

3.1.3 UC-4 Inspection

The Mud Pit C fence and SMs were in good condition at the time of the inspections. No erosion rills were identified, and previously identified rills showed no further signs of activity. No new erosion concerns were apparent at the time of the inspections. Some sagebrush was growing on the surface of the cap, but the inspection team used mechanical methods to remove a large amount of the vegetation during the 2012 inspection. No issues that affected the integrity of the cover and appurtenances were noted. Mud Pits A, B, and D were in excellent condition, and no issues were identified with Area S or Area X (Figure 6).

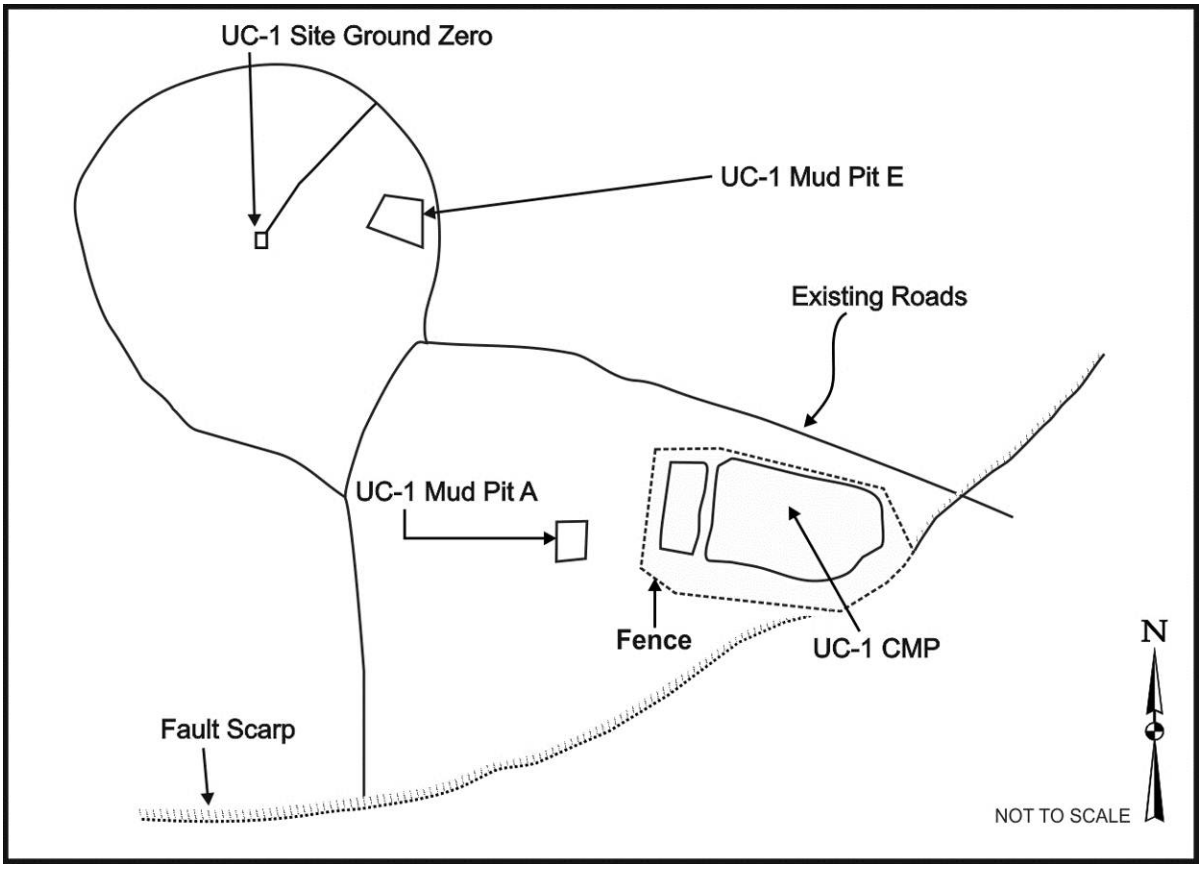

Figure 4. Location of UC-1 Significant Features

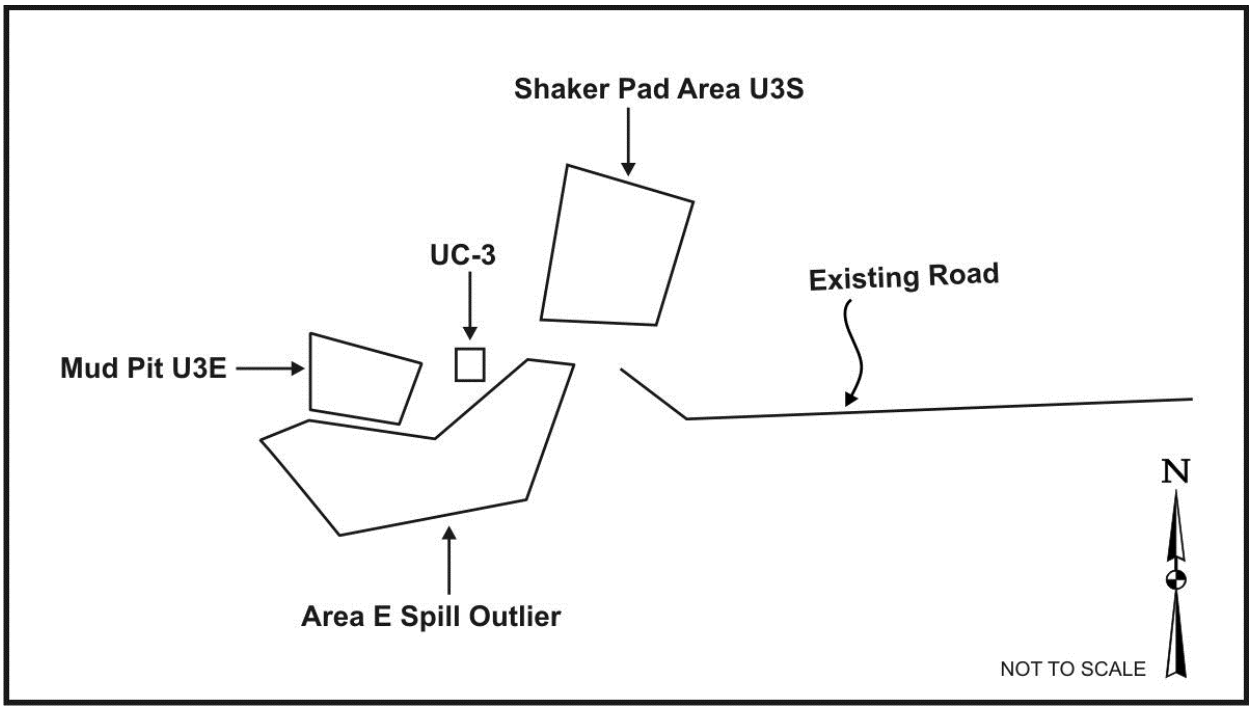

Figure 5. Location of UC-3 Significant Features

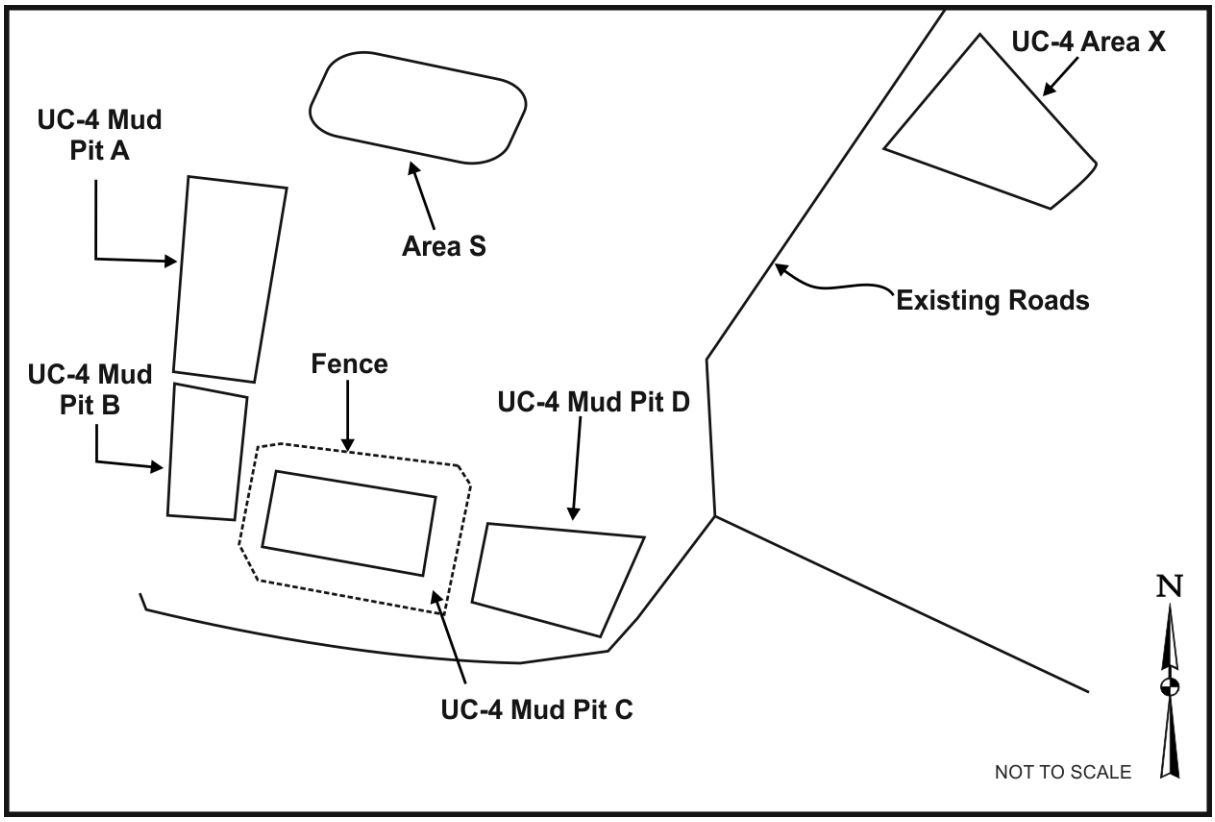

Figure 6. Location of UC-4 Significant Features

3.2 Subsidence Survey Results

Surveys of the SMs for UC-1 and UC-4 were performed on July 31, 2012. The following sections summarize the survey results.

3.2.1 UC-1 Survey

Twelve SMs were installed on the UC-1 CMP cover to provide elevation control and measure subsidence of the cover and relocation trench (NNSA/NV 2001). Figure 3 shows these SMs. The baseline subsidence survey was completed on December 4, 2000, and is used as the reference to calculate subsidence for each subsequent survey. Beginning in 2007, annual subsidence monitoring replaced the semiannual subsidence monitoring that had taken place since 2002. In 2011, the annual subsidence monitoring was replaced by biennial subsidence monitoring that was conducted for the first time in 2012. The UC-1 baseline survey locations and elevations are provided in Table B−1 in Appendix B, and are presented in graphical form in Figure 7.

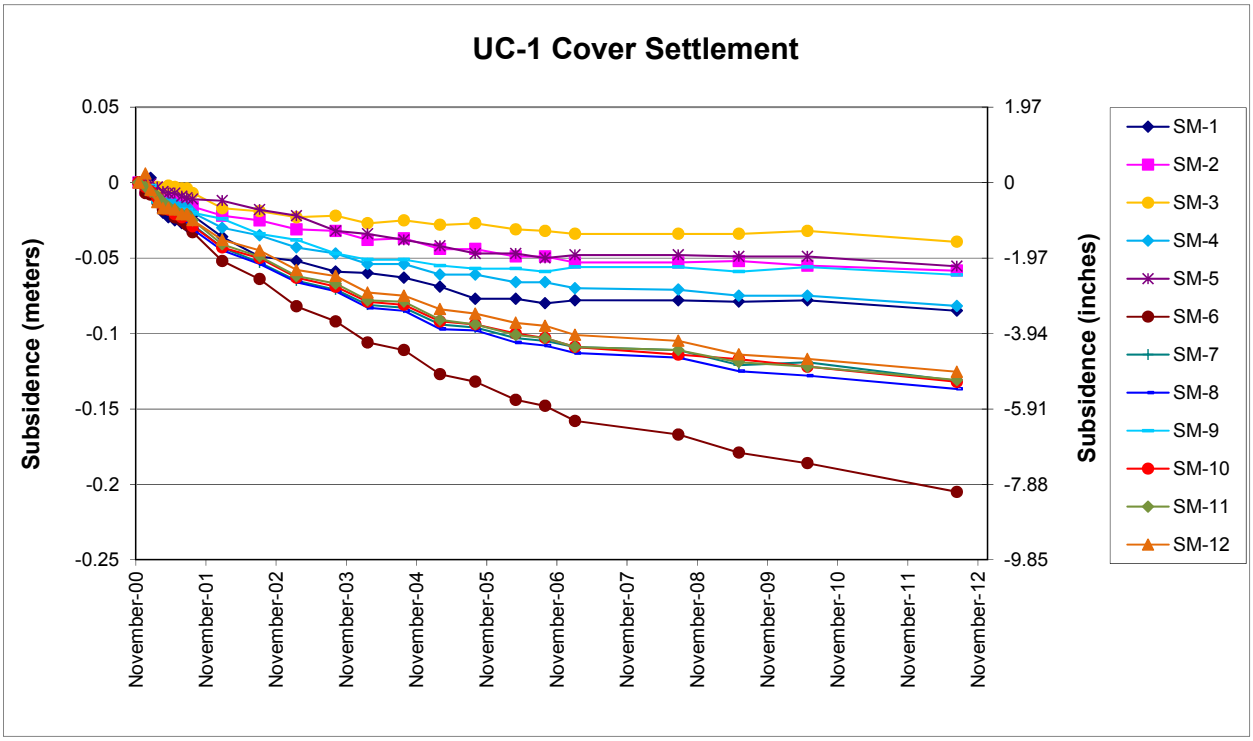

Figure 7. UC-1 Cover Settlement

The degree of settlement in the relocation trench and CMP is within the predicted range and shows no unusual subsidence. The data collected over the CMP section of the cover indicate that the largest subsidence is along the centerline of the CMP, including SM-6, SM-7, and SM-8, and along the southern portion of the cap at SM-10, SM-11, and SM-12. This was expected because of the thicker layer of underlying mud in these areas. The northern monuments (SM-2, SM-3, and SM-4) and the westernmost monuments (SM-1, SM-5, and SM-9) show the least subsidence because the layer of underlying mud along these margins of the cover is thinner. The greatest degree of settlement continues to be on SM-6, which has subsided a total of 0.205 m (8.07 in) since the baseline survey in December 2000.

3.2.2 UC-4 Survey

Two SMs (west and east monuments) were installed in the UC-4 cover to provide elevation control for measuring the subsidence of the cover. Figure 8 shows these SMs. An initial subsidence survey was completed on October 12, 1999, and is used as a baseline to calculate subsidence. The UC-4 baseline survey locations and elevations are provided in Table B−2 in Appendix B, and are presented in graphical form in Figure 9. Since the last subsidence survey in 2010, both SMs show a decrease in elevation. The elevation of the east SM decreased 0.01 m (0.394 in), and the elevation of the west SM decreased 0.013 m (0.512 in) since the last subsidence survey.

Historically, settling of the west SM is still slightly greater than the predicted settling of 0.05 m (2 in); the total subsidence is 0.057 m (2.24 in) since the baseline survey in October 1999. The east SM has subsided a total of 0.024 m (0.94 in) since the baseline survey. The largest changes occurred during the first 3 years.

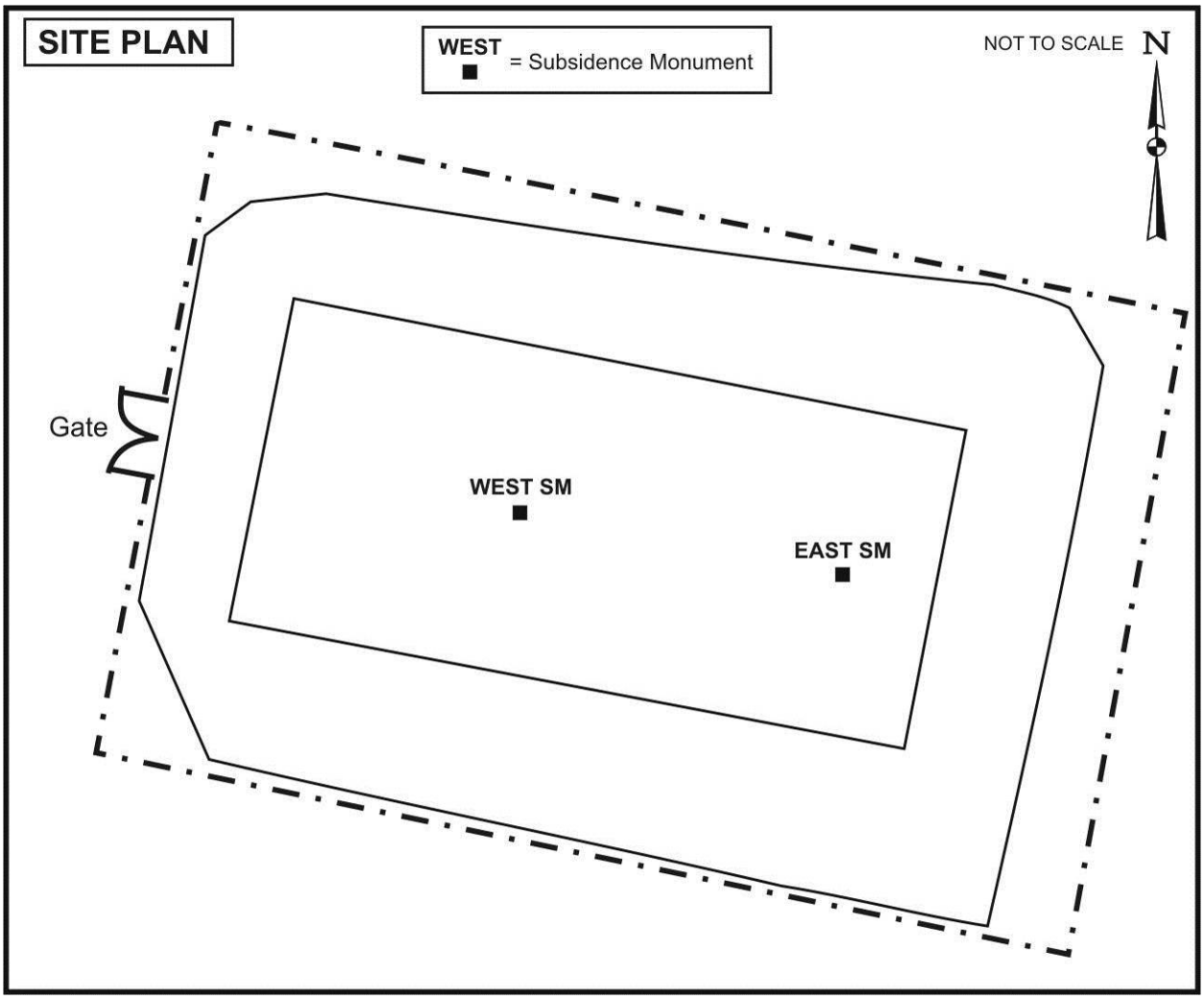

Figure 8. UC-4 West and East Monuments

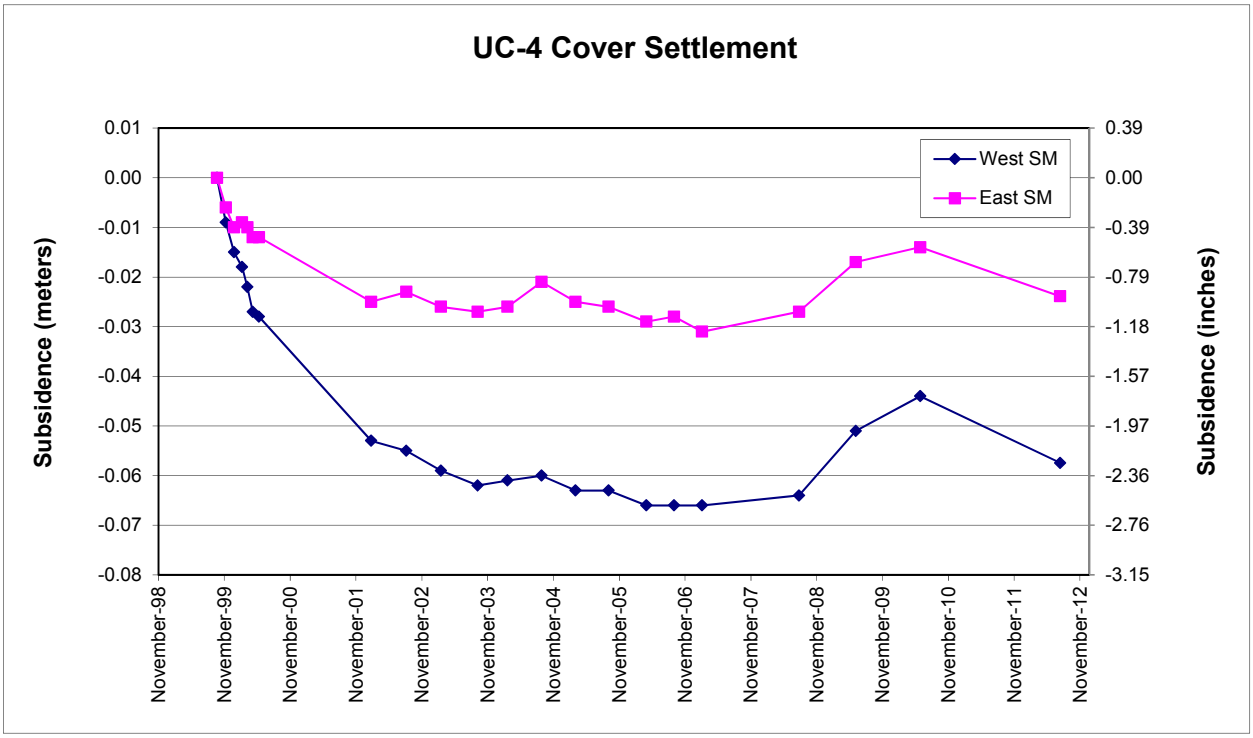

Figure 9. UC-4 Cover Settlement

3.3 Vegetation Survey Results

In 2000 and 2001, the DOE Office of Environmental Management reclaimed the UC-1 CMP by seeding the pit's constructed soil cover with native species and planting 5,000 live plants. A fence was constructed around the disposal cell to exclude livestock. Post-closure requirements for the UC-1 CMP include periodic vegetation surveys to assess the health and stability of the vegetated cover. A preliminary evaluation of the site was conducted in July 2001 to confirm germination. Additional surveys were conducted in October 2001, March and September 2002, June 2003, June 2004, May 2006, May 2007, and June 2009 to evaluate the density, diversity, and overall condition of the vegetation. The most recent vegetation survey was performed concurrently with the site inspection on July 31, 2012.

Vegetation is an integral component of the pit's cover. Through evapotranspiration, vegetation reduces storm water infiltration and percolation through the cover. It also helps reduce wind and water erosion on the soil cover by reducing surface velocities. Previous monitoring indicates that a healthy plant community has become established on the soil cover and in disturbed areas outside the fence, although areas outside the fence were slower to establish because of periodic livestock grazing.

Revegetation of the UC-1 CMP cover and perimeter area continues to be successful, especially under prolonged drought conditions. Foliar cover data were estimated on the CMP cover, in the CMP perimeter area (areas of disturbed and reclaimed soils outside the cover fence), and in an adjacent undisturbed, native area. Total foliar cover and species richness values have changed little in the revegetated areas since 2009. A detailed vegetation monitoring report is included in Appendix C, but results of the 2012 monitoring are summarized below.

On the CMP cover, rubber rabbitbrush and thread snakeweed were the dominant species, and secondary species were big sagebrush, fourwing saltbush, and Indian ricegrass. In the CMP perimeter area, rubber rabbitbrush and big sagebrush were dominant, and thread snakeweed was secondary. Big sagebrush was the dominant species in the undisturbed, native area; thread snakeweed and bottlebrush squirreltail were secondary. Drought stress was evident across the UC-1 site, and many small shrubs on the CMP cover were dead.

Total foliar cover on the CMP cover and in the CMP perimeter area was estimated to be slightly higher in 2009 than in 2012. The undisturbed, native area showed the opposite pattern, as total foliar cover increased substantially. These changes in plant cover are likely the result of prolonged drought, which may favor large, established sagebrush, which is dominant in the native area, over the younger, dominant shallow-rooted shrubs on the CMP. Grazing and browsing animals (antelope, rabbits, and deer) may also favor the more palatable species on the CMP during times of drought. As in previous years, shrubs and grasses on the CMP had been noticeably grazed by these animals. Vegetation in the CMP perimeter area is also available for grazing by livestock, and this may account for the lower foliar cover in this area.

3.4 Precipitation and Soil Moisture Monitoring Results

A Campbell Scientific TE525 tipping bucket rain gauge collects precipitation data at the UC-1 CMP cover. A CS705 precipitation adapter is used for snowfall measurements. The rain gauge data are collected and stored by the data logger and sent to an onsite telemetry station. The data are then sent to, and saved on, SOARS. The rain gauge was evaluated and repaired during a general site maintenance visit conducted in early October 2008.

Figure 10 present the 2-year precipitation record from the UC-1 CMP rain gauge. Precipitation measured from July 1, 2010, through June 30, 2011, totaled 251.2 millimeters (mm) or 9.9 in. Precipitation measured from July 1, 2011, through June 30, 2012, totaled 126 mm or 5 in. Precipitation measured for the same time period ending in 2009 and 2010 was 174.8 mm (6.9 in) and 175.3 mm (6.9 in), respectively. Refer to Appendix B (Figure B–1 and Table B–3) for the historic precipitation data from 2008 through 2012.

3.4.1 UC-1 Soil Moisture Results

Figure 11 through Figure 14 present graphs of the TDR-derived soil moisture content for July 1, 2010, through June 30, 2012. A summary of the data is provided in the following section.

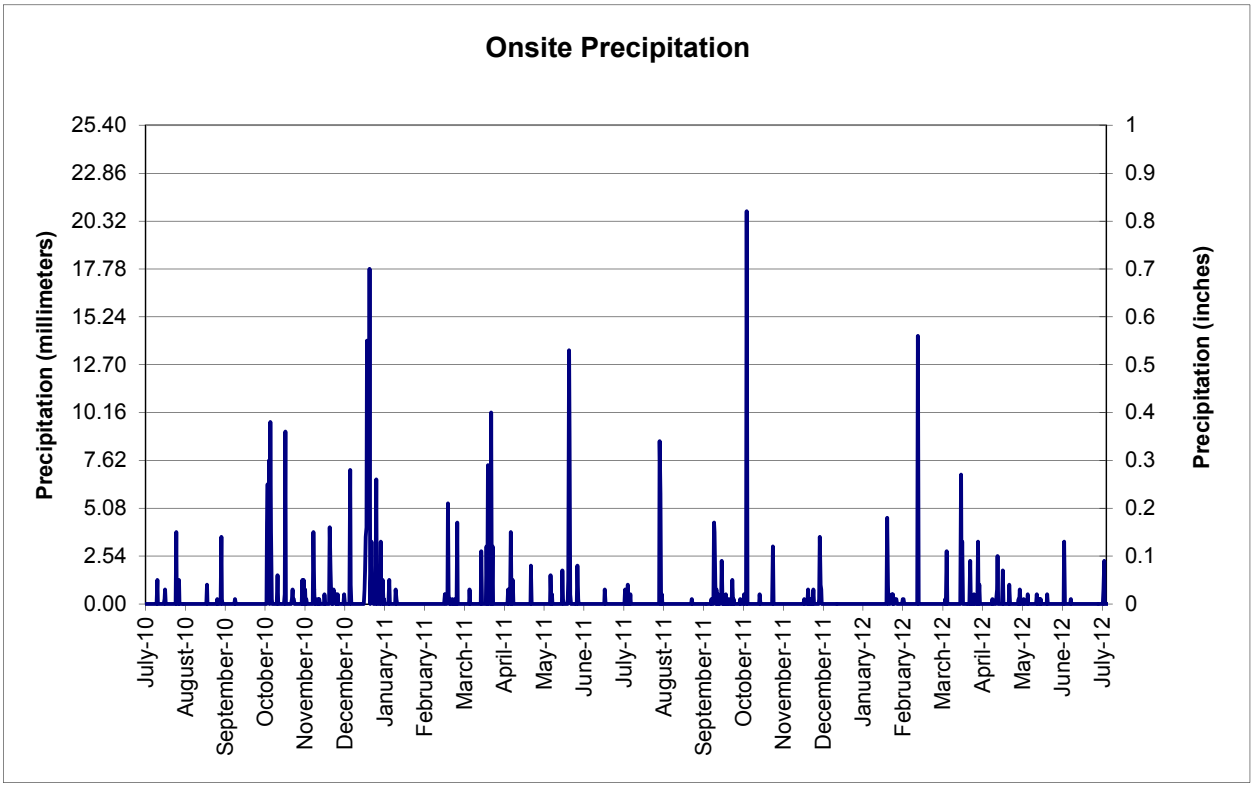

Figure 10. July 1, 2010, through June 30, 2012, Precipitation Data

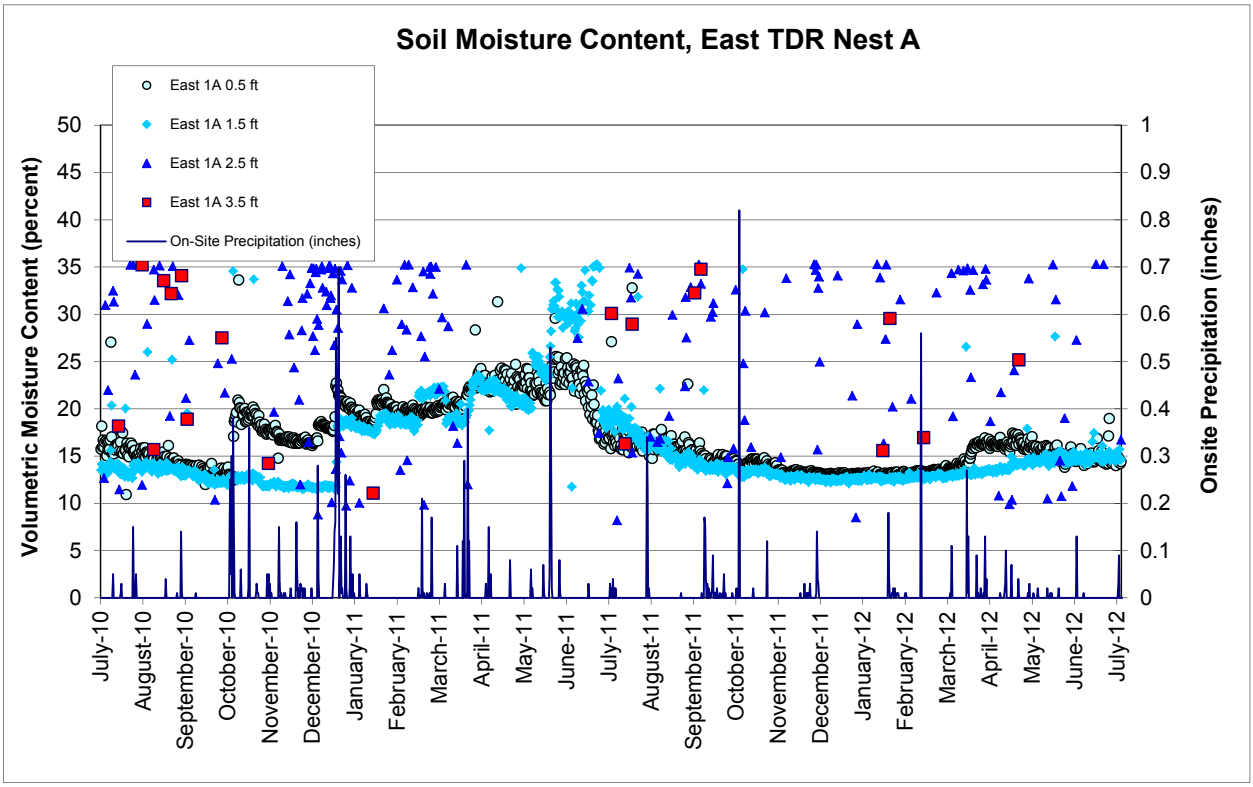

Figure 11. UC-1 Soil Moisture Content, East TDR Nest A

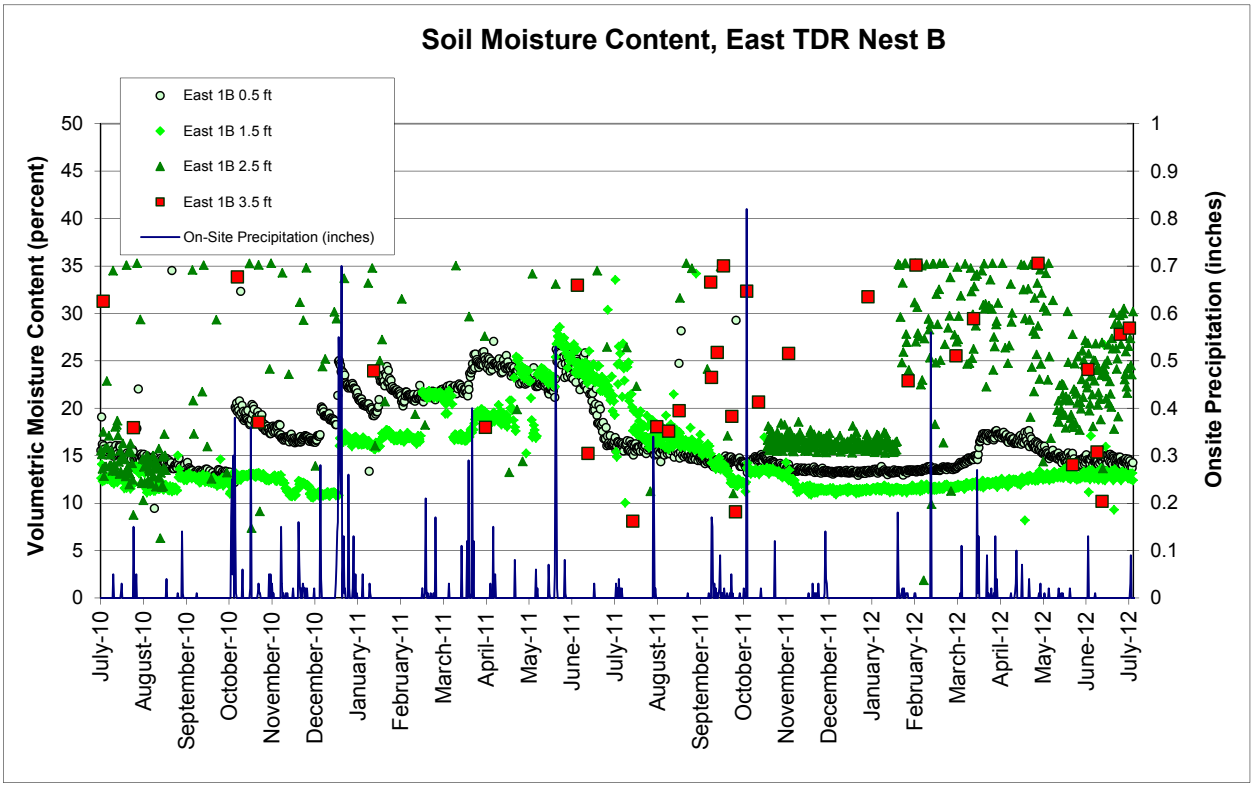

Figure 12. UC-1 Soil Moisture Content, East TDR Nest B

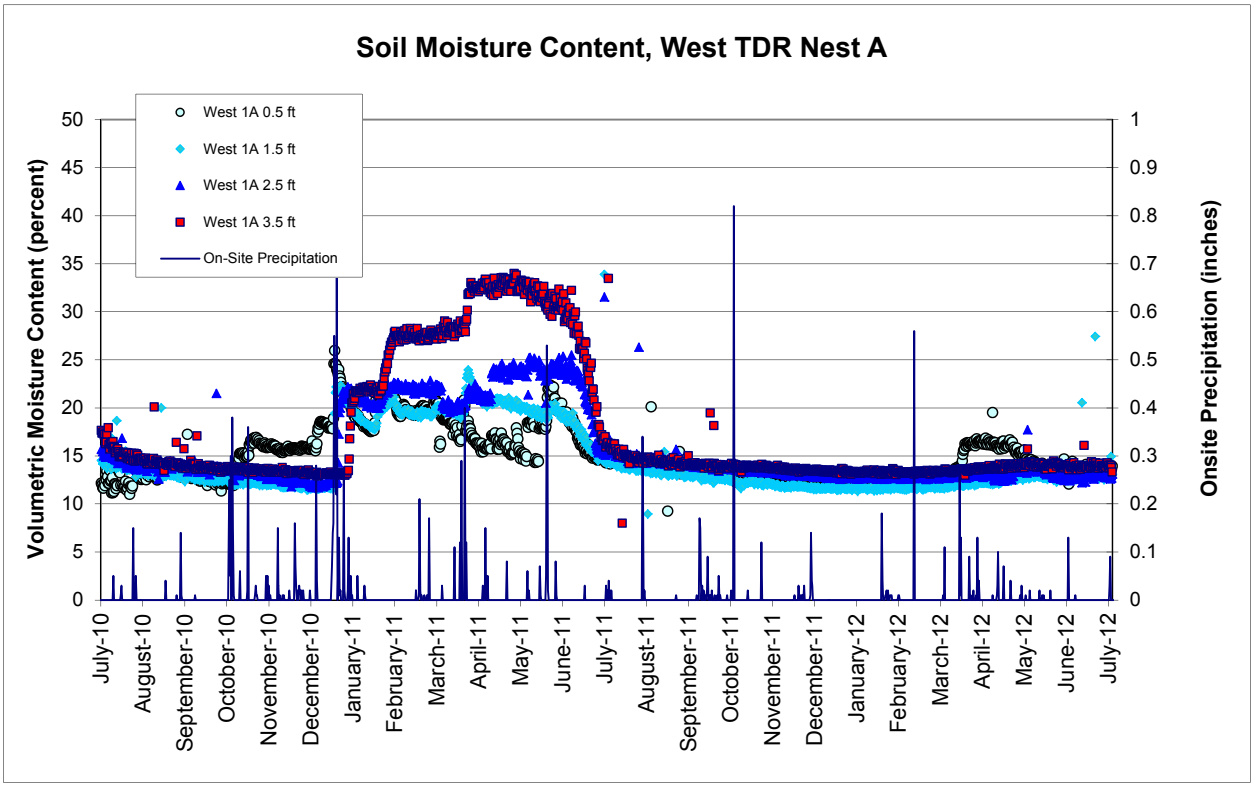

Figure 13. UC-1 Soil Moisture Content, West TDR Nest A

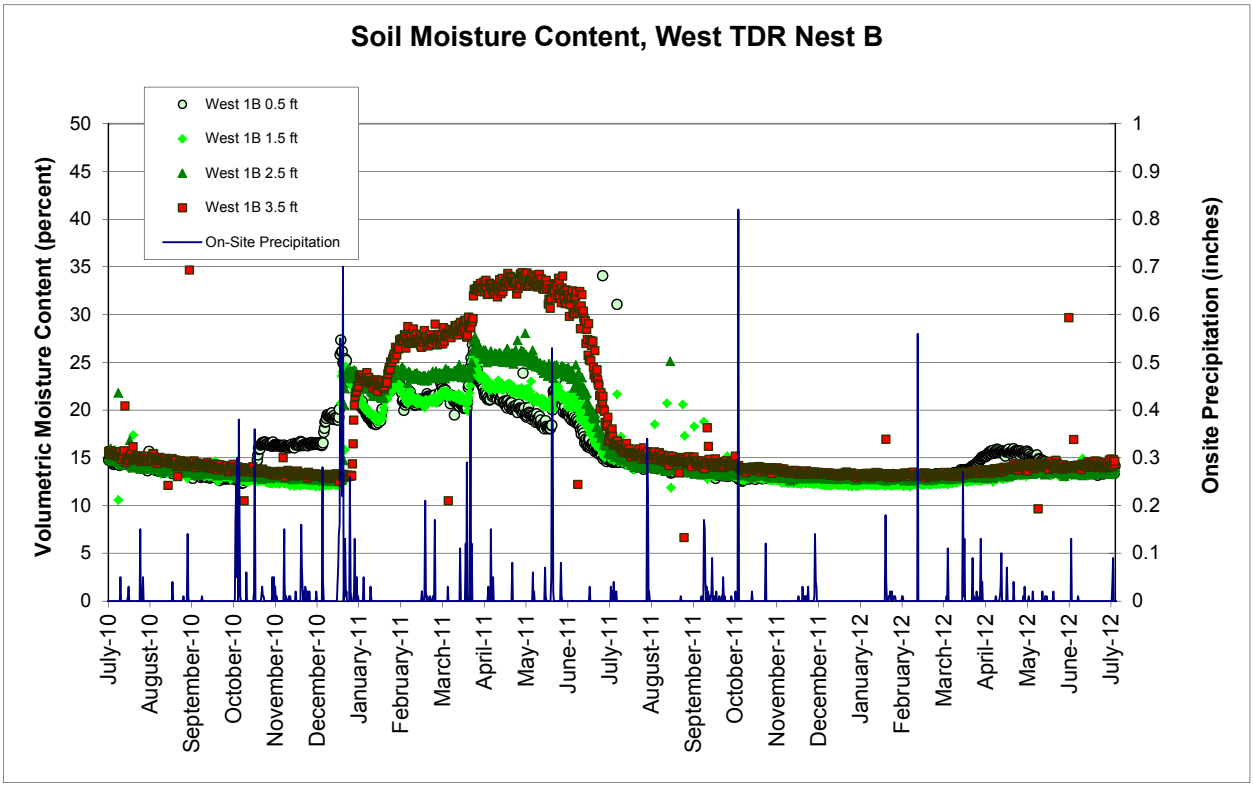

Figure 14. UC-1 Soil Moisture Content, West TDR Nest B

UC-1 East TDR Nest

Soil moisture data obtained for the 2.5 and 3.5 ft depths of the east TDR nests (Figure 11 and Figure 12) are discontinuous and may be corrupted or an indication of saturated conditions at these depths. Previously, the lengthy cable created a problem in measuring the reflected signal from the TDR probes (NNSA/NV 2007). The TDR data from the shallower depths appear to be responding to the infiltrating moisture that corresponds to a decrease in precipitation during the 2-year monitoring period. The VMC data fluctuate seasonally in response to snowmelt during spring thaw and precipitation events. Annually, the VMC data are highest during spring thaw, and they slowly decrease throughout the spring and early summer when the VMC reaches steady-state conditions, ranging from 11 to 15 percent in the upper 1.5 ft of the cover. Refer to Appendix B (Figures B–2 and B–3) for historical moisture data obtained from the 0.5, 1.5, and 3.5 ft depths from 2007 through 2012.

UC-1 West TDR Nest

Soil moisture data obtained for the west TDR nests (Figure 13 and Figure 14) corresponds to a decrease in precipitation during the 2-year monitoring period. The VMC data fluctuate seasonally in response to snowmelt during spring thaw. Annually, the VMC data are highest during spring thaw, and they slowly decrease throughout the spring and early summer when the VMC reaches steady-state conditions, ranging from 11 to 15 percent in the upper 3.5 ft of the cover. These trends extended into May and June, when surface temperatures increased and evapotranspiration again began removing moisture from the cover. Refer to Appendix B (Figures B–4 and B–5) for historical moisture data obtained from the 0.5, 1.5, 2.5, and 3.5 ft depths from 2007 through 2012.

4.0 Summary, Conclusions, and Recommendations

4.1 Summary

The UC-1 CMP was observed as being in good condition during the 2011 and 2012 inspections. No new fractures or extension of existing fractures was observed, and no issues with the fence or gate were identified. The vegetation on the cover continues to look healthy, but the biennial vegetation survey conducted during the 2012 inspection indicated that the total foliar cover was slightly higher in 2009 than in 2012. This may be indicative of a decrease in precipitation observed during the 2-year monitoring period. The precipitation totaled 9.9 in from July 1, 2010, through June 30, 2011, and 5 in from July 1, 2011, through June 30, 2012. This decrease in precipitation is also evident in the soil moisture data obtained from the TDR sensors. Soil moisture content data show that the UC-1 cover is performing as designed, and evapotranspiration is effectively removing water from the cover.

The biennial survey of the UC-1 and UC-4 SMs was conducted during the 2012 inspection. Survey data from the UC-1 monuments indicate a settling trend that has been occurring since the baseline survey in December 2000. The data also continue to indicate that the largest subsidence is in areas where the mud thickness is greatest, along the centerline (SM-6, SM-7, and SM-8) and southern portion (SM-10, SM-11, and SM-12) of the CMP. This corresponds with soil moisture data from TDR sensors in this area, specifically the two deepest sensors (2.5 and 3.5 ft) in the east TDR nest that may be indicating saturation from the dewatering of the underlying drilling mud. The degree of settling in both the relocation trench and the CMP are within the predicted range and show no unusual subsidence. Survey data from the UC-4 monuments indicate a decrease in elevation. Subsidence at the west monument is still slightly greater than the predicted settling; the total subsidence was 0.057 m (2.24 in) since the baseline survey in October 1999.

The inspection of UC-3 indicated that the sites are in excellent condition. All monuments and use-restriction signs are in good condition. No issues were identified, and no maintenance or repair activities are recommended at this time.

The inspection of UC-4 indicated that the sites are in excellent condition. All monuments and use-restriction signs are in good condition. No concerns with the monuments or gate were identified.

4.2 Conclusions

The following conclusions are based on the 2011 and 2012 annual inspections:

- No significant concerns were noted for the UC-1 CMP and UC-4 Mud Pit C covers during the annual inspections, and no further maintenance or repairs are recommended at this time. Personnel traveling to the site will continue to monitor the erosion piping feature that was identified on the northeast side of the downstream toe of the CMP in 2010.
- No significant concerns were noted on the subsidence surveys for UC-1 and UC-4. The next subsidence survey will be conducted during the 2014 annual inspection.
- The UC-1 CMP cover is performing as designed. Soil moisture monitoring data indicate that evapotranspiration is effectively removing water from the cover; however, data from the two deepest sensors in the east TDR nest make it difficult to establish soil-moisture-monitoring

compliance criteria. This, in combination with the continued settling of the SMs at UC-1 CMP, indicates that steady-state conditions have not yet been reached. When it's determined that steady-state conditions have been reached, the soil moisture compliance criteria can be established.

4.3 Recommendations

The following recommendations are based on the 2011 and 2012 inspections:

- Continue site inspections biennially, as scheduled, to observe the condition of the covers, fence, vegetation, signs, and monuments, but prepare a report on a biennial basis, and require that the next report be produced in 2014.
- Continue biennial subsidence surveys on UC-1 and UC-4 in 2014.
- Conduct a biennial vegetation survey in 2014.
- Be prepared to further remove large vegetation from the UC-4 cover during the 2014 inspection.
- Continue to collect soil moisture data from the TDR nests, but verify soil moisture data from the deepest sensors in the east TDR nest by collecting soil samples near the deepest sensors for evaluation of soil moisture content.
- Respond to reports from the public of detrimental conditions at the site within 90 days.

5.0 References

Barnes, W., 1968. *Report of Exploration Progress, Central Nevada, Period August 1, 1967 December 31, 1967*, U.S. Geological Survey Technical Letter, Central Nevada 3-2.

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Healey, D.L., 1968. *Gravity Survey of Northern Hot Creek Valley, Nye County, Nevada*, U.S. Geological Survey Technical Letter, Central Nevada-18.

NNSA/NV (U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office), 2001. *Closure Report for Corrective Action Unit 417: Central Nevada Test Area Surface, Nevada*, DOE/NV-743, Rev. 1, Las Vegas, Nevada.

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Topp, G.C., Davis, J.L., and Annan, A.P., 1980. "Electromagnetic Determination of Soil Water Content: Measurements in Coaxial Transmission Lines," *Water Resources Research*, vol. 16, pp. 574–582.

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Appendix A

Inspection Checklists and Photographs—2011 and 2012

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CAU 417: CNTA UC-1 CENTRAL MUD PIT COVER, POST-CLOSURE INSPECTION CHECKLIST

Date of Last Inspection: June 15, 2010	Reason for Last Inspection: Annual Inspection
Responsible Agency: DOE-LM	Project Manager: Rick Hutton
Inspection Date: May 11, 2011	
Inspector (name, title, organization): Rick Findlay, Site Lead, S.M. Stoller	
Assistant Inspector (name, title, organization): Sandy Beranich Environmental Compliance, Stoller	

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
3. Any checklist line item marked by an inspector in a SHADED BOX, must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, annotated site maps.
4. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
5. A standard set of color 35 mm photographs (or equivalent) is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. This unit will be inspected biannually with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photo log attached, and recommendations and conclusions.

B. PREPARATION (To be completed prior to site visit)	YES	NO	EXPLANATION
1. Site as-built plans and site base map reviewed.	✓		
2. Previous inspection reports reviewed.	✓		
a. Were anomalies or trends detected on previous inspections?	✓		continued expansion of existing cracks
b. Was maintenance performed?	✓		yes existing cracks were filled with soil
3. Site maintenance and repair records reviewed.	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-builts available that reflect repair changes?		✓	

C. SITE INSPECTION (To be completed during inspection)	YES	NO	EXPLANATION
1. Adjacent off-site features within watershed areas.			
a. Have there been any changes in use of adjacent area?	✓		two new well pads were recontoured and reseeded.
b. Are there any new roads or trails?	✓		access roads to the wells were included with the recontourey also of the well pads
c. Has there been a change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Change in surrounding vegetation?	✓		the well pads were seeded as part of the reclamation
2. Security fence, signs.			
a. Displacement of fences, site markers, boundary markers, or monuments?		✓	
b. Have any signs been damaged or removed? (Number of signs replaced: _____)		✓	
c. Were gates locked?	✓		

CAU 417: CNTA UC-1 CENTRAL MUD PIT COVER, POST-CLOSURE MONITORING CHECKLIST

	YES	NO	EXPLANATION
3. Waste Unit cover.			
a. Is there evidence of settling?		✓	No subsidence survey performed
b. Is there cracking?	✓		historical presence noted and cracks continue to be present, but no new cracks observed
c. Is there evidence of erosion around the cap (wind or water)?	✓		The northeast portion of the cap, outside the fence, shows signs of water drainage rills and accumulation.
d. Is there evidence of animal burrowing?		✓	
e. Have the site markers been disturbed by man or natural processes?	✓		One marker near Mud Pit A has been moved slightly from drilling and pad restoration.
f. Do natural processes threaten to integrity of any cover or site marker?		✓	
g. Other?		✓	
4. Vegetative cover.			
a. Is perimeter fence or mesh fencing damaged?		✓	
b. Is there evidence of horses or rabbits on site?	✓		No evidence of horses or cattle but evidence of rabbits and deer/antelope
c. Is organic mulch and/or plants adequate to prevent erosion?	✓		
d. Are weedy annual plants present? If yes, are they a problem?		✓	
e. Are seeded plant species found on site?	✓		
f. Is there evidence of plant mortality?	✓		
5. Photo Documentation			
a. Has a photo log been prepared?	✓		
c. Number of photos exposed (18)			
D. FIELD CONCLUSIONS			
1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		✓	
Person/Agency to whom report made:			
2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		
4. Is other maintenance/repair necessary?		✓	
5. Is current status/condition of vegetative cover satisfactory?	✓		

6. Rationale for field conclusions: Overall integrity of the site is good. No new cracks or rills were observed on the CAP. Run off continues to be directed around the CAP on the northeast side and is evident from the drainage rill and accumulation area that has developed. The existing cracks on the CAP were filled.

E. CERTIFICATION

I have conducted an inspection of the UC-1 Cental Mud Pit Cover, CAU 417, at the Central Nevada Test Area in accordance with the Post-Closure Monitoring Plan (see Closure Report) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.

Chief Inspector's Signature: Richard C. Findlay | Printed Name: Richard C. Findlay

Title: Site Lead | Date: May 11, 2011

CAU 417: CNTA UC-3, POST-CLOSURE INSPECTION CHECKLIST

Date of Last Inspection: June 15, 2010	Reason for Last Inspection: Annual Inspection
Responsible Agency: DOE - LM	Project Manager: Rick Hutton
Inspection Date: May 11, 2011	
Inspector (name, title, organization): Rick Findlay, Site Lead, S.M. Stoller	
Assistant Inspector (name, title, organization): Sandy Beranich, Environmental Compliance, Stoller	

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
3. Any checklist line item marked by an inspector in a SHADED BOX, must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, annotated site maps.
4. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
5. A standard set of color 35 mm photographs (or equivalent) is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. This unit will be inspected biannually with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photo log attached, and recommendations and conclusions.

B. PREPARATION (To be completed prior to site visit)	YES	NO	EXPLANATION
1. Site as-built plans and site base map reviewed.	✓		
2. Previous inspection reports reviewed.	✓		
a. Were anomalies or trends detected on previous inspections?		✓	
b. Was maintenance performed?		✓	
3. Site maintenance and repair records reviewed.	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-builts available that reflect repair changes?		✓	

C. SITE INSPECTION (To be completed during inspection)	YES	NO	EXPLANATION
1. Adjacent off-site features within watershed areas.			
a. Have there been any changes in use of adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been a change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Change in surrounding vegetation?		✓	
2. Security fence, signs.			
a. Displacement of fences, site markers, boundary markers, or monuments?		✓	
b. Have any signs been damaged or removed? (Number of signs replaced: _____)		✓	
c. Were gates locked?		✓	No gate at site

CAU 417: CNTA UC-3, POST-CLOSURE INSPECTION CHECKLIST

D. FIELD CONCLUSIONS

1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		✓	
Person/Agency to whom report made:			
2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		
4. Is other maintenance/repair necessary?		✓	
5. Is current status/condition of unit satisfactory?	✓		
6. Rationale for field conclusions: The site is in good condition.			

E. CERTIFICATION

I have conducted an inspection of UC-3, CAU 417, at the Central Nevada Test Area in accordance with the Post-Closure Monitoring Plan (see Closure Report) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.

Chief Inspector's Signature: Richard C. Findlay	Printed Name: Richard C. Findlay
Title: Site Lead	Date: May 11, 2011

CAU 417: CNTA UC-4 MUD PIT C COVER, POST-CLOSURE INSPECTION CHECKLIST

Date of Last Inspection: June 15, 2010	Reason for Last Inspection: Annual Inspection
Responsible Agency: DOE-LM	Project Manager: Rick Hutton
Inspection Date: May 11, 2011	
Inspector (name, title, organization): Rick Findlay, Site Lead, S.M. Stoller	
Assistant Inspector (name, title, organization): Sandy Beranich, Environmental Compliance, Stoller	

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
3. Any checklist line item marked by an inspector in a SHADED BOX, must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, annotated site maps.
4. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
5. A standard set of color 35 mm photographs (or equivalent) is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. This unit will be inspected biannually with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photo log attached, and recommendations and conclusions.

B. PREPARATION (To be completed prior to site visit)	YES	NO	EXPLANATION
1. Site as-built plans and site base map reviewed.	✓		
2. Previous inspection reports reviewed.	✓		
a. Were anomalies or trends detected on previous inspections?		✓	
b. Was maintenance performed?		✓	
3. Site maintenance and repair records reviewed.	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-builts available that reflect repair changes?		✓	

C. SITE INSPECTION (To be completed during inspection)	YES	NO	EXPLANATION
1. Adjacent off-site features within watershed areas.			
a. Have there been any changes in use of adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been a change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Change in surrounding vegetation?		✓	
2. Security fence, signs.			
a. Displacement of fences, site markers, boundary markers, or monuments?		✓	
b. Have any signs been damaged or removed? (Number of signs replaced: _____)		✓	
c. Were gates locked?	✓		no gate at site RLF 5-11-2011

CAU 417: CNTA UC-4 MUD PIT C COVER, POST-CLOSURE INSPECTION CHECKLIST

3. Waste Unit cover.	YES	NO	EXPLANATION
a. Is there evidence of settling?		✓	
b. Is there cracking?			
c. Is there evidence of erosion around the cap (wind or water)?			
d. Is there evidence of animal burrowing?		✓	
e. Have the site markers been disturbed by man or natural processes?		✓	
f. Is there vegetation on the cover?	✓		Yes, but a majority of the larger vegetation (bushes) were removed during previous inspection.
g. Do natural processes threaten to integrity of any cover or site marker?		✓	
h. Other?		✓	
4. Photo Documentation			
a. Has a photo log been prepared?	✓		
c. Number of photos exposed (15)			

D. FIELD CONCLUSIONS			
1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		✓	
Person/Agency to whom report made:			
2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		
4. Is other maintenance/repair necessary?		✓	
5. Is current status/condition of vegetative cover satisfactory?	✓		

6. Rationale for field conclusions: Site was in good condition.

E. CERTIFICATION

I have conducted an inspection of the UC-4 Mud Pit C Cover, CAU 417, at the Central Nevada Test Area in accordance with the Post-Closure Inspection Plan (see Closure Report) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.

Chief Inspector's Signature: Richard C. Fillay	Printed Name: Richard C. Fillay
Title: Site Lead	Date: May 11, 2011

CAU 417: CNTA UC-1 CENTRAL MUD PIT COVER, POST-CLOSURE INSPECTION CHECKLIST

Date of Last Inspection: May 11, 2011	Reason for Last Inspection: Annual Inspection
Responsible Agency: DOE-LM	Project Manager: Rick Findlay
Inspection Date: July 31, 2012	
Inspector (name, title, organization): PAUL S. DARR, Project Specialist, S.M. STOLLER	
Assistant Inspector (name, title, organization): LINDA STEADER, Vegetation Specialist, S.M. STOLLER	

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
3. Any checklist line item marked by an inspector in a SHADED BOX, must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, annotated site maps.
4. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
5. A standard set of color 35 mm photographs (or equivalent) is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. This unit will be inspected biannually with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photo log attached, and recommendations and conclusions.

B. PREPARATION (To be completed prior to site visit)	YES	NO	EXPLANATION
1. Site as-built plans and site base map reviewed.	✓		
2. Previous inspection reports reviewed.	✓		
a. Were anomalies or trends detected on previous inspections?		✓	No new cracks.
b. Was maintenance performed?		✓	
3. Site maintenance and repair records reviewed.	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-builts available that reflect repair changes?		✓	

C. SITE INSPECTION (To be completed during inspection)	YES	NO	EXPLANATION
1. Adjacent off-site features within watershed areas.			
a. Have there been any changes in use of adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been a change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Change in surrounding vegetation?		✓	
2. Security fence, signs.			
a. Displacement of fences, site markers, boundary markers, or monuments?		✓	
b. Have any signs been damaged or removed? (Number of signs replaced: _____)		✓	
c. Were gates locked?	✓		

CAU 417: CNTA UC-1 CENTRAL MUD PIT COVER, POST-CLOSURE MONITORING CHECKLIST

	YES	NO	EXPLANATION
3. Waste Unit cover.			
a. Is there evidence of settling?	✓		See Subsidence Monitoring Survey data.
b. Is there cracking?	✓		Historical cracking. No new cracks.
c. Is there evidence of erosion around the cap (wind or water)?		✓	
d. Is there evidence of animal burrowing?	✓		Animal burrows noted along north east part of cell.
e. Have the site markers been disturbed by man or natural processes?		✓	
f. Do natural processes threaten to integrity of any cover or site marker?		✓	
g. Other?		✓	
4. Vegetative cover.			
a. Is perimeter fence or mesh fencing damaged?		✓	
b. Is there evidence of horses or rabbits on site?		✓	
c. Is organic mulch and/or plants adequate to prevent erosion?	✓		
d. Are weedy annual plants present? If yes, are they a problem?		✓	
e. Are seeded plant species found on site?	✓		
f. Is there evidence of plant mortality?	✓		
5. Photo Documentation			
a. Has a photo log been prepared?	✓		
c. Number of photos exposed (12)			
D. FIELD CONCLUSIONS			
1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		✓	
Person/Agency to whom report made:			
2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		
4. Is other maintenance/repair necessary?		✓	
5. Is current status/condition of vegetative cover satisfactory?	✓		

6. Rationale for field conclusions: Overall integrity of the site is good. No new cracks or rills were observed on the site.

E. CERTIFICATION

I have conducted an inspection of the UC-1 Cental Mud Pit Cover, CAU 417, at the Central Nevada Test Area in accordance with the Post-Closure Monitoring Plan (see Closure Report) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.

Chief Inspector's Signature: Paul S. Dam	Printed Name: PAUL S. DARR
Title: Project Specialist	Date: July 31, 2012

CAU 417: CNTA UC-3, POST-CLOSURE INSPECTION CHECKLIST

Date of Last Inspection: May 11, 2011	Reason for Last Inspection: Annual Inspection
Responsible Agency: DOE LM	Project Manager: Rick Findlay
Inspection Date: July 31, 2012	
Inspector (name, title, organization): Paul S. Dana, Project Specialist, S.M. Stoller	
Assistant Inspector (name, title, organization): Linda Sheaffer, Vegetation Specialist, SM Stoller	

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
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4. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
5. A standard set of color 35 mm photographs (or equivalent) is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. This unit will be inspected biannually with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photo log attached, and recommendations and conclusions.

B. **PREPARATION** (To be completed prior to site visit)	YES	NO	EXPLANATION
1. Site as-built plans and site base map reviewed.	✓		
2. Previous inspection reports reviewed.	✓		
a. Were anomalies or trends detected on previous inspections?		✓	
b. Was maintenance performed?		✓	
3. Site maintenance and repair records reviewed.	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-builts available that reflect repair changes?		✓	

C. **SITE INSPECTION** (To be completed during inspection)	YES	NO	EXPLANATION
1. Adjacent off-site features within watershed areas.			
a. Have there been any changes in use of adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been a change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Change in surrounding vegetation?		✓	
2. Security fence, signs.			
a. Displacement of fences, site markers, boundary markers, or monuments?		✓	
b. Have any signs been damaged or removed? (Number of signs replaced: _____)		✓	
c. Were gates locked?		✓	No gate at site.

CAU 417: CNTA UC-3, POST-CLOSURE INSPECTION CHECKLIST

D. FIELD CONCLUSIONS

1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		✓	
Person/Agency to whom report made:			
2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		
4. Is other maintenance/repair necessary?		✓	
5. Is current status/condition of unit satisfactory?	✓		

6. Rationale for field conclusions: The site is in good condition.

E. CERTIFICATION

I have conducted an inspection of UC-3, CAU 417, at the Central Nevada Test Area in accordance with the Post-Closure Monitoring Plan (see Closure Report) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.

Chief Inspector's Signature: Paul S. Dahl	Printed Name: PAUL S. DAHL
Title: Project Specialist	Date: July 31, 2012

CAU 417: CNTA UC-4 MUD PIT C COVER, POST-CLOSURE INSPECTION CHECKLIST

Date of Last Inspection: May 11, 2011	Reason for Last Inspection: Annual Inspection
Responsible Agency: DOE-LM	Project Manager: Rick Findlay
Inspection Date: July 31, 2012	
Inspector (name, title, organization): PAUL S. DAAR, Project Specialist, S.M. Stoller	
Assistant Inspector (name, title, organization): Linda Sheader, Vegetation Specialist, SM Stoller	

A. GENERAL INSTRUCTIONS

1. All checklist items must be completed and detailed comments made to document the results of the site inspection. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Attach the additional pages and number all pages upon completion of the inspection.
3. Any checklist line item marked by an inspector in a SHADED BOX, must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, annotated site maps.
4. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
5. A standard set of color 35 mm photographs (or equivalent) is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. This unit will be inspected biannually with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photo log attached, and recommendations and conclusions.

B. PREPARATION (To be completed prior to site visit)	YES	NO	EXPLANATION
1. Site as-built plans and site base map reviewed.	✓		
2. Previous inspection reports reviewed.	✓		
a. Were anomalies or trends detected on previous inspections?		✓	
b. Was maintenance performed?		✓	
3. Site maintenance and repair records reviewed.	✓		
a. Has site repair resulted in a change from as-built conditions?		✓	
b. Are revised as-builts available that reflect repair changes?		✓	

C. SITE INSPECTION (To be completed during inspection)	YES	NO	EXPLANATION
1. Adjacent off-site features within watershed areas.			
a. Have there been any changes in use of adjacent area?		✓	
b. Are there any new roads or trails?		✓	
c. Has there been a change in the position of nearby washes?		✓	
d. Has there been lateral excursion or erosion/deposition of nearby washes?		✓	
e. Are there new drainage channels?		✓	
f. Change in surrounding vegetation?		✓	
2. Security fence, signs.			
a. Displacement of fences, site markers, boundary markers, or monuments?		✓	
b. Have any signs been damaged or removed? (Number of signs replaced: _____)		✓	
c. Were gates locked?	✓		

CAU 417: CNTA UC-4 MUD PIT C COVER, POST-CLOSURE INSPECTION CHECKLIST

3. Waste Unit cover.	YES	NO	EXPLANATION
a. Is there evidence of settling?		✓	
b. Is there cracking?		✓	
c. Is there evidence of erosion around the cap (wind or water)?		✓	
d. Is there evidence of animal burrowing?		✓	
e. Have the site markers been disturbed by man or natural processes?		✓	
f. Is there vegetation on the cover?	✓		All vegetation on top of cap was cut down.
g. Do natural processes threaten to integrity of any cover or site marker?		✓	
h. Other?		✓	
4. Photo Documentation			
a. Has a photo log been prepared?	✓		
c. Number of photos exposed (7)			

D. FIELD CONCLUSIONS			
1. Is there an imminent hazard to the integrity of the unit? (Immediate report required)		✓	
Person/Agency to whom report made:			
2. Are more frequent inspections required?		✓	
3. Are existing maintenance/repair actions satisfactory?	✓		
4. Is other maintenance/repair necessary?		✓	
5. Is current status/condition of vegetative cover satisfactory?	✓		

6. Rationale for field conclusions: The site is in good condition. One strand of barbed wire needs to be fixed along northside of site.

E. CERTIFICATION

I have conducted an inspection of the UC-4 Mud Pit C Cover, CAU 417, at the Central Nevada Test Area in accordance with the Post-Closure Inspection Plan (see Closure Report) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.

Chief Inspector's Signature: Paul S. Dahn	Printed Name: PAUL S. DAHN
Title: Project Specialist	Date: July 31, 2012

Photograph 1. UC-1, view from south edge, looking west

Photograph 2. UC-1, view from south edge, looking northwest

Photograph 3. UC-1, view from south edge, looking north

Photograph 4. UC-1, view from south edge, looking northeast

Photograph 5. UC-1, view south along SM-1, SM-5, and SM-9

Photograph 6. UC-1, view north along SM-9, SM-5, and SM-1

Photograph 7. UC-1, view south along SM-2, SM-6, and SM-10

Photograph 8. UC-1, view north along SM-10, SM-6, and SM-2

Photograph 9. UC-1, view south along SM-3, SM-7, and SM-11

Photograph 10. UC-1, view north along SM-11, SM-7, and SM-3

Photograph 11. UC-1, view south along SM-4, SM-8, and SM-12

Photograph 12. UC-1, view north along SM-12, SM-8, and SM-4

Photograph 13. UC-4, view east from west SM

Photograph 14. UC-4, view west from east SM

Photograph 15. UC-4, view northeast from southwest corner of cap

Photograph 16. UC-4, view northwest from southeast corner of cap

Photograph 17. UC-4, view southwest from northeast corner of cap

Photograph 18. UC-4, view southeast from northwest corner of cap

Photograph 19. UC-4, view of broken barbed-wire strand along north side of cap

Appendix B

Historical Survey, Precipitation, and Moisture Data

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Table B–1. UC-1 Monument Elevations and Subsidence

Date	Elevation at Top of Monument[a,b] Subsidence (m)											
	SM-1 N 6,430,874.2869 E 539,588.2339	**SM-2 N 6,430,863.3239 E 539,644.8195**	**SM-3 N 6,430,855.2553 E 539,684.3327**	**SM-4 N 6,430,849.7763 E 539,715.7991**	**SM-5 N 6,430,852.0243 E 539,585.4651**	**SM-6 N 6,430,841.7590 E 539,641.4674**	**SM-7 N 6,430,834.5289 E 539,680.5243**	**SM-8 N 6,430,828.6994 E 539,712.4350**	**SM-9 N 6,430,828.8720 E 539,582.4750**	**SM-10 N 6,430,818.6353 E 539,638.2030**	**SM-11 N 6,430,812.8276 E 539,676.0839**	**SM-12 N 6,430,806.7973 E 539,708.9837**
12/04/2000 Baseline	**1836.604**	**1835.154**	**1834.995**	**1834.854**	**1836.541**	**1834.887**	**1834.709**	**1834.681**	**1836.547**	**1834.943**	**1834.744**	**1834.635**
	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
01/10/2001	1836.603	1835.149	1834.991	1834.850	1836.540	1834.880	1834.704	1834.676	1836.545	1834.940	1834.741	1834.641
	−0.001	−0.005	−0.004	−0.004	−0.001	−0.007	−0.005	−0.005	−0.002	−0.003	−0.003	0.006
2/06/2001	1836.607	1835.150	1834.992	1834.849	1836.540	1834.879	1834.703	1834.674	1836.545	1834.937	1834.738	1834.630
	−0.003	−0.004	−0.003	−0.005	−0.001	−0.008	−0.006	−0.007	−0.002	−0.006	−0.006	−0.005
03/13/2001	1836.595	1835.147	1834.992	1834.845	1836.538	1834.874	1834.699	1834.669	1836.534	1834.933	1834.735	1834.622
	−0.009	−0.007	−0.003	−0.009	−0.003	−0.013	−0.010	−0.012	−0.013	−0.010	−0.009	−0.013
04/11/2001	1836.584	1835.144	1834.991	1834.841	1836.535	1834.869	1834.693	1834.662	1836.531	1834.928	1834.731	1834.618
	−0.020	−0.010	−0.004	−0.013	−0.006	−0.018	−0.016	−0.019	−0.016	−0.015	−0.013	−0.017
05/09/2001	1836.581	1835.144	1834.993	1834.841	1836.534	1834.869	1834.691	1834.661	1836.529	1834.925	1834.728	1834.618
	−0.023	−0.010	−0.002	−0.013	−0.007	−0.018	−0.018	−0.020	−0.018	−0.018	−0.016	−0.017
6/12/2001	1836.579	1835.142	1834.992	1834.840	1836.534	1834.864	1834.689	1834.659	1836.529	1834.922	1834.726	1834.617
	−0.025	−0.012	−0.003	−0.014	−0.007	−0.023	−0.020	−0.022	−0.018	−0.021	−0.018	−0.018
07/18/2001	1836.577	1835.141	1834.991	1834.838	1836.532	1834.862	1834.686	1834.656	1836.529	1834.920	1834.723	1834.614
	−0.027	−0.013	−0.004	−0.016	−0.009	−0.025	−0.023	−0.025	−0.018	−0.023	−0.021	−0.021
08/14/2001	1836.575	1835.140	1834.991	1834.838	1836.531	1834.859	1834.685	1834.655	1836.529	1834.921	1834.723	1834.614
	−0.029	−0.014	−0.004	−0.016	−0.010	−0.028	−0.024	−0.026	−0.018	−0.022	−0.021	−0.021
09/12/2001	1836.582	1835.138	1834.988	1834.834	1836.530	1834.854	1834.681	1834.650	1836.527	1834.914	1834.719	1834.610
	−0.022	−0.016	−0.007	−0.020	−0.011	−0.033	−0.028	−0.031	−0.020	−0.029	−0.025	−0.025
02/13/2002	1836.568	1835.132	1834.978	1834.824	1836.529	1834.835	1834.666	1834.636	1836.523	1834.900	1834.703	1834.597
	−0.036	−0.022	−0.017	−0.030	−0.012	−0.052	−0.043	−0.045	−0.024	−0.043	−0.041	−0.038
08/26/2002	1836.555	1835.129	1834.976	1834.819	1836.523	1834.823	1834.656	1834.627	1836.513	1834.893	1834.695	1834.590
	−0.049	−0.025	−0.019	−0.035	−0.018	−0.064	−0.053	−0.054	−0.034	−0.050	−0.049	−0.045
03/06/2003	1836.552	1835.123	1834.972	1834.811	1836.519	1834.805	1834.644	1834.615	1836.509	1834.880	1834.682	1834.577
	−0.052	−0.031	−0.023	−0.043	−0.022	−0.082	−0.065	−0.066	−0.038	−0.063	−0.062	−0.058
09/26/2003	1836.545	1835.122	1834.973	1834.807	1836.509	1834.795	1834.638	1834.609	1836.500	1834.874	1834.677	1834.573
	−0.059	−0.032	−0.022	−0.047	−0.032	−0.092	−0.071	−0.072	−0.047	−0.069	−0.067	−0.062
03/10/2004	1836.544	1835.116	1834.968	1834.800	1836.507	1834.781	1834.628	1834.598	1836.496	1834.864	1834.666	1834.562
	−0.060	−0.038	−0.027	−0.054	−0.034	−0.106	−0.081	−0.083	−0.051	−0.079	−0.078	−0.073
09/15/2004	1836.541	1835.117	1834.970	1834.800	1836.503	1834.776	1834.626	1834.596	1836.496	1834.862	1834.665	1834.560
	−0.063	−0.037	−0.025	−0.054	−0.038	−0.111	−0.083	−0.085	−0.051	−0.081	−0.079	−0.075
03/22/2005	1836.535	1835.110	1834.967	1834.793	1836.499	1834.760	1834.615	1834.584	1836.492	1834.851	1834.653	1834.551
	−0.069	−0.044	−0.028	−0.061	−0.042	−0.127	−0.094	−0.097	−0.055	−0.092	−0.091	−0.084
09/21/2005	1836.527	1835.110	1834.968	1834.793	1836.494	1834.755	1834.613	1834.583	1836.490	1834.849	1834.650	1834.548
	−0.077	−0.044	−0.027	−0.061	−0.047	−0.132	−0.096	−0.098	−0.057	−0.094	−0.094	−0.087
04/19/2006	1836.527	1835.105	1834.964	1834.788	1836.494	1834.743	1834.606	1834.575	1836.490	1834.843	1834.643	1834.542
	−0.077	−0.049	−0.031	−0.066	−0.047	−0.144	−0.103	−0.106	−0.057	−0.100	−0.101	−0.093
09/19/2006	1836.524	1835.105	1834.963	1834.788	1836.491	1834.739	1834.604	1834.573	1836.488	1834.840	1834.641	1834.54
	−0.08	−0.049	−0.032	−0.066	−0.05	−0.148	−0.105	−0.108	−0.059	−0.103	−0.103	−0.095
02/22/2007	1836.526	1835.101	1834.961	1834.784	1836.493	1834.729	1834.600	1834.568	1836.491	1834.834	1834.635	1834.534
	−0.078	−0.053	−0.034	−0.070	−0.048	−0.158	−0.109	−0.113	−0.056	−0.109	−0.109	−0.101
08/12/2008	1836.526	1835.101	1834.961	1834.783	1836.493	1834.720	1834.598	1834.565	1836.491	1834.829	1834.633	1834.530
	−0.078	−0.053	−0.034	−0.071	−0.048	−0.167	−0.111	−0.116	−0.056	−0.114	−0.111	−0.105
06/23/2009	1836.525	1835.102	1834.961	1834.779	1836.492	1834.708	1834.588	1834.556	1836.488	1834.826	1834.625	1834.521
	-0.079	-0.052	-0.034	-0.075	-0.049	-0.179	-0.121	-0.125	-0.059	-0.117	-0.199	-0.114
06/15/2010	1836.526	1835.099	1834.963	1834.779	1836.492	1834.701	1834.590	1834.553	1836.491	1834.821	1834.622	1834.518
	-0.078	-0.055	-0.032	-0.075	-0.049	-0.186	-0.119	-0.128	-0.056	-0.122	-0.122	-0.117
07/31/2012	1836.519	1835.096	1834.956	1834.722	1836.406	1834.682	1834.577	1834.544	1834.486	1836.811	1834.613	1834.510
	-0.085	-0.058	-0.039	-0.082	-0.055	-0.205	-0.132	-0.137	-0.061	-0.132	-0.131	-0.125

[a] Vertical datum: National Geodetic Vertical Datum of 1929 in meters
[b] Horizontal datum: U.S. State Plane 1983; vertical datum: National Geodetic Vertical Datum of 1929
N = northing
E = easting

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Table B–2. UC-4 Monument Elevations and Subsidence

Date	Elevation at Top of Monument[a,b] Subsidence (m)	
	West Monument N 6,435,982.965 E 538,966.436	**East Monument N 6,435,978.404 E 538,992.231**
10/12/1999 Baseline	**1999.269**	**1999.062**
	0.000	**0.000**
11/29/1999	1999.260	1999.056
	−0.009	−0.006
01/14/2000	1999.254	1999.052
	−0.015	−0.010
02/28/2000	1999.251	1999.053
	−0.018	−0.009
03/28/2000	1999.247	1999.052
	−0.022	−0.010
04/27/2000	1999.242	1999.05
	−0.027	−0.012
06/01/2000	1999.241	1999.05
	−0.028	−0.012
02/13/2002	1999.216	1999.037
	−0.053	−0.025
08/27/2002	1999.214	1999.039
	−0.055	−0.023
03/06/2003	1999.21	1999.036
	−0.059	−0.026
09/26/2003	1999.207	1999.035
	−0.062	−0.027
03/10/2004	1999.208	1999.036
	−0.061	−0.026
09/14/2004	1999.209	1999.041
	−0.060	−0.021
03/22/2005	1999.206	1999.037
	−0.063	−0.025
09/21/2005	1999.206	1999.036
	−0.063	−0.026
04/18/2006	1999.203	1999.033
	−0.066	−0.029
09/19/2006	1999.203	1999.034
	−0.066	−0.029
02/22/2007	1999.203	1999.031
	−0.066	−0.031
08/12/2008	1999.205	1999.035
	−0.064	−0.027
06/23/2009	1999.218	1999.045
	-0.051	-0.017
06/15/2010	1999.225	1999.048
	-0.057	-0.014
07/31/2012	1999.212	1999.038
	-0.057	-0.024

[a] Vertical datum: National Geodetic Vertical Datum of 1929 in meters
[b] Horizontal datum: U.S. State Plane 1983; Vertical datum: North American Vertical Datum of 1929
N = northing
E = easting

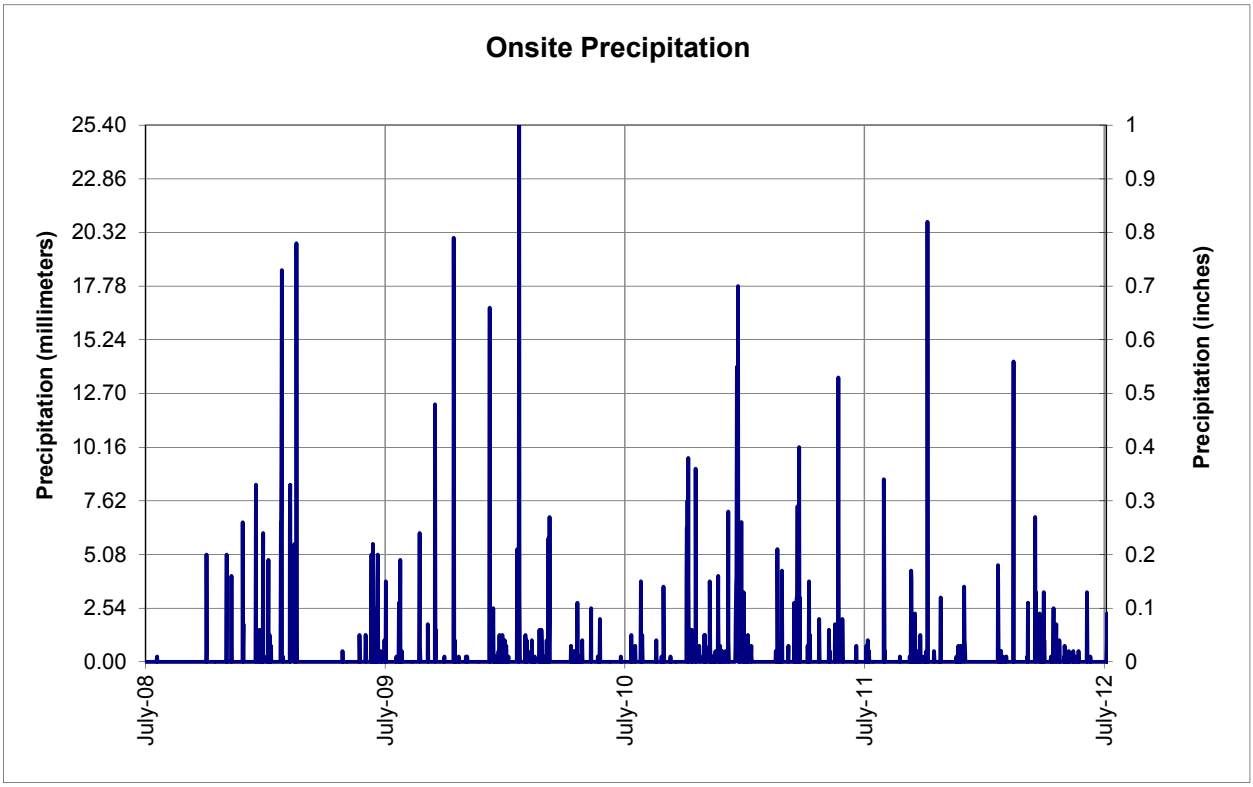

Figure B–1. July 2008 through July 2012, Precipitation Data

Table B–3. Yearly and Average Precipitation

Date Range	Yearly Precipitation Total		Average Yearly Precipitation	
	Millimeters	Inches	Millimeters	Inches
7/1/2008–6/30/2009	174.75	6.88	181.80	7.16
7/1/2009–6/30/2010	175.26	6.90		
7/1/2010–6/30/2011	251.20	9.89		
7/1/2011–6/30/2012	125.99	4.96		

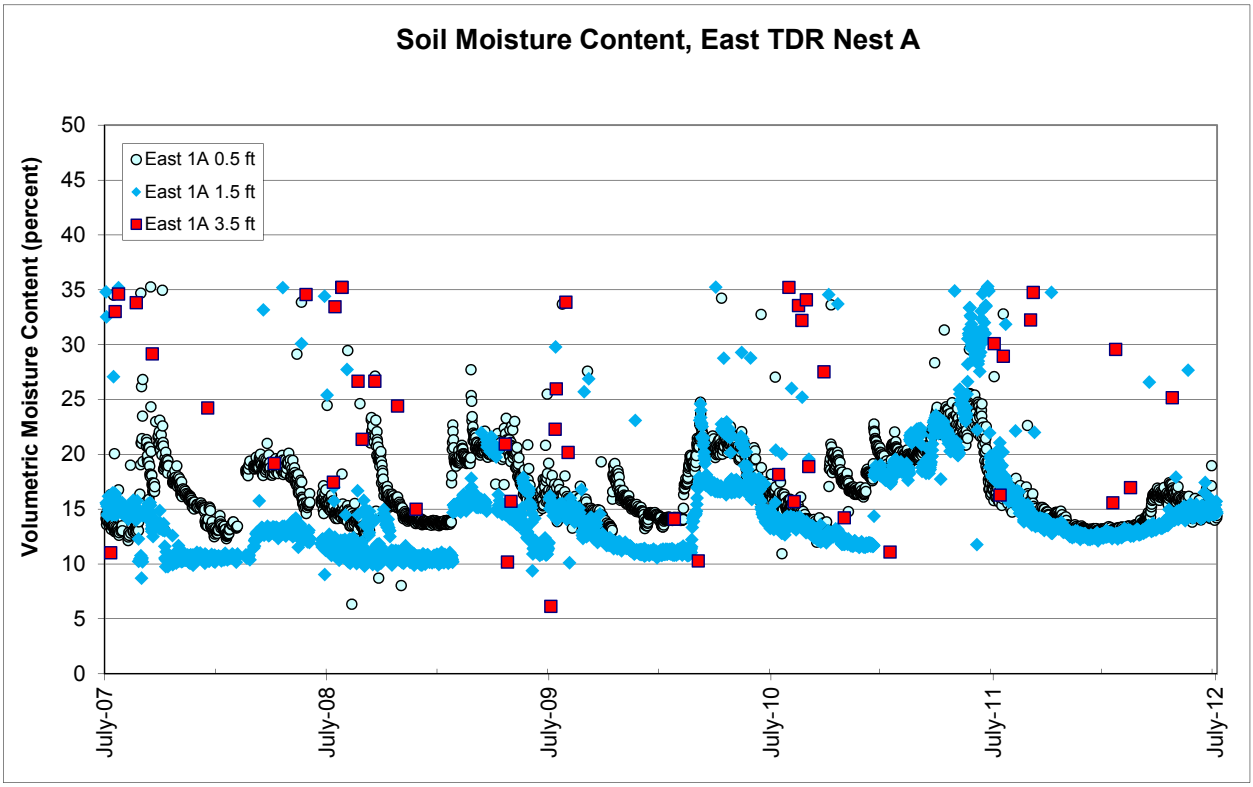

Figure B–2. July 2007 through July 2012 UC-1 Soil Moisture Content, East TDR Nest A

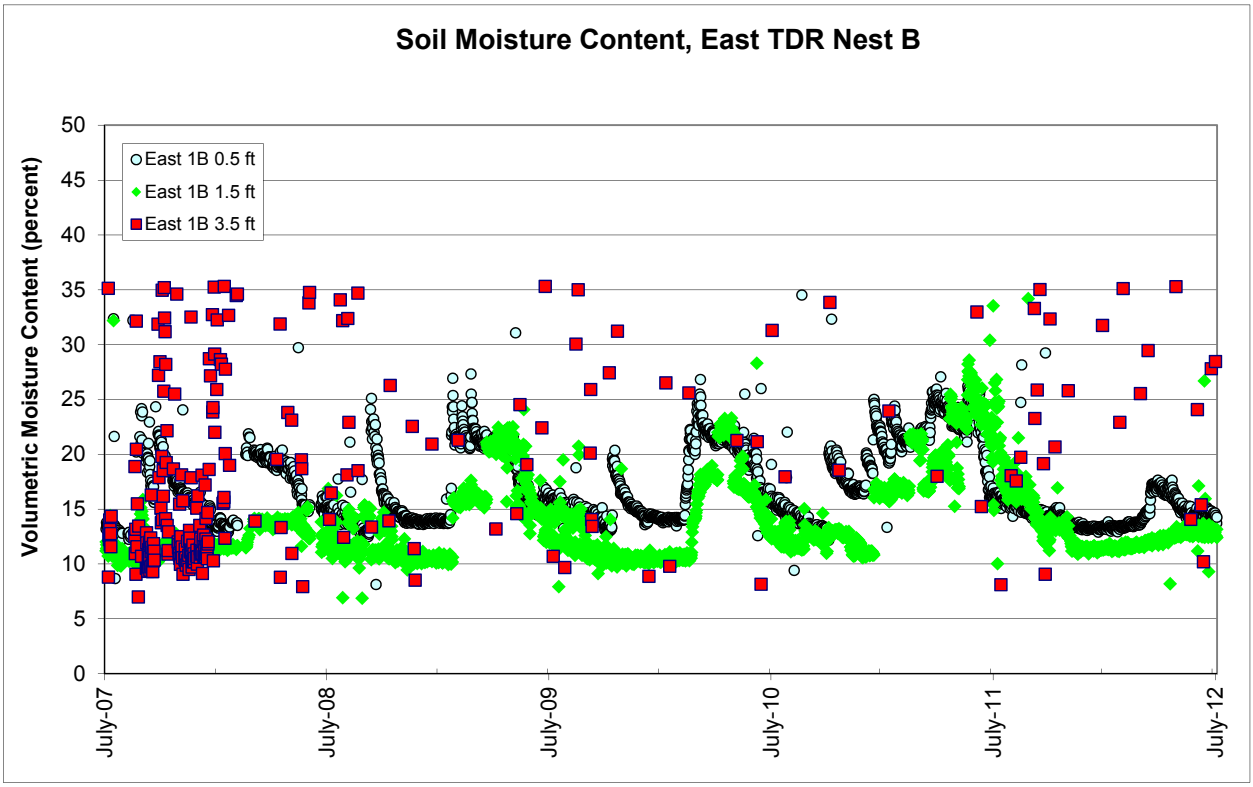

Figure B–3. July 2007 through July 2012 UC-1 Soil Moisture Content, East TDR Nest B

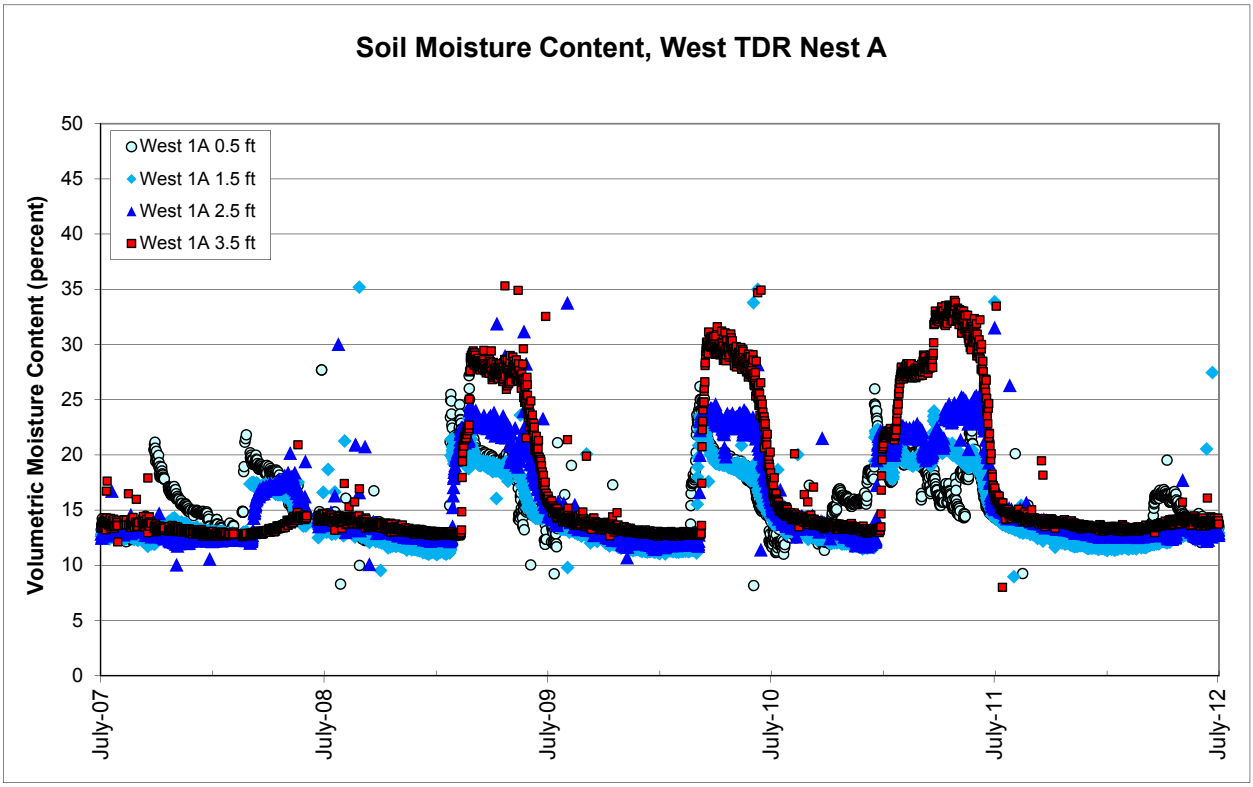

Figure B–4. July 2007 through July 2012 UC-1 Soil Moisture Content, West TDR Nest A

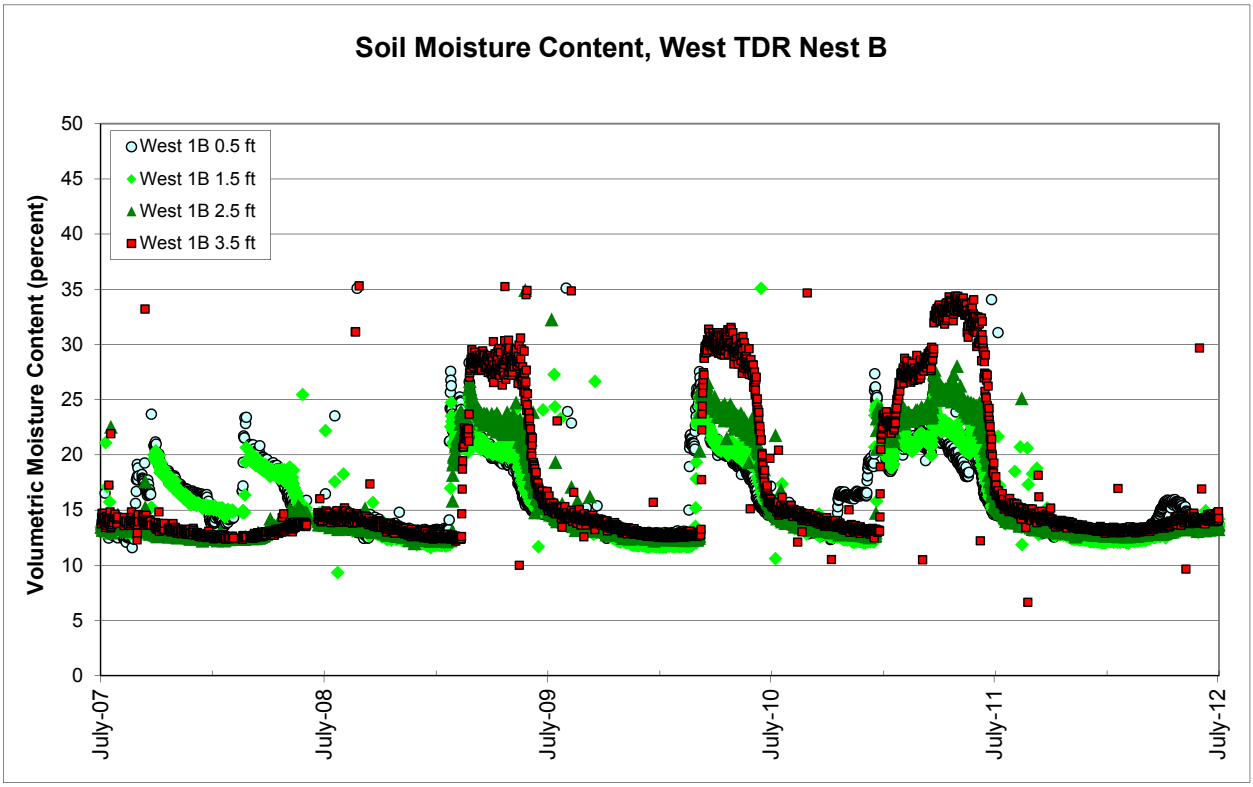

Figure B–5. July 2007 through July 2012 UC-1 Soil Moisture Content, West TDR Nest B

Appendix C

Vegetation Survey—2012

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Contents

Tables

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C1. Introduction and Purpose

The UC-1 Central Mud Pit (CMP) is located within Corrective Action Unit 417 at the Central Nevada Test Area in Hot Creek Valley, Nevada. The U.S. Department of Energy (DOE) Office of Environmental Management reclaimed the CMP in 2000 and 2001 by seeding the pit's constructed soil cover with native species and planting 5,000 live plants. Because vegetation is an integral component of the pit's cover, post-closure requirements for the UC-1 CMP include periodic vegetation monitoring to assess the health and stability of the vegetation.

The CMP cover is approximately 2 hectares (5 acres) in size and is enclosed by a fence. The pit's cover is composed of a clean, vegetated soil layer installed over hydrocarbon-containing waste materials that were generated by drilling. Vegetation, through evapotranspiration, reduces storm water infiltration and percolation through the cover. It also helps reduce wind and water erosion on the soil cover by reducing surface velocities. Approximately 1.5 hectares (3.7 acres) of additional land, the CMP perimeter area, was disturbed outside the fence during reclamation. This area, also seeded with native species in 2000, is included in monitoring along with a nearby undisturbed, native area that is used as a comparison to assess the development of the reclaimed areas over time. In 2010, a separate soil and vegetation baseline characterization was performed at UC-1 (DOE 2011). The baseline was a best management practice and was not a post-closure requirement. However, results of the baseline can also be used to assess the long-term development of vegetation in the reclaimed areas. In particular, the appearance of native species from the surrounding undisturbed areas in the revegetated areas is an indication of ecological development toward a mature, climax plant community.

Ecologists monitored the success of the revegetation effort periodically between 2001 and 2006 (Anderson 2005 and 2006). In 2006, success criteria were met on the CMP cover and in the CMP perimeter area. Additional post-closure vegetation monitoring occurred in 2007 and 2009 (DOE 2007 and 2009). This report presents results of the most recent vegetation survey, conducted concurrently with the site inspection on July 31, 2012.

C2. Monitoring Methods

Semi-quantitative monitoring methods have been used on the site to assess vegetation health since 2006, when vegetation success criteria were met. Field observations, including a list of plant species and a general assessment of plant health, are recorded for the CMP cover, for the CMP perimeter area, and for an undisturbed native area. Afterwards, 10 stratified random points are sampled within each area using a 1-meter-square quadrat. Visual estimates of the foliar cover of all live plant species rooted within or overlapping the quadrat are recorded along with estimates of litter (dead plant material), rock, and bare ground. A representative photograph of each area is also taken for comparison with previous monitoring photos.

C3. Results

A list of plant species identified at UC-1, including species found in previous monitoring years and during the 2010 baseline characterization, is shown in Table C–1. Nomenclature follows the U.S. Department of Agriculture PLANTS Database (USDA 2012).

Table C–1. Plant Species at UC-1, Central Nevada Test Area

Scientific Name	Common Name	Observed in 2012
Achnatherum hymenoides	Indian ricegrass	X
Agropyron cristatum	Crested wheatgrass	
Argemone sp.	Prickly poppy	
Aristida purpurea	Purple three-awn	X
Artemisia arbuscula	Low sagebrush	
Artemisia tridentata	Big sagebrush	X
Aster sp.	Aster	X
Astragalus sp.	Milkvetch	X
Atriplex canescens	Fourwing saltbush	X
Bouteloua gracilis	Blue grama	
Bromus tectorum	Cheatgrass	X
Chamaebataria millefolium	Fern bush	
Chrysothamnus viscidiflorus	Douglas rabbitbrush	
Descurainia sophia	Flixweed	X
Echinocereus sp.	Hedgehog cactus	
Elymus elymoides	Bottlebrush squirreltail	X
Ephedra nevadensis	Nevada jointfir	
Eriastrum diffusum	Minature woollystar	
Ericameria nauseosa	Rubber rabbitbrush	X
Eriogonum palmeranium	Palmer's buckwheat	
Gutierrezia microcephala	Thread snakeweed	X
Halogeton glomeratus	Halogeton	
Hesperostipa comata	Needle-and-thread	
Juniperus osteosperma	Utah juniper	
Krascheninnikovia lanata	Winterfat	X
Lappula occidentalis	Western sticktight	X
Opuntia polyacantha	Prickly pear	
Penstemon palmeri	Palmer penstemon	
Pleuraphis jamesii	Galleta grass	X
Purshia mexicana	Cliffrose	
Salsola tragus	Russian thistle	X
Sisymbrium altissimum	Tall tumblemustard	
Sphaeralcea grossularifolia	Gooseberry leaf globemallow	X

During the 2012 vegetation survey, total live foliar cover on the CMP cover was estimated at 20 to 30 percent[1]. Rubber rabbitbrush and thread snakeweed were the dominant species, and secondary species were big sagebrush, fourwing saltbush, and Indian ricegrass. In the CMP perimeter area, total live foliar cover was estimated at 13 to 20 percent. Rubber rabbitbrush and big sagebrush were dominant, and thread snakeweed was secondary. Foliar cover was slightly higher in the native area, at 29 to 35 percent. Big sagebrush was the dominant species; thread snakeweed and bottlebrush squirreltail were secondary. Drought stress was evident across the UC-1 site, and many small shrubs on the CMP cover were dead. Tables C–2, C–3, and C–4 show results from the quadrat data collected in 2012 on the CMP cover, in the CMP perimeter area, and in an undisturbed, native area, respectively. Photographs 1, 2, and 3 (Section C6, below)

[1] The first value (20 percent) was calculated from the quadrat data. The second value (30 percent) was estimated visually in the field for the entire area. Ranges of cover are presented in a similar way for the CMP perimeter area and for the undisturbed, native area.

show vegetation on the CMP cover, in the CMP perimeter area, and in an undisturbed, native area, respectively.

Table C–2. Live Foliar Cover (Percent) on the CMP Cover

Species/Quad	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Shrubs										
Artemesia tridentata	0	2	1	0	0	0	0	6	0	0
Ericameria nauseosa	3	0	0	0	10	10	15	10	15	8
Gutierrezia microcephala	0	0	35	18	15	0	5	10	20	10
Grasses										
Achnatherum hymenoides	0	0	0	2	3	0	0	0	0	0
Bromus tectorum	0	0	1	0	0	0	0	0	0	0
Elymus elymoides	0	0	0	0	0	0	5	0	0	0
Pleuraphis jamesii	0	0	0	0	0	0	0	0	0	0
Forbs										
Sphaeralcea grossulariifolia	0	0	1	0	0	0	0	0	0	0
Total Plant Cover	**3**	**2**	**38**	**20**	**28**	**10**	**25**	**26**	**35**	**18**
Litter	2	5	15	15	12	10	5	4	5	5
Rock	10	10	8	20	25	35	25	25	25	30
Bare ground	85	83	39	45	35	45	45	45	35	47

Other species observed: *Atriplex canescens, Descurainia sophia, Halogeton glomeratus, Krascheninnikovia lanata,* and *Salsola tragus.*

Table C–3. Live Foliar Cover (Percent) in the CMP Perimeter Area

Species/Quad	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Shrubs										
Artemesia tridentata	0	5	0	15	0	0	10	0	0	15
Ericameria nauseosa	15	0	0	0	0	5	3	10	10	18
Gutierrezia microcephala	0	0	0	0	0	0	2	0	5	0
Grasses										
Achnatherum hymenoides	0	0	0	0	1	0	0	0	0	0
Bromus tectorum	0	0	1	0	0	0	0	0	0	0
Elymus elymoides	0	0	2	0	0	0	5	0	0	0
Forbs										
Descurainia sophia	0	0	0	0	0	3	0	0	0	0
Salsola tragus	0	0	0	0	0	2	0	0	0	0
Total Plant Cover	**15**	**5**	**3**	**15**	**1**	**10**	**20**	**10**	**15**	**33**
Litter	5	8	5	10	4	15	15	10	25	30
Rock	15	22	20	20	25	35	20	15	10	7
Bare ground	65	65	72	55	70	40	45	65	50	30

Other species observed: *Aster* sp., *Astragalus* sp., *Halogeton glomeratus, Krascheninnikovia lanata, Lappula occidentalis, Pleuraphis jamesii*, and *Sphaeralcea grossulariifolia.*

Table C–4. Live Foliar Cover (Percent) in the Undisturbed, Native Area

Species/Quad	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Shrubs										
Artemesia tridentata	5	40	30	10	8	10	5	35	15	20
Gutierrezia microcephala	10	0	0	25	0	5	0	10	18	0
Grasses										
Aristida purpurea	0	0	0	0	0	0	0	0	2	3
Elymus elymoides	5	5	10	0	0	2	0	5	3	0
Pleuraphis jamesii	0	0	0	0	0	1	0	0	0	2
Forbs										
Descurainia sophia	0	0	0	0	0	0	2	0	0	0
Total Plant Cover	**20**	**45**	**40**	**35**	**8**	**18**	**7**	**50**	**38**	**25**
Litter	2	10	10	15	5	5	10	10	20	5
Rock	5	0	5	5	10	5	15	5	20	30
Bare ground	73	45	45	45	77	72	68	35	22	40

Other species observed: *Bromus tectorum.*

On the CMP cover, total foliar cover was estimated from the quadrat data to be slightly higher in 2009 (23 percent) than in 2012 (20 percent). Similarly, in the CMP peripheral area, total foliar cover fell from 14 percent in 2009 to 13 percent in 2012. The undisturbed, native area showed the opposite pattern, as total foliar cover increased from 18 percent in 2009 to 29 percent in 2012. In 2012, species richness (the number of distinct plant species observed) was higher in the revegetated areas (CMP cover [13 species observed] and CMP peripheral area [15 species observed]) than in the undisturbed, native area (7 species observed).

C4. Discussion

Revegetation of the CMP cover and perimeter area continues to be successful, especially under prolonged drought conditions. Total foliar cover and species richness values have changed little in the revegetated areas between 2009 and 2012. Several species found in small numbers within the revegetated areas (*Sphaeralcea grossulariifolia* and *Krascheninnikovia lanata*) are common to undisturbed, native communities in the area (DOE 2011), and they may indicate that vegetation continues to slowly develop toward a mature, climax community.

In accordance with success criteria established for the CMP, revegetation is considered successful when the total foliar cover equals or exceeds 70 percent of total foliar cover in the native, undisturbed area (Anderson 2005, 2006). This success criterion was met in 2006 and continued through 2009 (DOE 2009). In 2012, estimated total foliar cover on the CMP was 70 percent of the native area (20 percent), but cover in the CMP peripheral area no longer met the original success criterion, mainly because cover in the native area increased substantially from an estimated 18 percent in 2009 to 29 percent in 2012. These changes in plant cover are likely the result of prolonged drought, which may favor large, established sagebrush, which is dominant in the native area, over the younger, dominant, shallow-rooted shrubs on the CMP. Grazing and browsing animals (antelope, rabbits, and deer) may also favor the more palatable species on the CMP during times of drought. As in previous years, shrubs and grasses on the CMP had been noticeably grazed by these animals. Vegetation in the CMP peripheral area is also

available for grazing by livestock, and this may account for the lower foliar cover in this area. Continued monitoring every 2 years is recommended to evaluate whether the observed trends will indicate changes in the health of the vegetation over time.

C5. References

Anderson, D., 2005. *Revegetation Success Monitoring, Corrective Action Unit 417 Central Nevada Test Area—Surface, Hot Creek Valley, Nevada*, included as Appendix to *Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area – Surface, Hot Creek Valley, Nevada For Calendar Year 2005*, DOE/NV-1122, U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office, April 2006.

Anderson, D., 2006. *Revegetation Success Monitoring, Central Nevada Test Area Corrective Action Unit 417*, included as Appendix C to *Draft Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area – Surface, Hot Creek Valley, Nevada*, DOE/NV/25946-168, U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office, April 2007.

DOE (U.S. Department of Energy), 2007. *2007 Revegetation Success Monitoring, Central Nevada Test Area Corrective Action Unit 417, UC-1 Central Mud Pit,* Appendix C of *Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area Surface, Hot Creek Valley, Nevada for Calendar Year 2007*, DOE-LM/1558-2007, September 2008.

DOE (U.S. Department of Energy), 2009. *2009 Revegetation Success Monitoring, Central Nevada Test Area Corrective Action Unit 417, UC-1 Central Mud Pit*, Appendix C of *Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area Surface, Hot Creek Valley, Nevada*, LMS/CNT/05767, U.S. Department of Energy Office of Legacy Management, October.

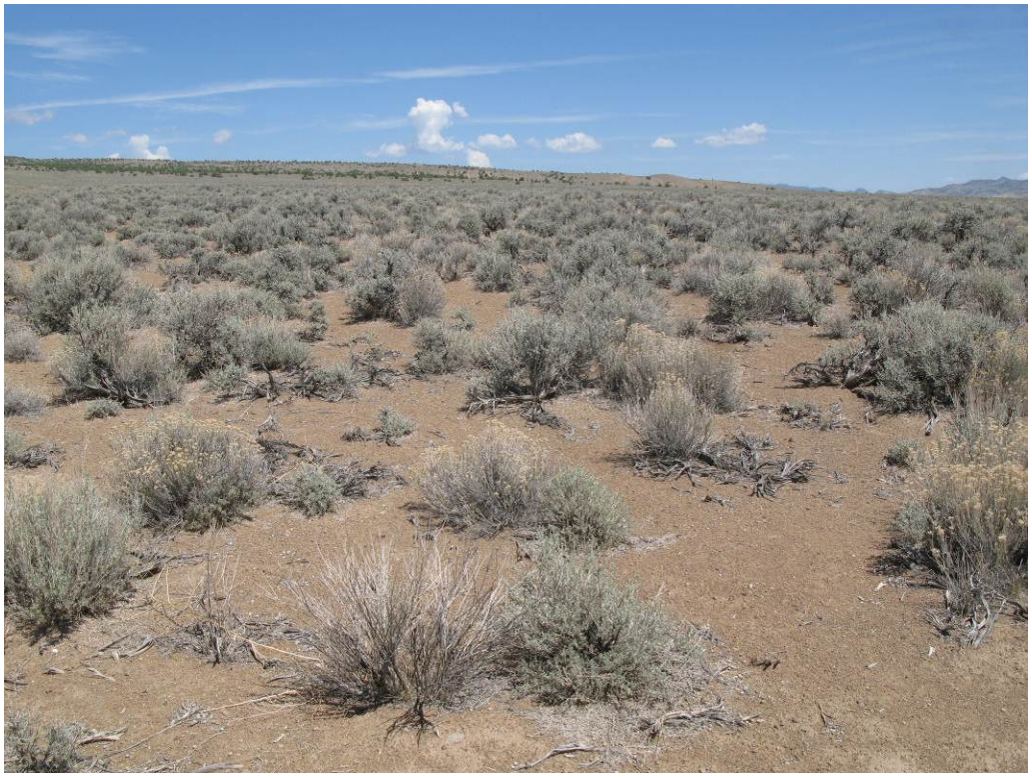
DOE (U.S. Department of Energy), 2011. *Baseline Soil and Vegetation Characterization of the Central Nevada Test Area*, LMS/CNT/S07591, U.S. Department of Energy Office of Legacy Management, April.

USDA (U.S. Department of Agriculture), 2012. Natural Resources Conservation Service PLANTS Database, available online at http://plants.usda.gov, accessed on October 22, 2012.

C6. Photographs

Photograph 1. View south of CMP cover vegetation

Photograph 2. View west of vegetation in the CMP perimeter area



Photograph 3. View north of undisturbed, native area

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Appendix D

NDEP Correspondence and Record of Review

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ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Brian Sandoval, Governor
Leo M. Drozdoff, P.E., Director
Colleen Cripps, Ph.D., Administrator

January 18, 2013

Mr. Mark Kautsky
Site Manager
U. S. Department of Energy
Office of Legacy Management
2597 Legacy Way
Grand Junction, CO 81503

RE: Draft Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area Surface, Hot Creek Valley, Nevada
October 2012
Federal Facility Agreement and Consent Order

Dear Mr. Kautsky:

The Nevada Division of Environmental Protection, Bureau of Federal Facilities (NDEP) staff has received and reviewed the above-referenced report on the post-closure inspection and monitoring activities conducted at the Central Nevada Test Area during Calendar Years 2011 and 2012. The annual report was prepared in accordance with the Federal Facility Agreement and Consent Order (FFACO) and the Closure Report for Corrective Action Unit 417. While this letter does serve as a Notice of Completion for the milestone of the Draft Post-Closure Inspection Report for CAU 417: Central Nevada Test Area Surface, pursuant to Subpart XXV.1 of the FFACO, the NDEP has the following comments, which were discussed in the December 10, 2012 teleconference between the NDEP and OLM, on this draft report:

1. Page 1, Section 1.0, Second Paragraph, Second Sentence; Page 5, Section 2.1, First Paragraph; Page 20, Section 4.3, First and Fourth Bullets: According to the "Record of Technical Change (ROTC) Number DOE/NV—743 ROTC 2 for the Final Closure Report, Revision 1, For Corrective Action Unit 417: Central Nevada Test Area-Surface, Nevada, November 2001," "the frequency of the post-closure inspections and surveying of the subsidence monuments will be performed every other year, beginning in 2012, for the next ten years." Therefore, the statement in the second sentence of second paragraph on Page 1, "…agreed the annual inspections would continue but a report would only be produced biennially beginning in 2012." is in error and should be corrected. Also, the language on Page 5 and Page 20 should be reworded to reflect that in the ROTC.

2. Pages 6 and 7, Section 2.4, First and Second Paragraphs; Pages 19 and 20, Section 4.2, Third Bullet: Further discussion between the NDEP and the OLM is needed and will occur in subsequent monthly teleconferences and/or meetings in regards to the Cover

Performance modeling results for soil moisture content presented in the 2000 CAU 417 Corrective Action Plan (CAP) and the actual field results that have been collected over the past twelve (12) years.

Other than the language changes needed to the First and Fourth Bullets in order to be consistent with the ROTC, the NDEP concurs with the Recommendations stated in Section 4.3 of the report.

Please address any questions regarding this matter to Chris Andres at (702) 486-2850 ext. 232.

Sincerely,

T. H. Murphy
Chief
Bureau of Federal Facilities

cc: Jeffrey Fraher, DTRA/CXTS, Kirtland AFB, NM
J. B. Chapman, DRI, Las Vegas, NV
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U.S. Department of Energy Office of Legacy Management

Record of Review

Due Date	Review No.	Project	Type of Review
1/29/13	1	Offsites Project - CNTA	Technical

Document Title and\or Number and Revision
Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area Surface, Hot Creek Valley, Nevada (S09307)

Author
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Reviewers' Recommendation

- ☐ Release Without Comment
- ☐ Consider Comments
- ☒ Resolve Comments and Reroute for Review

Refer to the NDEP letter dated January 18, 2013

Signature of Reviewer and Date

- ☒ Comments Have Been Addressed

Mark Kautsky
2013.02.21 15:38:19 -07'00'

Signature of Author and Date

- ☒ Comment Resolution Satisfactory
- ☐ Comment Resolution Unsatisfactory

Christ Andres 3/15/13

Signature of Reviewer and Date

Item No.	Reviewer's Comments and Recommendation	Reqd. (Y/N)	Item No.	Author's Response (if required)
1	Page 1, Section 1.0, Second Paragraph, Second Sentence; Page 5, Section 2.1, First Paragraph; Page 20, Section 4.3, First and Fourth Bullets: According to the "Record of Technical Change (ROTC) Number DOE/NV-743 ROTC 2 for the Final Closure Report, Revision 1, For Corrective Action Unit 417: Central Nevada Test Area-Surface, Nevada, November 2001," "the frequency of the post-closure inspections and surveying of the subsidence monuments will be performed every other year, beginning in 2012, for the next ten years." Therefore, the statement in the second sentence of second paragraph on Page 1, "... agreed the annual inspections would continue but a report would only be produced biennially beginning in 2012." is in error and should be corrected. Also, the language on Page 5 and Page 20 should be reworded to reflect that in the ROTC.			The sections were revised as requested. The most significant changes were to the second, third, and forth sentences of the second paragraph of Section 1.0 and are provided below: "In 2011, LM and the Nevada Division of Environmental Protection (NDEP) agreed that the post-closure inspections and surveying of the subsidence monuments would be performed every other year with the first biennial monitoring event to be performed in 2012. In 2011 a site inspection was conducted in conjunction with other site activities, and in 2012, the post-closure inspection was conducted to document the physical condition of the CAU 417 soil covers, monuments, signs, fencing, and restricted-use areas. Subsidence surveys of the UC-1 Central Mud Pit (CMP) and UC-4 Mud Pit C covers were also conducted during the 2012 inspection."

Record of Review (continuation)

Review No.	Project

Item No.	Reviewer's Comments and Recommendation	Reqd. (Y/N)	Item No.	Author's Response (if required)
2	Pages 6 and 7, Section 2.4, First and Second Paragraphs; Pages 19 and 20, Section 4.2, Third Bullet: Further discussion between the NDEP and the OLM is needed and will occur in subsequent monthly teleconferences and/or meetings in regards to the Cover Performance modeling results for soil moisture content presented in the 2000 CAU 417 Corrective Action Plan (CAP) and the actual field results that have been collected over the past twelve (12) years.			OLM agrees with the statement and looks forward to additional discussions on the subject. To further these discussions and to obtain additional information on the soil moisture content, the fifth bullet in the recommendations Section 4.3 was revised as follows: "Continue to collect soil moisture data from the TDR nests, but verify soil moisture data from the deepest sensors in the east TDR nest by collecting soil samples near the deepest sensors for evaluation of soil moisture content."

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