Nevada
Environmental
Restoration
Project

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Annual Report
RCRA Post-Closure Monitoring
and Inspections for CAU 112:
Area 23 Hazardous Waste Trenches,
Nevada Test Site, Nevada
For the Period
October 2000 - July 2001

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Division

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National Nuclear Security Administration
Nevada Operations Office

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**ANNUAL REPORT
RCRA POST-CLOSURE MONITORING
AND INSPECTIONS FOR
CORRECTIVE ACTION UNIT 112:
AREA 23 HAZARDOUS WASTE TRENCHES,
NEVADA TEST SITE, NEVADA**

**FOR THE PERIOD
OCTOBER 2000 - JULY 2001**

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Prepared for
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AREA 23 HAZARDOUS WASTE TRENCHES
NEVADA TEST SITE, NEVADA**

**FOR THE PERIOD
OCTOBER 2000 - JULY 2001**

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LIST OF ABBREVIATIONS AND ACRONYMS

BN	Bechtel Nevada
CFR	Code of Federal Regulations
cm	centimeter
CRMC	Cumulative Residual Moisture Content
DOE/NV	U.S. Department of Energy, Nevada Operations Office
ET _{POT}	Estimates of Potential Evapotranspiration
ft	foot
gal	gallon
hr	hour
in	inch
km	kilometer
L	liter
m	meter
mi	mile
NDEP	Nevada Division of Environmental Protection
NTS	Nevada Test Site
RCRA	Resource Conservation and Recovery Act
REEC _o	Reynolds Electrical & Engineering Co., Inc.
RVMC	Residual Volumetric Moisture Content
sec	second
VMC	Volumetric Moisture Content

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ABSTRACT

This annual Neutron Soil Moisture Monitoring report provides an analysis and summary for site inspections, meteorological information, and neutron soil moisture monitoring data obtained at the Area 23 Hazardous Waste Trenches Resource Conservation and Recovery Act (RCRA) unit, located in Area 23 of the Nevada Test Site, Nye County, Nevada, during the October 2000 - July 2001 monitoring period.

Inspections of the Area 23 Hazardous Waste Trenches RCRA unit are conducted to determine and document the physical condition of the covers, facilities, and any unusual conditions that could impact the proper operation of the waste unit closure.

Physical inspections of the closure were completed quarterly and indicated that the site is in good condition with no significant findings noted.

An annual subsidence survey of the elevation markers was conducted in July 2001. There has been no subsidence at any of the markers since monitoring began eight years ago.

Precipitation for the period October 2000 through July 2001 was 9.42 centimeters (cm) (3.71 inches [in]) (U.S. National Weather Service, 2001). The prior year annual rainfall (January 2000 through December 2000) was 10.44 cm (4.11 in.). The recorded average annual rainfall for this site from 1972 to January 2000 is 14.91 cm (5.87 in.).

The objective of the neutron logging program is to monitor the soil moisture conditions along 30 neutron access tubes and detect changes that may be indicative of moisture movement at a point located directly beneath each trench.

All monitored access tubes are within the compliance criteria of less than 5 percent residual volumetric moisture content at the compliance point directly beneath each respective trench. Soil conditions remain dry and stable underneath the trenches.

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EXECUTIVE SUMMARY

INTRODUCTION

The Area 23 Hazardous Waste Trenches were closed in-place in September 1993. Post-closure monitoring of the Area 23 Hazardous Waste Trenches began in October 1993. The post-closure monitoring program is used to verify that the Area 23 Hazardous Waste Trench covers are performing properly, and that there is no water infiltrating into or out of the waste trenches. The performance of the Area 23 Hazardous Waste Trenches is currently monitored using 30 neutron access tubes positioned on and along the margins of the covers. Soil moisture measurements are obtained in the soils directly beneath the trenches and compared to baseline conditions from the first year of post-closure operation. This report documents the post-closure activities between October 2000 and July 2001.

REGULATORY CRITERIA

A formal change of the compliance criteria for the Nevada Test Site (NTS) Resource Conservation and Recovery Act (RCRA) Part B Permit was submitted to the Nevada Division of Environmental Protection (NDEP) in December 1996 and was approved on February 10, 1997. These changes were incorporated into the Part B Permit (NEV HW009) as a Class 1 Modification as per Appendix I to Title 40 Code of Federal Regulations CFR §270.42 (CFR, 1998).

In October 19, 1999, a formal change of the compliance criteria for the NTS RCRA Part B Permit was submitted to NDEP, requesting to reduce the monitoring period from quarterly to biannual and to remove the monthly monitoring requirement for one quarter after a precipitation event of 1 inch (in) of rainfall in any 24-hour period or over an integrated 30-day period.

In November 2000, the NDEP granted the requested change in the monitoring period from quarterly to biannual monitoring and removed the monthly monitoring requirement for precipitation events. These changes were incorporated into the reissued RCRA Part B Permit and became effective November 17, 2000.

All monitoring for the October 1999 to October 2000 monitoring period was conducted under the provisions of the February 10, 1997, modification to the original RCRA Part B Permit. The changes incorporated into the reissued permit became effective in this year's annual report.

The level of concern, point of compliance, and schedule of actions are summarized below. Notification to NDEP is required if Residual Volumetric Moisture Content (RVMC) above 5 percent (relative to baseline conditions) is observed and confirmed in two consecutive monitoring periods at a point directly beneath each respective hazardous waste trench. The

NDEP must be notified within seven days of determination of a valid trend. A preliminary written assessment detailing recommendations to determine the nature, cause, and action to be taken is to be submitted to NDEP for concurrence within 30 days of the notification.

RESULTS OF INSPECTIONS AND THE MONITORING PROGRAM

The unit was inspected quarterly. No significant concerns were observed.

PRECIPITATION

Precipitation data were collected from the National Weather Service Nuclear Support Office's CLINET station "MER" in Mercury, Nevada. Precipitation records for this station for the period October 2000 through July 2001 are found in Figure 3 and Appendix D.

Precipitation for the period October 2000 through July 2001 was 9.42 centimeters (cm) (3.71 inches [in]) (U.S. National Weather Service, 2001). The prior year annual rainfall (January 2000 through December 2000) was 10.44 cm (4.11 in.). The recorded average annual rainfall for this site from 1972 to January 2000 is 14.91 cm (5.87 in.).

SOIL MOISTURE MONITORING

Graphs of Cumulative Residual Moisture Content (CRMC) relative to the regulatory level of concern (5 percent RVMC) are found for each trench in Figures ES-1 through ES-4.

The CRMC graphs track changes over time from the baseline conditions at the point of compliance (directly beneath the hazardous waste trench) for each access tube. The residual moisture content is calculated by subtracting the first year average soil moisture content (baseline) from the soil moisture content for each monitoring period on a depth basis. The residual soil moisture is plotted as RVMC vs logging date for each access tube.

The soil moisture content point of compliance is located at a depth of 0.91 meters (m) (3 feet [ft]) from the bottom of each neutron access tube (the point directly beneath each hazardous waste trench). The monitored depth varies from tube to tube because the angled boreholes have varying stand-off distances to each respective trench.

The level of regulatory concern is indicated as the dark line at the 5 percent residual moisture level (Figures ES-1 through ES-4). Values exceeding this limit for two consecutive monitoring periods require notification to NDEP and the submittal of an Action Plan to investigate the cause.

SUMMARY AND CONCLUSIONS

1. Precipitation for the period October 2000 through July 2001 was 9.42 cm (3.71 in.) (U.S. National Weather Service, 2001). The prior year annual rainfall (January 2000 through December 2000) was 10.44 cm (4.11 in.). The average annual rainfall for this site from 1972 to January 2000 is 14.91 cm (5.87 in.).
2. Inspections of the cover were done to identify any significant changes to the unit requiring action. No significant concerns were observed.
3. An elevation survey of the subsidence markers was conducted in July 2001. There has been no subsidence at any of the markers since monitoring began eight years ago.
4. Most access tubes indicate only near-surface wetting and drying events and remain unchanged from the previous monitoring period.
5. All monitored access tubes are within the compliance criteria of less than 5 percent RVMC at the compliance point directly beneath each respective trench. Soil conditions remain dry and stable underneath the trenches.

Summary of Trench Conditions:

Trench A

CRMC at the point of compliance indicates that soil surrounding the access tubes is stable, dry, and below the compliance level of 5 percent RVMC.

Trench B

CRMC at the point of compliance for all Row B access tubes remains stable and dry, and is within the compliance criteria.

Trench C

CRMC at the point of compliance for all Row C tubes remains at less than 1 percent RVMC with no trends evident.

The Row C access tubes remain stable, dry, and below the compliance criteria of 5 percent RVMC.

Trench S-1

CRMC at the point of compliance for all Row S-1 tubes remains at less than 1 percent RVMC.

The Row S-1 access tubes remain stable, dry, and below the compliance criteria of 5 percent RVMC.

Trench S-2

CRMC at the point of compliance for all Row S-2 tubes remains at less than 1 percent RVMC with no trends evident.

The Row S-2 access tubes indicate that the soil remains stable, dry, and below the compliance criteria of 5 percent RVMC.

Control Well V-1

The Vertical Control Tube V-1 is a 15.2-m (50-ft) vertical neutron access tube located at the north margin of the cover. Its purpose was to provide information on infiltration and evaporation sequences of the soils immediately surrounding the RCRA closure. It is used for background comparative purposes. Unfortunately, the tube was located in a slight depression that frequently filled with ponded water from runoff from the covers and a catchment area located to the north. As a result, this "control" tube represents a worse-case scenario in terms of the amount and degree of water infiltration rather than typical conditions.

Conditions along this access tube are unchanged over the monitoring period, but still remain well above baseline moisture content and limit the usefulness of this access tube for its intended purpose.

The CRMC for access Tube V-1 remains below 5 percent RVMC.

FINDINGS

1. Some access tubes located along the periphery of the cover (Rows A, B, C-1 through C-4, and S-2) had shown low levels of infiltration that have occurred down along the access tubes to depth. No further movement of moisture was noted in any tube over the monitoring period.

Access tubes located on, and penetrating the cover, indicate that near-surface infiltration is strictly limited to 1.83 m (6 ft) where the geomembrane liner is located. No leakage across the liner has been observed.

2. No significant concerns were observed during the site inspections over the period October 2000 to July 2001.
3. The annual subsidence survey of the two covers indicates that there has been no subsidence detected to date.
4. Soil conditions remain dry and stable beneath the trench through the October 2000 to July 2001 monitoring period.
5. Moisture contents at the point of compliance for all access tubes remain below the compliance criteria of 5 percent RVMC.

RECOMMENDATIONS

1. Continue to monitor for near-surface infiltration along the wellhead protection seals to determine that the repair work performed in 1997 has not been compromised by burrowing animals.

Mercury Hazardous Waste Trenches - Row A

Cumulative Residual Moisture Content Beneath Trench

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure ES-1 - Row A Cumulative Residual Moisture Content

Mercury Hazardous Waste Trenches - Row B **Cumulative Residual Moisture Content Beneath Trench**

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
 Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure ES-2 - Row B Cumulative Residual Moisture Content

ES-7

Mercury Hazardous Waste Trenches - Row C

Cumulative Residual Moisture Content Beneath Trench

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure ES-3 - Row C Cumulative Residual Moisture Content

Mercury Hazardous Waste Trenches - Row S1 **Cumulative Residual Moisture Content Beneath Trench**

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
 Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure ES-4 - Row S1 Cumulative Residual Moisture Content

Mercury Hazardous Waste Trenches - Row S2 **Cumulative Residual Moisture Content Beneath Trench**

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
 Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure ES-5 - Row S2, V1 Cumulative Residual Moisture Content

1.0 INTRODUCTION

1.1 SCOPE AND OBJECTIVE

This annual Neutron Soil Moisture Monitoring report provides an analysis and summary for site inspections, meteorological information, and neutron soil moisture monitoring data obtained at the Area 23 Hazardous Waste Landfill, Corrective Action Unit 112, located in Mercury, Nevada. This report covers the period October 2000 through July 2001.

Inspections of the Area 23 Hazardous Waste Landfill are conducted to determine and document the physical condition of the covers, facilities, and any unusual conditions that could impact the proper operation of the landfill closure.

The objective of the neutron logging program is to monitor the stability in soil moisture conditions beneath the trenches and detect changes that may be indicative of moisture entering through the landfill cover and, therefore, producing leachate movement beneath the landfill.

1.2 SITE HISTORY

A summary of significant events regarding the closure of the Area 23 Hazardous Waste Trenches can be found in Table 1.

The Area 23 Landfill (Figure 1) has been in operation for approximately 25 years. During that time, various trenches were excavated and used for the disposal of sewage from portable toilets, sanitary waste, aerosol cans, wood waste, noninfectious medical waste, and hazardous wastes. All the trenches were originally covered with a soil cover. A portion of the landfill (Figure 2) was closed under the Resource Conservation and Recovery Act (RCRA) using an engineered soil/synthetic geomembrane cover. The cover was completed in August 1993. Soil moisture monitoring began in October 1993.

The unit consists of two covers, a smaller cover for Trench A, and a larger, separate cover for Trenches B, C, S-1, and S-2. Hazardous Waste Trench A is greater than 51.8 meters (m) (170 feet [ft]) in length and approximately 0.61 m (2 ft) wide and 1.68 m (5.5 ft) deep. The northern portion of this trench was identified as containing hazardous waste and is approximately 16.76 m (55 ft) in length, with the remaining portions filled with sanitary wastes. The southern extent of the trench (containing sanitary waste) is not known (U.S. Department of Energy, Nevada Operations Office [DOE/NV], 1992).

**TABLE 1- CHRONOLOGY OF SIGNIFICANT EVENTS - AREA 23
HAZARDOUS WASTE TRENCHES**

DATE	SIGNIFICANT EVENTS
1988	<u>Closure Plan for the Nevada Test Site</u> , Earth Technology Corporation, 1988.
1990	Letter to DOE/NV from the Nevada Division of Environmental Protection (NDEP), <u>Effective Date of Closure for Area 23 Landfill</u> , May 17, 1990.
	<u>Exploratory Excavation at the Area 23 Landfill, Nevada Test Site, Mercury, Nevada</u> , issued 1990.
1991	Excavation activities occurred during the period October 14, 1991 to November 21, 1991. Four exploratory trenches and potholes were used to identify waste materials and locations.
1992	<u>Area 23 Exploratory Excavation Activities to Identify the Location of Hazardous Waste Trenches (Phase 1 Report)</u> Vols. 1 and 2, issued April 1992 (U.S. Department of Energy, Nevada Operations Office, 1992).
	Four small exploratory trenches were excavated for sampling. Activities occurred between June 29 through July 1, 1992.
1993	<u>Amended Closure Plan, Area 23 Landfill, Hazardous Waste Trenches (Phase 2 Report)</u> , issued April 1993 (DOE/NV, 1993a).
	Closure of the hazardous waste trenches March 25 through August 26, 1993.
	79 neutron access tubes were installed along the periphery and through the cover of the two landfills between March 25 to May 18, 1993. Approximately 5,200 feet of casing was installed.
	Post-closure monitoring began in October 1993.
	<u>Certification and Closure Report Area 23 Landfill Hazardous Waste Trenches</u> , issued October 1993 (DOE/NV 1993b).
1994	<u>First Quarterly Report RCRA Post Closure Monitoring and Inspection, Mercury Landfill Hazardous Waste Trenches</u> , report issued April 1994 (DOE/NV, 1994a).
	<u>Second Quarterly Report RCRA Post Closure Monitoring and Inspection, Mercury Landfill Hazardous Waste Trenches</u> , report issued May 1994 (DOE/NV, 1994b).
	<u>Third Quarterly Report RCRA Post Closure Monitoring and Inspection, Mercury Landfill Hazardous Waste Trenches</u> , report issued August 1994 (DOE/NV, 1994c).
	<u>Revised Post-Closure Soil Moisture Monitoring Schedule for Closed Area 23 Landfill Hazardous Waste Trenches</u> , December 21, 1994, Letter from P. J. Liebendorfer to D. R. Elle.

DATE	SIGNIFICANT EVENTS
1995	RCRA Part B permit number NEV HW009 became effective May 1, 1995.
	<u>Fourth Quarterly Report RCRA Post Closure Monitoring and Inspection, Mercury Landfill Hazardous Waste Trenches</u> , report issued January 1995 (DOE/NV, 1995a).
	In September 1995, the Nevada Division of Environmental Protection (NDEP) requested that a uniform reporting format and specific changes in the presentation of the soil moisture data be developed. In subsequent meetings between DOE/NV, NDEP, and Reynolds Electrical & Engineering Co., Inc. (REECo) (currently Bechtel Nevada [BN]), the compliance criteria was modified placing the point of compliance beneath each respective hazardous waste trench.
1996	<u>Annual Report RCRA Post-Closure Monitoring and Inspection, Mercury Landfill Hazardous Waste Trenches, Volumes I and II December 1994 - December 1995</u> , report issued March 1996 (DOE/NV, 1996).
	A request was submitted to NDEP in December 1996 requesting that the interim monitoring criteria be formally adopted.
1997	<u>Annual Report RCRA Post-Closure Monitoring and Inspection, Mercury Landfill Hazardous Waste Trenches, Volumes I and II for the Period October 1995 - October 1996</u> , report issued January 1997 (DOE/NV, 1997a).
	NDEP approved the request to adopt the proposed monitoring criteria on February 10, 1997. The changes were incorporated into the Permit (NEV HW009) as a Class 1 modification as per Appendix I to 40 Code of Federal Regulations (CFR) §270.42.
	Maintenance and corrective actions to address the ponding and leakage problems associated with the access tubes located along the margins of the cover was started September 18 and completed October 2, 1997. Soils were excavated around the wellhead protection blocks, a bentonite layer was emplaced, and the soils recompact and graded to prevent runoff and ponded water from infiltrating down along the access tubes. The soils along the toe of the closure cover were regraded to provide improved drainage.
1999	A request was submitted to NDEP on October 19, 1999, to reduce the frequency of monitoring to biannual and to remove the quarterly monitoring requirement for precipitation events over 1 inch (in.) accumulated in a 30-day period.
2000	Rev. 1, for the 1999 annual report was issued. Quarterly monitoring after a 1-in. precipitation event prior to December 1998 had been interpreted as a total of three consecutive monthly monitoring logs. NDEP provided comments that quarterly monitoring must also include the precipitation event as well, for a total of four months. DOE/NV has adopted this position and will monitor for four consecutive months following a 1-in. precipitation event.
	The request, submitted to NDEP in October 1999, to reduce the frequency of monitoring to biannual and to remove the quarterly monitoring requirement for precipitation events over 1 in. accumulated in a 30-day period was granted by NDEP. These changes were written into the RCRA Part B Permit which was reissued on November 17, 2000.
2001	Monitoring and reporting are conducted according to the provisions specified under the November 17, 2000, RCRA Part B permit.
1993 - 2001	No infiltration has been detected through the covers and the waste remains dry and stable.

Trench B is 135 m (442 ft) long, 0.61 to 0.91 m (2 to 3 ft) wide, and 1.68 to 2.13 m (5.5 to 7 ft) deep. Monuments for Trench B were labeled "Medical Waste" and "Sanitary Waste" on the north end of the trench. Medical waste was found overlying hazardous waste on the north end of the trench during characterization studies (DOE/NV, 1992).

Trench C is 114.6 m (376 ft) long, 0.91 m (2 to 3 ft) wide and 0.15 to 2.44 m (0.5 to 8 ft) deep. Concrete monuments on the north end of Trench C were labeled "Sanitary Waste," "Aerosol Cans," and "Hazardous Waste" (DOE/NV, 1992).

Trench S-1 is approximately 84.12 m (276 ft) long, 0.91 to 1.37 m (3 to 4.5 ft) wide, and varies from 1.52 to 3.96 m (5 to 13 ft) deep. Trench S-1 was marked with a concrete monument labeled "Sewage" on the north end of the trench and unmarked on the south end (DOE/NV, 1992).

Trench S-2 is greater than 70.7 m (232 ft) long, 1.07 to 2.13 m (3.5 to 7 ft) wide, and 3.05 to 4.27 m (10 to 14 ft) in depth. Trench S-2 was marked with a concrete monument as "Sewage" on the north end, but unmarked on the southern end. The southern end was not determined in exploratory excavations (DOE/NV, 1992).

Waste inventories (Earth Technology, 1988) indicate that approximately 62,459 liters (L) (16,500 gallons [gal]) of hazardous wastes were disposed of in trenches A, B, and C at the Area 23 Landfill. This waste includes 37,854 L (10,000 gal) of corrosive material and 20,820 L (5,500 gal) of ignitable materials. Approximately 13,249 L (3,500 gal) of miscellaneous nonhazardous chemicals were also disposed of in the trenches. Waste inventory data are not available for Trenches S-1 and S-2. Waste oil was observed in both trenches during exploratory excavation of these trenches (DOE/NV, 1992).

1.3 SITE GEOLOGY AND HYDROLOGY

The Area 23 Hazardous Waste Landfill is located approximately 1.21 kilometers (km) (3/4 mile [mi]) west of Mercury, Nevada, on the Nevada Test Site (NTS), Nye County, Nevada (Figure 1). The site lies within the Mercury Valley and is underlain by unconsolidated alluvium derived from the Specter Range, Red Mountain, and Mercury Ranges. These ranges consist of Paleozoic carbonates and quartzites. The near-surface alluvium is composed of silty sands containing abundant gravel and cobbles. Some boulders, up to 0.91 m (3 ft) in diameter, have been noted. Localized caliche development is present in the near surface and is observed in the boreholes used to emplace the neutron access tubes.

The NTS is underlain by the Ash Meadows Aquifer. It is an interbasin flow system above a carbonate basement rock and is relatively independent of the topographic boundaries. The Ash Meadows Aquifer beneath the Area 23 Landfill occupies the lower Cenozoic alluvial fill with the groundwater table estimated at about 244 to 335 m (800 to 1,100 ft) below the ground surface

with flow to the southwest (Winograd et al., 1975). The nearest water well is located approximately 5.63 km (3.5 mi) to the southwest at Army Well Number 1.

A groundwater monitoring well for the Area 23 Sewage Lagoons was drilled approximately 0.4 km (0.25 mi) south of the trenches. This well was completed in March 1996 to a depth of about 350 m (1,300 ft). Groundwater was intercepted at approximately 396 m (1,300 ft) under 45 m (150 ft) of head. Groundwater level in the well is currently in equilibrium at approximately 350 m (1,150 ft).

The longest continuous rainfall records available for the NTS were recorded in Area 5 over a 31-year period. The average rainfall was 12.45 centimeters (cm) (4.90 in.), while the annual total ranged between a minimum of 2.79 cm (1.1 in.) to a maximum of 23.42 cm (9.22 in.). Estimates of Potential Evapotranspiration (ET_{POT}) obtained from characterization studies in Area 5 indicate an ET_{POT} of about 157.5 centimeters/year (62 inches/year), which is significantly higher than the mean annual precipitation (DOE/NV, 1995b).

Record amounts of rainfall occurred during February 23- 24, 1998. A report detailing this record site-wide precipitation event was issued in September 1999 (DOE/NV, 1999b).

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2.0 REGULATORY CRITERIA

2.1 BACKGROUND

The Amended Closure Plan (DOE/NV, 1993a) included a proposal that the level of concern triggering notification to the Nevada Division of Environmental Protection (NDEP) would be based on the hydraulic conductivity of the soils beneath the trenches. A hydraulic conductivity vs. saturation curve was proposed to determine the moisture content at which the soils had a hydraulic conductivity of 1×10^{-7} cm/second (sec) (3.94×10^{-8} in./sec), which is the U.S. Environmental Protection Agency criteria for clay liners. For soils in Area 5, this value was reached for a measured water content of 14 percent. This value was chosen for the Area 23 Hazardous Waste Trenches as the action threshold above which water movement may occur. The reporting criteria to NDEP as stated in the Amended Closure Plan (DOE/NV, 1993a) was:

If the measured water content of 14 percent is exceeded in two consecutive monthly measurements, or obvious damage occurs to the cover....action would be taken.

Once the closure drilling and construction program was completed and the first neutron logs were obtained, it was found that the fundamental assumption of homogeneous soils similar to those in Area 5 was incorrect. The soils beneath the site are heterogeneous and inter-fingered with caliche lenses producing an environment that is not hydrologically similar to that of Area 5. Drill logs and neutron logs indicate that it would be extremely difficult, if not impossible, to use the hydraulic conductivity method originally proposed due to lithologic variability of the alluvium. Doing so would lead to numerous false positives and negatives.

Instead, it was proposed in the first quarterly neutron logging report (DOE/NV, 1994a) to use the traditional method of a time series analysis to monitor and report wetting and drying changes over time. For the first year (baseline), residual volumetric moisture content (RVMC) was calculated monthly by the difference between the current month and the previous month's moisture content at each depth interval. The observation of a progressive wetting front (one that continues for two consecutive monthly measurements) greater than 5 percent RVMC would be tracked and reported to NDEP in the quarterly reports. Positioning errors of the neutron probe (tool), which could incorrectly infer changes in moisture content, are excluded. A further set of actions is necessary to determine the cause for progressive wetting fronts if observed in two consecutive months and infiltrating deeper than 4.27 m (14 ft). The 5 percent RVMC criteria was based on data observed on other neutron logs and infiltration studies conducted at comparable sites on the NTS. Changes of up to 15 percent RVMC over an interval of 0.9 to 1.5 m (3 to 5 ft) have been observed in soil covers from rainfall events in the lower elevations of Area 5. Considering that the neutron probe has a repeatability of ± 1 percent RVMC due to system noise, a level of concern of 5 percent RVMC was chosen as a conservative initial action level for compliance reporting.

The first-year data set (1994) was conducted on a monthly basis to obtain baseline data (DOE/NV, 1994a, b, c and 1995a). Based on the data collected over the first year, the monitoring program was modified by the NDEP and DOE/NV in late 1994 (NDEP, 1994). The following changes were made:

- Conduct moisture monitoring and liner inspections quarterly;
- Monitor only 30 neutron access tubes rather than 72 tubes. Table 2 provides the tubes selected for monitoring;
- Report monthly precipitation data to NDEP annually;
- If precipitation exceeds 2.54 cm (1.0 in.) in any 30-day period, or 2.54 cm (1.0 in.) in any 6-hour (hr) period, then monitoring will be conducted within two weeks of the end of the 30-day period and monthly, thereafter, for one quarter;
- After two years of post-closure monitoring, during which time the annual precipitation was average or above average, the DOE/NV may submit a request to NDEP to reevaluate the monitoring/inspection schedule for further reductions.

The NDEP requested that a uniform reporting format and specific changes in the presentation of the soil moisture data be developed in September 1995. The emphasis was to produce a simplified presentation of trends to observe whether the compliance level was being exceeded. The compliance criteria was modified in subsequent meetings between DOE/NV, NDEP, and Reynolds Electrical & Engineering, Co., Inc. (REECo) (currently Bechtel Nevada [BN]) placing the "point of compliance" beneath each respective hazardous waste trench. The neutron access tubes were installed with the bottom of the access tube at a point directly beneath each respective trench. The depth from the original grade of the landfill (before the installation of the cover) to this point is provided in Appendix A. To avoid measurement errors associated with geometry problems at the end of the access tube, a point 0.91 m (3 ft) from the bottom of the access tube was selected as the measurement point.

A formal change of the compliance criteria for the Unit NTS RCRA Part B Permit was submitted to NDEP in December 1996, requesting adaptation of the interim monitoring criteria. This request was approved on February 10, 1997. The changes were incorporated into the Part B Permit (NDEP, 1995) as a Class 1 Modification as per Appendix I to 40 Code of Federal Regulations (CFR) §270.42 (CFR, 1998).

A formal change of the compliance criteria for the Unit NTS RCRA Part B Permit (NDEP, 1995) was submitted to NDEP on October 19, 1999, requesting to reduce the monitoring period from quarterly to biannual and to remove the monthly monitoring requirement for one quarter after a precipitation event of 1 in. of rainfall in any 24-hr period or over an integrated 30-day period.

In November 2000, the NDEP granted the requested change in the monitoring period from quarterly to biannual monitoring and removed the monthly monitoring requirement for precipitation events. The changes became effective November 17, 2000, with the permit renewal.

Monitoring up to and including the October 2000 monitoring period were conducted under the provisions of the February 10, 1997, modification to the original RCRA Part B Permit. All subsequent monitoring follows the provisions of the November 2000 re-issue of the RCRA Part B Permit.

**TABLE 2 - NEUTRON ACCESS TUBES MONITORED AT THE AREA 23
HAZARDOUS WASTE LANDFILL RCRA UNIT^A**

TRENCH A	TRENCH B	TRENCH C	TRENCH S-1	TRENCH S-2
A-1	B-2	C-1	S1-2	S2-2
A-2	B-4	C-3	S1-5	S2-5
A-4	B-7	C-6	S1-8	S2-8
	B-10	C-9	S1-11	S2-11
	B-13	C-12	S1-14	S2-14
	B-16	C-15		
	B-19	C-18		
	B-22	C-21		

^A Background control well V-1 is also monitored

2.2 SITE INSPECTION COMPLIANCE CRITERIA

Visual inspections and photographs of the Area 23 Hazardous Waste Landfill RCRA Trenches are done on a quarterly basis and are reported in the annual report.

Inspections consist of the following observations:

- Condition of the gate (locked, open);
- Condition of signs (faded, missing, detached);
- Problems with fencing (breaks, needed repairs);
- Erosion of two overland flow diversion trenches;

- Condition of two covers (subsidence, erosion, excessive vegetation);
- Deterioration of the neutron access tube concrete pads, covers; and
- Unusual activity that could impact the proper operation of the covers.

2.3 SOIL MOISTURE MONITORING COMPLIANCE CRITERIA

A formal change of the compliance criteria for the Unit NTS RCRA Part B Permit was submitted to NDEP in December 1996 and was approved on February 10, 1997. The changes were incorporated into the Part B Permit (NDEP, 1995) as a Class 1 Modification as per Appendix I to 40 CFR §270.42 (CFR, 1998).

Notification to NDEP is required if RVMC above 5 percent (relative to baseline conditions) is observed and confirmed in two consecutive monitoring periods, at a point directly beneath each respective hazardous waste trench. The NDEP must be notified within seven days of determination of a valid trend. A preliminary written assessment detailing recommendations to determine the nature, cause, and action to be taken is to be submitted to NDEP for concurrence within 30 days of the notification.

Soil moisture monitoring is accomplished using a calibrated neutron tool. Thirty neutron access tubes are logged at 0.3-m (1-ft) intervals. The data are collected on a biannual basis (January and July) with an annual report issued by January 31st of the following year. Data analysis is based on the calculated residual moisture content obtained by subtracting the first-year average soil moisture content (baseline) from the soil moisture content for each monitoring period on a depth basis.

Neutron logging operations follow the guidance and notification criteria specified in the November 2000 RCRA Part B Permit, HW009, Section VII.B.1.b as follows:

“VII.B.1.b. Post-closure monitoring of the Area 23 Hazardous Waste Trenches will be conducted as follows:

- i Soil moisture monitoring shall be conducted biannually and site inspections shall be conducted quarterly.
- ii The Permittee shall obtain soil moisture data from the 30 neutron access tubes specified in Table 1, including the background control tube V-1. Tube V-1 is not subject to the notification requirements of paragraph VII.B.1.b.iv.

- iii The soil moisture data will be collected and analyzed biannually (January and July). Annual reports of post-closure monitoring shall include monthly precipitation data for the reporting period and shall be submitted to NDEP by the last day of January each reporting year.
- iv Data analysis will be based on the calculated Residual Volumetric Moisture content, obtained by subtracting the corresponding first year average (baseline) from the biannual soil moisture content value on a depth basis. Residual Volumetric Moisture Contents above five (5) percent (%) relative to baseline conditions observed and confirmed in two consecutive monitoring periods at a point directly beneath each respective hazardous waste trench 0.9 meters [three (3) ft.] from the bottom of each respective access tube access tube will require notification of the NDEP within seven (7) days of the confirmation. Events that occur as single point anomalies (at one depth) that are attributable to logging tool positioning errors will be excluded. Within thirty (30) days of the notification, a preliminary written assessment detailing recommendations to determine the nature, cause, and action will be submitted to NDEP for concurrence."

All monitoring, through October 2000, was conducted under the original provisions approved in the February 10, 1997, modification to the RCRA Part B Permit (NDEP, 1997). Monitoring for the November 2000 to July 2001 period was conducted using a biannual monitoring period and criteria specified in the November 2000 RCRA Part B Permit. (NDEP 2000).

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3.0 SITE INSPECTIONS AND ANNUAL SUBSIDENCE SURVEY

3.1 INTRODUCTION

The two covers and the surrounding area are thoroughly examined each quarter. The inspection checklists for the reporting period are found in Appendix B. Inspections consist of criteria identified in Section 2.3 of this report.

3.2 FINDINGS FROM THE QUARTERLY INSPECTIONS

3.2.1 FOURTH QUARTER INSPECTION (OCTOBER-DECEMBER 2000)

The quarterly inspection was conducted on December 27, 2000. This inspection indicated that two signs had fallen and there was minor vegetation growing along the fence of the unit and on the covers. It was recommended that the signs be rehung and the vegetation be removed.

3.2.2 FIRST QUARTER INSPECTION (JANUARY-MARCH 2001)

The quarterly inspection was conducted on March 28, 2001. This inspection indicated that identification tags at two moisture monitoring wells were missing, the outer lids on five of the wells were in place but not bolted down (though the inner covers were on the wells and properly locked), and one outer lid bolt was missing at three wells. Also, though the vegetation had been removed since the last post-closure inspection, vegetation had begun growing again along the fence to the unit and on the covers. The fallen signs noted in the last post-closure inspection had been rehung. The well lids that were not bolted down were bolted during the inspection. It was determined that the lids missing one bolt were damaged in such a way that replacing the missing bolt would not be feasible. However, though the lids are normally held on by three bolts, two bolts sufficiently secure the lid. Since the inner covers were properly installed and locked on all of the moisture monitoring wells, the integrity of the wells were never compromised. It was recommended that identification tags be installed on the two wells without tags and the vegetation be removed.

3.2.3 SECOND QUARTER INSPECTION (APRIL-JUNE 2001)

The quarterly inspection was conducted on June 18, 2001. This inspection indicated that the signs, fencing, and the site, in general, were in good condition, though two small animal burrows were backfilled during the inspection. The two moisture monitoring well identification tags that were missing had been replaced.

3.2.4 THIRD QUARTER INSPECTION (JULY-SEPTEMBER 2001)

The quarterly inspection was conducted on September 24, 2001. Vegetation had begun growing on and around the covers. It was recommended that the vegetation be removed. The signs, fencing, and the site, in general, were in good condition.

3.3 ANNUAL SUBSIDENCE SURVEY

The elevation of the subsidence markers were confirmed with an elevation survey conducted on July 17, 2000. There has been no subsidence at any of the markers since monitoring began in August 1993. The survey results are found in Table 3 and the survey plat is located in Appendix C. The subsidence monument coordinate locations are listed in Table 4.

TABLE 3 - SUBSIDENCE MONUMENT ELEVATIONS

DATE	ELEVATION TOP OF MONUMENT ¹									
	SM-1	SM-2	SM-3	SM-4	SM-5	SM-6	SM-7	SM-8	SM-9	SM-10
August 1993	3,669.17	3,666.41	3,669.31	3,660.61	3,653.32	3,658.52	3,664.49	3,665.65	3,659.41	3,654.23
August 1994	3,669.17	3,666.41	3,669.31	3,660.61	3,653.32	3,658.52	3,664.49	3,665.65	3,659.41	3,654.23
July 1995	3,669.17	3,666.41	3,669.31	3,660.61	3,653.32	3,658.52	3,664.49	3,665.65	3,659.41	3,654.23
August 1996	3,669.17	3,666.41	3,669.31	3,660.61	3,653.32	3,658.52	3,664.49	3,665.65	3,659.41	3,654.23
August 1997	3,669.17	3,666.41	3,669.31	3,660.61	3,653.32	3,658.52	3,664.49	3,665.65	3,659.41	3,654.23
August 1998	3,669.17	3,666.42	3,669.31	3,660.62	3,653.33	3,658.53	3,664.50	3,665.65	3,659.41	3,654.24
July 1999	3,669.17	3,666.41	3,669.31	3,660.62	3,653.33	3,658.53	3,664.50	3,665.66	3,659.42	3,654.24
August 2000	3,669.18	3,666.42	3,669.31	3,660.63	3,653.33	3,658.53	3,664.51	3,665.66	3,659.42	3,654.24
July 2001	3,669.17	3,666.42	3,669.31	3,660.62	3,653.33	3,658.53	3,664.50	3,665.66	3,659.42	3,654.24

¹ All elevations based on the North American Vertical Datum of 1929 in feet.

TABLE 4 - SUBSIDENCE MONUMENT COORDINATE LOCATIONS

MONUMENT NUMBER	COORDINATES ²	
	NORTHING	EASTING
SM-1	20380836.722	1832371.6774
SM-2	20380756.583	1832342.1769
SM-3	20380845.802	1832220.1677
SM-4	20380638.070	1832176.9730
SM-5	20380443.800	1832094.8852
SM-6	20380539.981	1832035.1841
SM-7	20380692.893	1832079.4908
SM-8	20380783.752	1832030.6240
SM-9	20380638.535	1831963.6795

² All coordinates based on the Nevada State Plane Grid - Central Zone - North American Datum of 1983, in feet.

4.0 SOIL MOISTURE MONITORING

4.1 INTRODUCTION

The objective of the Mercury Landfill Hazardous Waste Unit vadose zone monitoring system is to monitor the performance of the two landfill covers and provide an early warning of the potential for leachate migration from the landfill into the subsurface.

The Area 23 Landfill Hazardous Waste Trenches monitoring system uses a portable neutron moisture logging tool to determine changes in the moisture content in soils surrounding neutron access tubes that extend beneath the landfill. By monitoring changes in soil moisture content, it is possible to detect the movement of wetting and drying fronts in the soils beneath the two hazardous waste trenches. The detection of changes in soil moisture content beneath the landfill provides an early warning of the potential movement of leachate from the landfill to the surrounding environment, indicating possible failure of one or both covers.

A total of 79 neutron access tubes have been drilled at approximately 45 degree angles along the margins of the trenches (Figure 2). The access tubes extend to a point directly beneath the trenches and range in length from 11.6 m (8.2 m in vertical depth) to 31.1 m (21.9 m in vertical depth) (38 ft [27 ft vertical depth] to 102 ft [72 ft vertical depth]). The average length of the tubes is 19.8 m (14.0 m vertical depth) (65 ft [46 ft vertical depth]).

Two Campbell Pacific Nuclear Hydroprobes (Model 503DR), each containing 50 millicurie ²⁴¹americium/beryllium neutron sources, are used to obtain moisture logs in the access tubes. Each logging tool has a published range of 0-32 percent volumetric moisture content (VMC), with a precision of 0.24 percent at 24 percent VMC at a 1-minute count time (CPN, 1984).

Calibration of the neutron logging tools was done in soil pits constructed at the Area 23 Landfill. Six different soil moisture contents were used (3.4, 5.4, 7.5, 7.8, 11.2, and 12.0 percent VMC). The pits were carefully constructed to match typical near surface in-situ formation conditions and used the same neutron access tubes (approximately 12.7 cm [5 in.] outside-diameter steel ODEX 115 drill casing) as installed beneath the waste trenches.

The calibration procedure and results are discussed in the first quarterly post-closure report (DOE/NV, 1994a). Based on the results of the field calibration, the best fit linear regression equation for moisture content of the soil surrounding the neutron access tubes (percent VMC) is given by:

Meter Serial No. 1304: $\% \text{VMC} = 3.15 \times 10^{-3} \times (\text{COUNTS}) - 8.06$

Meter Serial No. 7074: $\% \text{VMC} = 4.68 \times 10^{-3} \times (\text{COUNTS}) - 8.36$

where "COUNTS" refers to the raw output from the neutron logging tool.

A coefficient of determination (r^2) of 0.98 was obtained for both linear regression calibration curves, indicating that the calibration data set and calibration model are in excellent agreement over the range of volumetric water contents represented. These logging tools can provide accurate estimates of the moisture content in typical near-surface geologic materials found at the landfill site.

The repeatability (precision) of the logging tools based on counting statistics can be determined from the approximate 95 percent confidence interval:

$$\text{Meter Serial No. 1304} = [3.15 \times 10^{-3}(\text{COUNTS}) - 8.06] \pm 6.17 \times 10^{-3} (\text{COUNTS}/k)^{0.5}$$

$$\text{Meter Serial No. 7074} = [4.68 \times 10^{-3}(\text{COUNTS}) - 8.36] \pm 9.17 \times 10^{-3} (\text{COUNTS}/k)^{0.5}$$

Where:

COUNTS are the instrument recorded and displayed value (actual count normalized to 16 sec); and

k = count time in sec divided by 16.

A 16-sec count time is used at the site resulting in a k = 1.

The calibration was conducted over the range of 3 percent to 12 percent VMC. It is valid (provides accurate moisture contents) over the range of moisture contents for soils with approximately the same mineralogy and density as the calibration soil.

Meter 7074 is no longer in use at the Area 23 Hazardous Waste Trenches after being irreparably damaged on January 28, 1997. Meter 1304 is now being used to log all Area 23 access tubes.

Soil moisture monitoring was initially done on a monthly basis for the 79 neutron access tubes over the first year of operation (DOE/NV, 1994a, b, c and 1995a). This data set represents the baseline conditions to which all subsequent data (this report) are compared. After the first year of operation, permission was granted by the NDEP to reduce the number of monitored access tubes from 79 to 30, and begin quarterly monitoring (NDEP, 1994).

4.2 OPERATING PROCEDURES

Neutron logging operations follow industry standard practices and procedures (CPN, 1984). Logging operations are conducted without a centralizer on the downhole tool as the neutron access tubes are inclined at a 45 degree angle. Field quality control operations require a daily standard count test to be run at the start and end of the day. Failure to pass this statistical test requires stopping operations, notifying the supervisor, and determining the cause.

Neutron logs are obtained by lowering the neutron tool to within 0.61 m (2 ft) of the bottom of the access tube. A count is obtained using a 16-sec count time at 0.3-m (1-ft) intervals along the length of the access tube. The data are recorded on field log sheets and stored in the data logger of the neutron probe as raw counts. The data logger is then downloaded to an office personnel computer on a daily basis where it is converted into absolute moisture content. Once the data have been converted to absolute moisture contents, they are presented as two graphs: Cumulative Residual Moisture Content (CRMC) and Baseline Difference. These graphs are discussed in Section 4.4.1 of this report.

4.3 PRECIPITATION DATA

Precipitation data were collected from the National Weather Service Nuclear Support Office's CLINET station "MER" in Mercury, Nevada. This station was relocated from its former location, approximately 1.2 km (3/4 mi) east of the Area 23 Hazardous Waste Trenches, to a location approximately 30 m (100 ft) northeast of the entrance gate. Precipitation records for this station for the period October 2000 through July 2001 are found in Appendix D and are summarized in Figure 3.

Precipitation for the period October 2000 through July 2001 was 9.42 cm (3.71 in.) (U.S. National Weather Service, 2001). The prior year annual rainfall (January 2000 through December 2000) was 10.44 cm (4.11 in.). The recorded average annual rainfall for this site from 1972 to January 2000 is 14.91 cm (5.87 in.).

Figure 3 - Precipitation Area 23 META Station

4.4 SOIL MOISTURE MONITORING RESULTS

4.4.1 DATA PRESENTATION

Due to the initial regulatory requirement to monitor underneath the trenches, and construction limitations to minimize the introduction of water through the very low-density polyethylene cover, the depth at which a tube intersects the centerline of any specific trench varies with the stand-off distance to that trench. A listing of depths can be found in Appendix A. Unless specifically stated, all depths reported here are access tube length, not vertical depth.

The CRMC graph (Figures 4-8) tracks changes over time from baseline conditions relative to the regulatory level of concern. The residual moisture content is calculated by subtracting the first-year average soil moisture content (baseline) from the soil moisture content for each monitoring period on a depth basis. The depth used is approximately 0.91 m (3 ft) from the bottom of each neutron access tube. This corresponds to the point directly beneath each hazardous waste trench and avoids geometry problems associated with the end of the access tube. This residual value is plotted as RVMC vs date for each access tube (Figures 4 through 8). The level of regulatory concern is indicated as a heavy line at the plus 5 percent residual moisture level. Values exceeding this limit for two consecutive monitoring periods require notifying the NDEP within 7 days and the submittal of an Action Plan to investigate the cause within 30 days.

A second graph, Baseline Difference (Appendix E), shows the changes occurring for one specific monitoring period along the entire length of a neutron access tube relative to baseline conditions. It is calculated by subtracting the first-year average soil moisture content (baseline) from the current soil moisture content for each monitoring period on a depth basis. The result of this subtraction is referred to as the Residual Soil Moisture Content (or Residual Moisture). The Residual Soil Moisture Content is plotted along with the actual Volumetric Soil Moisture Content of both the current and baseline data vs depth from the top of the casing. A positive residual moisture content indicates conditions at that depth and a point in time that are wetter than baseline conditions, while negative values indicate dryer conditions. Repeatability and instrumentation noise is approximately ± 1 percent RVMC. The Baseline Difference graph provides detailed information on the overall performance of the entire unit, while the Cumulative Residual graph focuses only on cumulative trends relative to the regulatory level of concern at a specific depth that are needed to make compliance decisions.

Mercury Hazardous Waste Trenches - Row A

Cumulative Residual Moisture Content Beneath Trench

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure 4 - Row A Cumulative Residual Moisture Content

Mercury Hazardous Waste Trenches - Row B **Cumulative Residual Moisture Content Beneath Trench**

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
 Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure 5 - Row B Cumulative Residual Moisture Content

Mercury Hazardous Waste Trenches - Row C

Cumulative Residual Moisture Content Beneath Trench

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure 6 - Row C Cumulative Residual Moisture Content

Mercury Hazardous Waste Trenches - Row S1 **Cumulative Residual Moisture Content Beneath Trench**

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
 Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure 7 - Row S1 Cumulative Residual Moisture Content

Mercury Hazardous Waste Trenches - Row S2 **Cumulative Residual Moisture Content Beneath Trench**

Residual Volumetric Moisture Content % = Volumetric moisture for a given date minus the baseline (first year average) volumetric moisture.
 Moisture content obtained at a point 3 feet from bottom of each access tube.

Figure 8 - Row S2, V1 Cumulative Residual Moisture Content

4.4.1.1 Discussion of Analytical Data Trends

The CRMC graphs (Figures 4 through 8) provide summary monitoring information with respect to the level of regulatory concern. Observations for each trench are provided below.

In general, most access tubes indicate stable conditions in both the near surface and extending to depth. Nearisurface changes in moisture content associated with December 2000 and January 2001 precipitation were, in general, limited to between 0.3 to 1.8 m (1 to 6 ft).

4.4.1.1.1 Hazardous Waste Trench A (Row A)

Baseline difference graphs for Tubes A-1, A-2, and A-4 in Trench A are found in Appendix E. Conditions remain dry and stable at depth for the period October 2000 through July 2001.

A near-surface wetting event, with a peak of 4 percent RVMC, is observed on Tube A-4 extending to 0.91m (3 ft) in the July data. No infiltration is noted at depth.

Tube A-2 shows a negative RVMC extending from 1 to 5 ft which may be indicative of an air gap formed between the neutron access tube and the soil interface. This effect may be caused by soil shrinkage from wetting and drying or due to settling within the annulus of the borehole.

CRMC graphs for Row A Tubes A-1, A-2, and A-4 are found in Figure 4. The vertical depth (from the original grade) beneath Trench A for Tubes A-1, A-2, and A-4 is approximately 16.8 m (55 ft).

The residual soil moisture content on Row A remains slightly below the first-year baseline conditions at less than -1 percent RVMC.

No trends are evident and conditions remain dry and stable and below the compliance criteria of 5 percent RVMC.

4.4.1.1.2 Hazardous Waste Trench B (Row B)

Baseline difference graphs for Row B Tubes are found in Appendix E.

As observed on Row A, typical minor changes in moisture content were observed in the near surface 0.305-0.914 m (1-3 ft) of the B row tubes.

Tube B-13 (and to a lesser extent Tubes B-10 and B-16) have in the past shown a progression of moisture moving down along the access tube to a depth of about 15.2 m (50 ft) where it was contained, probably due to a caliche layer. No changes are observed with depth or moisture content along these tubes over the reporting period. The peak moisture content is approximately 4.5 percent RVCM on Tube 16.

Tube B-22 shows some minor surface wetting to 1.2 m (4 feet) in the July data set.

The CRMC for Row B, Tubes B-2, B-4, B-7, B-10, B-13, B-16, B-19, and B-22 is found in Figure 5. The vertical depth (from the original grade) beneath Trench B for Tubes B-2 through B-7 varies from approximately 21.3 to 18.3 m (70 to 60 ft), while Tubes B-10 through B-22 vary between 16.8 to 15.8 m (55 to 52 ft). A listing of depths can be found in Appendix A.

Conditions remain dry and stable at depth for the period October 2000 through July 2001. At the compliance depth, all Row B access tubes remain at less than 1 percent RVMC and are well within the compliance criteria of 5 percent RVMC.

4.4.1.1.3 Hazardous Waste Trench C (Row C)

Access Tubes C-1 and C-3 are located along the northwest periphery of the cap. The remaining access Tubes C-6 through C-21 are located on and penetrate the cover. The depth of Tubes C-1 and C-3 is approximately 18.3 m (60 ft) beneath the original grade, while Tubes C-6 through C-21 are approximately 6.1 m (20 ft) beneath the original grade.

Baseline difference graphs (Appendix E) for Tubes C-1 and C-3 are similar to those of Rows A and B and other access tubes located along the periphery of the cover, and show some minor near-surface wetting and drying along the access tube.

All the access tubes on Row C indicate no changes in moisture content. Tube C-1, as noted in previous reports (DOE/NV, 1999a; 2000; 2001), had shown some infiltration down along the access tube in response to the February 1998 rainfall event. Over the October 2000 to July 2001 monitoring period, the moisture content at the 12.2-m (40-ft) depth has remained unchanged at less than 2 percent RVMC and has shown no further downward movement.

CRMC graphs for Row C, Tubes C-1, C-3, C-6, C-9, C-12, C-15, C-18, and C-21 are found in Figure 6. The CRMC at the point of compliance for all Row C tubes remains at less than 1 percent RVMC with no trends evident. Row C access tubes remain stable, dry, and below the compliance criteria of 5 percent RVMC.

4.4.1.1.4 Hazardous Waste Trench S-1 (Row S-1)

Access tubes for Row S-1 are installed on top of the cover and penetrate through it to a depth of approximately 6.1 m (20 ft) below the original ground surface.

Baseline difference graphs (Appendix E) for tubes on Row S-1 are very similar to those of Row C. Wetting can be observed in the first 0.3 to 0.6 m (1 to 2 ft) with infiltration down to 1.8 m (6 ft) where the geomembrane liner prevents any further movement. Below the liner, the tubes remain stable and dry with the residual moisture contents remaining at less than 1 percent.

With the exception of Tube S1-5, all access tubes show the typical near-surface wetting and drying in the 0.304-1.83 m (1-6 ft) depths over the course of the monitoring period. Typically, these tubes are wetter than baseline conditions above the geomembrane liner at 1.8 m (6 ft), but all are dry and stable below this point.

Tube S1-5 shows a -4 percent RVMC at 0.3 m (1 ft) which is probably indicative of an air gap that has formed beneath the wellhead protection.

No changes are noted on any of these access tubes from the previous monitoring period.

CRMC graphs for Row S-1, Tubes S1-2, S1-5, S1-8, S1-11, and S1-14 are found in Figure 7. All tubes are installed on the cover and extend through it to a vertical depth of approximately 6.1 m (20 ft) from the original ground surface.

CRMC at the point of compliance for all Row S-1 tubes (Figure 7) remains at less than 1 percent RVMC with no trends evident. Row S-1 access tubes remain stable, dry, and below the compliance criteria of 5 percent RVMC.

4.4.1.1.5 Hazardous Waste Trench S-2 (Row S-2)

Access tubes on Row S2 are located along the northwest periphery of the cover. Baseline difference graphs (Appendix E) indicate similar conditions as observed on Rows A and B with near surface wetting and drying in the upper 1.8 m (6 ft) and dry stable conditions extending to depth.

No changes are noted along these monitoring tubes from the previous monitoring period. Tubes S2- 2, S2-5, S2- 8, S2-11, and S2-14 all show dry stable conditions extending from the 1.8 m (6 ft) to depth.

The CRMC for Row S-2, Tubes S2-2, S2-5, S2-8, S2-11, and S2-14, are found in Figure 8. The vertical depths (from the original surface) beneath Trench S-2 for Tubes S2-1 through S2-5 is approximately 16.8 m (55 ft). For Tubes S2-8 to S2-14, the depth varies from 19.8 to 21.9 m (65 to 72 ft). A listing of access tube depths can be found in Appendix A.

CRMC at the point of compliance for all Row S-2 tubes remains at less than 1 percent RVMC with no trends evident. Row S-2 access tubes remain stable, dry, and below the compliance criteria of 5 percent RVMC.

4.4.1.1.6 Vertical Control Tube V-1

The Vertical Control Tube V-1 is a 15.2-m (50-ft) vertical neutron access tube located at the

north margin of the cover. Its purpose was to provide information on infiltration and evaporation sequences of the soils immediately surrounding the RCRA closure. It is used for background comparative purposes. Unfortunately, the tube was located in a slight depression that frequently filled with ponded water from runoff from the covers and a catchment area located to the north. As a result, this "control" tube represents a worse-case scenario in terms of the amount and degree of water infiltration rather than typical conditions.

Control Tube V-1 conditions are unchanged over the monitoring period, but still remain well above baseline moisture content and limit the usefulness of this access tube for its intended purpose.

The CRMC for access Tube V-1 remains below 5 percent RVMC.

5.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 SUMMARY AND CONCLUSIONS

1. Precipitation for the period October 2000 through July 2001 was 9.42 cm (3.71 in.) (U.S. National Weather Service, 2001). The prior year annual rainfall (January 2000 through December 2000) was 10.44 cm (4.11 in.). The average annual rainfall for this site from 1972 to January 2000 is 14.91 cm (5.87 in.).
2. Inspections of the cover were conducted to identify any significant changes to the unit requiring action. No significant concerns were observed.
3. An elevation survey of the subsidence markers was conducted in July 2001. There has been no subsidence at any of the markers since monitoring began eight years ago.
4. Most access tubes indicate only near-surface wetting and drying events and remain unchanged from the previous monitoring period.
5. All monitored access tubes are within the compliance criteria of less than 5 percent RVMC at the compliance point directly beneath each respective trench. Soil conditions remain dry and stable underneath the trenches.

Summary of Trench Conditions:

Trench A

CRMC at the point of compliance indicates that soil surrounding the access tubes is stable, dry, and below the compliance level of 5 percent RVMC.

Trench B

CRMC at the point of compliance for all Row B access tubes remains stable and dry, and is within the compliance criteria.

Trench C

CRMC at the point of compliance for all Row C tubes remains at less than 1 percent RVMC with no trends evident.

The Row C access tubes remain stable, dry, and below the compliance criteria of 5 percent RVMC.

Trench S-1

CRMC at the point of compliance for all Row S-1 tubes remains at less than 1 percent RVMC.

The Row S-1 access tubes remain stable, dry, and below the compliance criteria of 5 percent RVMC.

Trench S-2

CRMC at the point of compliance for all Row S-2 tubes remains at less than 1 percent RVMC with no trends evident.

The Row S-2 access tubes indicates that the soil remains stable, dry, and below the compliance criteria of 5 percent RVMC.

Control Well V-1

The Vertical Control Tube V-1 is a 15.2-m (50-ft) vertical neutron access tube located at the north margin of the cover. Its purpose was to provide information on infiltration and evaporation sequences of the soils immediately surrounding the RCRA closure. It is used for background comparative purposes. Unfortunately, the tube was located in a slight depression that frequently filled with ponded water from runoff from the covers and a catchment area located to the north. As a result, this "control" tube represents a worse-case scenario in terms of the amount and degree of water infiltration rather than typical conditions.

Conditions along this access tube are unchanged over the monitoring period, but still remain well above baseline moisture content and limit the usefulness of this access tube for its intended purpose.

The CRMC for access Tube V-1 remains below 5 percent RVMC.

5.2 FINDINGS

1. Some access tubes located along the periphery of the cover (Rows A, B, C-1 through C-4, and S-2) had shown low levels of infiltration that have occurred down along the access tubes to depth. No further movement of moisture was noted in any tube over the monitoring period.

Access tubes located on, and penetrating the cover, indicate near-surface infiltration is strictly limited to 1.83 m (6 ft) where the geomembrane liner is located. No leakage across the liner has been observed.

2. No significant concerns were observed during the site inspections over the period October 2000 to July 2001.
3. The annual subsidence survey of the two covers indicates that there has been no subsidence detected to date.
4. Soil conditions remain dry and stable beneath the trench through the October 2000 to July 2001 monitoring period.
5. Moisture contents at the point of compliance for all access tubes remain below the compliance criteria of 5 percent RVMC.

5.3 RECOMMENDATIONS

1. Continue to monitor for near-surface infiltration along the wellhead protection seals to determine that the repair work performed in 1997 has not been compromised by burrowing animals.

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6.0 REFERENCES

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Monitoring Report CAU 112
Section: APPENDIX A
Revision: 0
Date: 12/11/2001

APPENDIX A

NEUTRON ACCESS TUBE INSTALLATION SUMMARY

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APPENDIX A -- NEUTRON ACCESS TUBE INSTALLATION SUMMARY

NEUTRON ACCESS TUBE NUMBER	DRILLING COMPLETION DATE	PLANNED		AS BUILT		CALCULATED VERTICAL DEPTH ¹ (FEET)	VERTICAL POINT OF COMPLIANCE DEPTH ¹ (FEET)
		LENGTH (FEET)	ANGLE	LENGTH (FEET)	ANGLE		
V-1	5-28-93	50.0	90	50.0	90	50.0	48
A-1	5-18-93	78.0	45	78.0	45	55.1	53.0
A-2	5-19-93	80.0	45	71.5	45	50.6	48.8
A-3	5-19-93	84.0	45	84.0	45	59.4	NM ²
A-4	5-20-93	84.0	45	84.0	45	59.4	56.6
B-1	4-29-93	104.0	45	104.0	45	73.5	NM ²
B-2	4-30-93	98.0	45	98.0	45	69.3	67.2
B-3	4-30-93	92.0	45	92.0	45	65.0	NM ²
B-4	5-3-93	88.3	45	88.3	45	62.4	60.1
B-5	5-4-93	84.2	45	84.2	45	59.5	NM ²
B-6	5-4-93	84.0	45	84.0	45	59.4	NM ²
B-7	5-5-93	84.1	45	84.1	45	59.4	56.6
B-8	5-6-93	84.0	45	84.0	45	59.4	NM ²
B-9	5-7-93	79.5	45	79.5	45	56.2	NM ²
B-10	5-10-93	78.0	45	78.0	45	55.1	53.0
B-11	5-10-93	78.0	45	78.0	45	55.1	NM ²
B-12	5-11-93	79.0	45	79.0	45	55.8	NM ²
B-13	5-11-93	79.0	45	79.0	45	55.8	53.7
B-14	5-11-93	74.0	45	74.0	45	52.3	NM ²
B-15	5-12-93	74.0	45	74.0	45	52.3	NM ²
B-16	5-12-93	74.0	45	77.0	45	54.4	53.0
B-17	5-13-93	79.0	45	79.0	45	55.8	NM ²
B-18	5-13-93	79.5	45	79.5	45	56.2	NM ²
B-19	5-13-93	78.0	45	78.0	45	55.1	53.7
B-20	5-14-93	78.0	45	78.0	45	55.1	NM ²
B-21	5-14-93	79.0	45	79.0	45	55.8	NM ²
B-22	5-17-93	78.0	45	78.0	45	55.1	53.0
B-23	5-17-93	79.5	45	79.5	45	56.2	NM ²
C-1	5-26-93	88.0	45	88.0	45	62.2	60.1
C-2	5-27-93	92.0	45	75.0	45	53.0	NM ²
C-3	5-21-93	94.0	45	85.0	45	60.1	55.2
C-4	4-12-93	41.0	45	41.0	45	29.0	NM ²
C-5	4-12-93	41.0	45	41.0	45	29.0	NM ²
C-6	4-9-93	41.0	45	41.0	45	29.0	26.2
C-7	4-9-93	41.0	45	41.0	45	29.0	NM ²
C-8	4-7-93	41.0	45	41.0	45	29.0	NM ²
C-9	4-7-93	41.0	45	41.0	45	29.0	25.5
C-10	4-7-93	41.0	45	41.0	45	29.0	NM ²
C-11	4-7-93	41.0	45	41.0	45	29.0	NM ²
C-12	4-6-93	41.0	45	41.0	45	29.0	26.2
C-13	4-6-93	41.0	45	41.0	45	29.0	NM ²
C-14	4-6-93	41.0	45	41.0	45	29.0	NM ²
C-15	4-5-93	41.0	45	41.0	45	29.0	26.9
C-16	4-5-93	41.0	45	41.0	45	29.0	NM ²

APPENDIX A -- NEUTRON ACCESS TUBE INSTALLATION SUMMARY

NEUTRON ACCESS TUBE NUMBER	DRILLING COMPLETION DATE	PLANNED		AS BUILT		CALCULATED VERTICAL DEPTH ¹ (FEET)	VERTICAL POINT OF COMPLIANCE DEPTH ¹ (FEET)
		LENGTH (FEET)	ANGLE	LENGTH (FEET)	ANGLE		
C-17	4-5-93	41.0	45	41.0	45	29.0	NM ²
C-18	4-5-93	41.0	45	41.0	45	29.0	27.6
C-19	4-2-93	41.0	45	41.0	45	29.0	NM ²
C-20	4-2-93	41.0	45	41.0	45	29.0	NM ²
C-21	4-2-93	41.0	45	41.0	45	29.0	27.6
S1-1	3-25-93	41.0	45	41.0	45	29.0	NM ²
S1-2	3-25-93	41.0	45	41.0	45	29.0	27.6
S1-3	3-26-93	41.0	45	41.0	45	29.0	NM ²
S1-4	3-26-93	41.0	45	41.0	45	29.0	NM ²
S1-5	3-30-93	41.0	45	41.0	45	29.0	26.9
S1-6	3-30-93	41.0	45	41.0	45	29.0	NM ²
S1-7	3-31-93	41.0	45	41.0	45	29.0	NM ²
S1-8	3-31-93	41.0	45	41.0	45	29.0	27.6
S1-9	3-31-93	41.0	45	41.0	45	29.0	NM ²
S1-10	3-31-93	41.0	45	41.0	45	29.0	NM ²
S1-11	4-1-93	41.0	45	41.0	45	29.0	27.6
S1-12	4-1-93	41.0	45	41.0	45	29.0	NM ²
S1-13	4-1-93	41.0	45	41.0	45	29.0	NM ²
S1-14	4-1-93	41.0	45	41.0	45	29.0	26.9
S1-15	4-2-93	41.0	45	41.0	45	29.0	NM ²
S2-1	4-13-93	74.2	45	74.2	45	52.4	NM ²
S2-2	5-18-93	78.0	45	78.0	45	55.1	53.0
S2-3	4-14-93	78.0	45	78.0	45	55.1	NM ²
S2-4	4-15-93	79.0	45	79.0	45	55.8	NM ²
S2-5	4-16-93	82.2	45	82.2	45	58.1	55.2
S2-6	4-19-93	82.2	45	82.2	45	58.1	NM ²
S2-7	4-19-93	92.0	45	92.0	45	65.0	NM ²
S2-8	4-21-93	92.0	45	92.0	45	65.0	63.6
S2-9	4-21-93	93.5	45	93.5	45	66.1	NM ²
S2-10	4-22-93	96.0	45	96.0	45	67.9	NM ²
S2-11	4-22-93	97.4	45	97.4	45	68.9	66.5
S2-12	4-23-93	99.0	45	99.0	45	70.0	NM ²
S2-13	4-26-93	103.6	45	103.6	45	73.2	NM ²
S2-14	4-27-93	101.9	45	101.9	45	72.0	69.3
S2-15	4-28-93	98.2	45	98.2	45	69.4	NM ²

Note 1: Calculated depth is from existing grade prior to construction of the cover and is based upon the As-Built length of casing and angle

Note 2: NM - Not Monitored

APPENDIX B

MONTHLY INSPECTION CHECKLISTS

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AREA 23, HAZARDOUS WASTE TRENCHES POST-CLOSURE INSPECTION CHECKLIST PAGE 1 OF 3

Inspection Start Date and Time: 12/27/2000 at 11:45

Responsible Agency: Bechtel Nevada Remediation Projects

Address: Nevada Test Site, Mercury, Nevada

Responsible Agency Official: Wayne Johnson, Project Manager

Date of Last Post-Closure Inspection: 11/27/2000

Reason for Last Post-Closure Inspection: Monthly (this is first official quarterly inspection)

Chief Inspector: James Traynor Associate Scientist Environmental Restoration

Name Title Organization

Assistant Inspector: Dennis Gustafson Senior Scientist Environmental Restoration

Name Title Organization

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.
2. 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, and/or annotated site maps.
3. The site inspection is a walking inspection of the entire site (i.e., the area within the fence line around the cover), including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist. Every monument, sign, and fence section will be inspected.
4. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes, however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.

B. PREPARATION (To be completed prior to site visit)

YES

NO

EXPLANATION

1. Post-Closure Permit reviewed.

X

2. Design basis documents reviewed.

X

3. Site as-built plans and site base map reviewed.

X

4. Previous inspection reports reviewed.

X

a. Were anomalies or trends detected on previous inspections?

X

Surface water had been pooling at monitoring wells and seeping down casing of wells

b. Was maintenance performed?

X

Recontoured soil elevation at wells slightly above grade; added additional bentonite around well casings

5. Site maintenance and repair records reviewed.

X

a. Has site repair resulted in a change from as-built conditions?

X

b. Are revised as-builts available that reflect repair changes?

N/A

C. SITE INSPECTION PREPARATION

Assemble the following equipment, as needed, to conduct inspections

a. Keys to locks

b. Clipboard

c. Other miscellaneous support equipment

AREA 23, HAZARDOUS WASTE TRENCHES
POST-CLOSURE INSPECTION CHECKLIST (cont.)

YES

NO

EXPLANATION

PAGE 2 OF 3

D. SITE INSPECTION (To be completed during inspection)

1. Adjacent off-site features of Area 23 Hazardous Waste Trenches.

- a. Have there been any changes in use of adjacent area?
- b. Are there any new roads or trails?
- c. Other?

	X	
	X	
	X	

2. Access roads, fences, gates, and signs.

- a. Is there a break in the fence?
- b. Have any posts been damaged or their anchoring weakened?
- c. Does the gate show evidence of tampering or damage?
- d. Is there any evidence of human intrusion?
- e. Is there any evidence of animal intrusion/burrowing?
- f. Have any signs been damaged or removed?
(Number of signs replaced: _____)
- g. Other?

	X	
	X	
	X	
	X	
	X	
X		2 signs were fallen
	X	

3. Monuments and other permanent features

- a. Have the site markers or neutron monitoring access wells been disturbed by man or natural processes?
- b. Do natural processes threaten the integrity of any site marker or monitoring well?
- c. Are all neutron monitoring access well covers closed?
- d. Other?

	X	
	X	
X		
	X	

4. Area 23 Hazardous Waste Trenches covers and overland flow diversion trenches

- a. Is there evidence of settling?
- b. Is there evidence cracking?
- c. Is there evidence of erosion on the covers or diversion trenches (wind or water)?
- d. Is there evidence of animal burrowing?
- e. Is there vegetation growing on the cover or in the diversion trenches?
- f. Other (including trash, debris, etc. within fenced area)?

	X	
	X	
	X	
	X	
X		Minor vegetation along fence and on covers
X		Rolls of plastic stored within fence line

**AREA 23, HAZARDOUS WASTE TRENCHES
POST-CLOSURE INSPECTION CHECKLIST (cont.)**

YES

NO

EXPLANATION

PAGE 3 OF 3

E. FIELD CONCLUSIONS

1. Is there an imminent hazard to the integrity of the Area 23 Hazardous Waste Trenches Covers? (Immediate report required)

X

Person/Agency to whom report made: _____

2. Are more frequent inspections required?

X

3. Are existing maintenance/repair actions satisfactory?

X

4. Is other maintenance/repair necessary?

X

Remove vegetation and rehang fallen signs

5. Rationale for field conclusions: All observations indicate continued integrity of the cover and appurtenances.

Inspector's Conclusions: The Hazardous Waste Trenches covers, diversion trenches, fence, and signing are secure and in adequate condition. However, the minor vegetation should be removed, and the fallen signs should be rehung.

F. CERTIFICATION

I have conducted an inspection of the Area 23 Hazardous Waste Trenches Covers at the NTS in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, and field notes.

Chief Inspector's Signature

Printed Name James Traynor

Title Associate Scientist

Date 12/27/2000

AREA 23, HAZARDOUS WASTE TRENCHES POST-CLOSURE INSPECTION CHECKLIST PAGE 1 OF 3

Inspection Start Date and Time: 3/28/2001 at 1300

Responsible Agency: Bechtel Nevada Remediation Projects

Address: Nevada Test Site, Mercury, Nevada

Responsible Agency Official: Wayne Johnson, Project Manager

Date of Last Post-Closure Inspection: 12/27/2000 at 1145

Reason for Last Post-Closure Inspection: Quarterly

Chief Inspector: James Traynor

Associate Scientist

Environmental Restoration

Name

Title

Organization

Assistant Inspector:

Brad Jackson

Senior Scientist

Environmental Restoration

Name

Title

Organization

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.
2. 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, and/or annotated site maps.
3. The site inspection is a walking inspection of the entire site (i.e., the area within the fence line around the cover), including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist. Every monument, sign, and fence section will be inspected.
4. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes, however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.

B. PREPARATION (To be completed prior to site visit)

YES

NO

EXPLANATION

1. Post-Closure Permit reviewed.

X

2. Design basis documents reviewed.

X

3. Site as-built plans and site base map reviewed.

X

4. Previous inspection reports reviewed.

X

a. Were anomalies or trends detected on previous inspections?

X

Surface water had been pooling at monitoring wells and seeping down casing of wells

b. Was maintenance performed?

X

Recontoured soil elevation at wells slightly above grade; added additional bentonite around well casings

5. Site maintenance and repair records reviewed.

X

a. Has site repair resulted in a change from as-built conditions?

X

b. Are revised as-builts available that reflect repair changes?

N/A

C. SITE INSPECTION PREPARATION

Assemble the following equipment, as needed, to conduct inspections

a. Keys to locks

b. Clipboard

c. Other miscellaneous support equipment

**AREA 23, HAZARDOUS WASTE TRENCHES
POST-CLOSURE INSPECTION CHECKLIST (cont.)**

YES

NO

EXPLANATION

PAGE 2 OF 3

D. SITE INSPECTION (To be completed during inspection)

1. Adjacent off-site features of Area 23 Hazardous Waste Trenches.

- a. Have there been any changes in use of adjacent area?
- b. Are there any new roads or trails?
- c. Other?

	X	
	X	
	X	

2. Access roads, fences, gates, and signs.

- a. Is there a break in the fence?
- b. Have any posts been damaged or their anchoring weakened?
- c. Does the gate show evidence of tampering or damage?
- d. Is there any evidence of human intrusion?
- e. Is there any evidence of animal intrusion/burrowing?
- f. Have any signs been damaged or removed?
(Number of signs replaced: _____)

	X	
	X	
	X	
	X	
	X	
	X	Two fallen signs noted during last post-closure inspection have been rehung.
	X	

g. Other?

3. Monuments and other permanent features

- a. Have the site markers or neutron monitoring access wells been disturbed by man or natural processes?
- b. Do natural processes threaten the integrity of any site marker or monitoring well?
- c. Are all neutron monitoring access well covers closed?

X		Identification tags at 2 wells missing (wells B-2 and B-21)
	X	
X		Interior covers were closed and locked and outer lids were on but outer lid bolts not in place at wells A-4, B-19, B-4, B-2 and B-7. Bolts returned to outer lids during inspection.
X		One outer lid bolt missing at wells S2-1, S2-3, C-8, and C-16.

d. Other?

4. Area 23 Hazardous Waste Trenches covers and overland flow diversion trenches

- a. Is there evidence of settling?
- b. Is there evidence cracking?
- c. Is there evidence of erosion on the covers or diversion trenches (wind or water)?
- d. Is there evidence of animal burrowing?
- e. Is there vegetation growing on the cover or in the diversion trenches?
- f. Other (including trash, debris, etc. within fenced area)?

	X	
	X	
	X	
	X	
X		Minor vegetation along fence and on covers
X		Rolls of plastic stored within fence line, minor sanitary trash (trash removed during inspection)

AREA 23, HAZARDOUS WASTE TRENCHES
POST-CLOSURE INSPECTION CHECKLIST (cont.)

YES

NO

EXPLANATION

PAGE 3 OF 3

E. FIELD CONCLUSIONS

1. Is there an imminent hazard to the integrity of the Area 23 Hazardous Waste Trenches Covers? (Immediate report required)

X

Person/Agency to whom report made: _____

2. Are more frequent inspections required?

X

3. Are existing maintenance/repair actions satisfactory?

X

4. Is other maintenance/repair necessary?

X

Remove vegetation and replace identification tags.

5. Rationale for field conclusions: All observations indicate continued integrity of the cover.

Inspector's Conclusions:

The Hazardous Waste Trenches covers, diversion trenches, fence, and signing are secure and in adequate condition. Vegetation had been removed since last post-closure inspection, but minor vegetation has returned and should again be removed. The fallen signs noted in the last inspection were rehung. Identification tags should be made and installed on wells where tags are missing.

F. CERTIFICATION

I have conducted an inspection of the Area 23 Hazardous Waste Trenches Covers at the NTS in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, and field notes.

Chief Inspector's Signature

James Traynor

Printed Name James Traynor

Title Associate Scientist

Date

3/28/2001

AREA 23, HAZARDOUS WASTE TRENCHES POST-CLOSURE INSPECTION CHECKLIST PAGE 1 OF 3

Inspection Start Date and Time: 6/18/2001 at 1145

Responsible Agency: Bechtel Nevada Remediation Projects

Address: Nevada Test Site, Mercury, Nevada

Responsible Agency Official: Wayne Johnson, Project Manager

Date of Last Post-Closure Inspection: 03/28/2001 at 1145

Reason for Last Post-Closure Inspection: Quarterly

Chief Inspector: James Traynor Associate Scientist Environmental Restoration

Name

Title

Organization

Assistant Inspector:

Name

Title

Organization

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.
2. 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, and/or annotated site maps.
3. The site inspection is a walking inspection of the entire site (i.e., the area within the fence line around the cover), including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist. Every monument, sign, and fence section will be inspected.
4. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes, however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.

B. PREPARATION (To be completed prior to site visit)

YES

NO

EXPLANATION

1. Post-Closure Permit reviewed.

X

2. Design basis documents reviewed.

X

3. Site as-built plans and site base map reviewed.

X

4. Previous inspection reports reviewed.

X

a. Were anomalies or trends detected on previous inspections?

X

Surface water had been pooling at monitoring wells and seeping down casing of wells

b. Was maintenance performed?

X

Recontoured soil elevation at wells slightly above grade; added additional bentonite around well casings

5. Site maintenance and repair records reviewed.

X

a. Has site repair resulted in a change from as-built conditions?

X

b. Are revised as-builts available that reflect repair changes?

N/A

C. SITE INSPECTION PREPARATION

Assemble the following equipment, as needed, to conduct inspections

- a. Keys to locks
- b. Clipboard
- c. Other miscellaneous support equipment

**AREA 23, HAZARDOUS WASTE TRENCHES
POST-CLOSURE INSPECTION CHECKLIST (cont.)**

YES

NO

EXPLANATION

PAGE 2 OF 3

D. SITE INSPECTION (To be completed during inspection)

1. Adjacent off-site features of Area 23 Hazardous Waste Trenches.

- a. Have there been any changes in use of adjacent area?
- b. Are there any new roads or trails?
- c. Other?

	X	
	X	
	X	

2. Access roads, fences, gates, and signs.

- a. Is there a break in the fence?
- b. Have any posts been damaged or their anchoring weakened?
- c. Does the gate show evidence of tampering or damage?
- d. Is there any evidence of human intrusion?
- e. Is there any evidence of animal intrusion/burrowing?
- f. Have any signs been damaged or removed?
(Number of signs replaced: _____)
- g. Other?

	X	
	X	
	X	
	X	
	X	
	X	
	X	

3. Monuments and other permanent features

- a. Have the site markers or neutron monitoring access wells been disturbed by man or natural processes?
- b. Do natural processes threaten the integrity of any site marker or monitoring well?
- c. Are all neutron monitoring access well covers closed?
- d. Other?

	X	Identification tags at 2 wells replaced (wells B-2 and B-21)
	X	
X		
X		One outer lid bolt missing at wells S2-1, S2-3, C-8, and C-16.

4. Area 23 Hazardous Waste Trenches covers and overland flow diversion trenches

- a. Is there evidence of settling?
- b. Is there evidence cracking?
- c. Is there evidence of erosion on the covers or diversion trenches (wind or water)?
- d. Is there evidence of animal burrowing?
- e. Is there vegetation growing on the cover or in the diversion trenches?
- f. Other (including trash, debris, etc. within fenced area)?

	X	
	X	
	X	
X		Burrows at A-4 and C-16
	X	
X		Rolls of plastic stored within fence line, minor sanitary trash (trash removed during inspection)

AREA 23, HAZARDOUS WASTE TRENCHES POST-CLOSURE INSPECTION CHECKLIST (cont.)		YES	NO	EXPLANATION	PAGE 3 OF 3
E. FIELD CONCLUSIONS					
1. Is there an imminent hazard to the integrity of the Area 23 Hazardous Waste Trenches Covers? (Immediate report required)			X		
Person/Agency to whom report made: _____					
2. Are more frequent inspections required?			X		
3. Are existing maintenance/repair actions satisfactory?		X			
4. Is other maintenance/repair necessary?			X		
5. Rationale for field conclusions: <u>All observations indicate continued integrity of the cover.</u>					

Inspector's Conclusions:					
<u>The Hazardous Waste Trenches covers, diversion trenches, fence, and signing are secure and in adequate condition.</u>					

F. CERTIFICATION					
I have conducted an inspection of the Area 23 Hazardous Waste Trenches Covers at the NTS in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, and field notes.					
Chief Inspector's Signature		Printed Name James Traynor			
Title Associate Scientist		Date 6/18/01			

AREA 23, HAZARDOUS WASTE TRENCHES POST-CLOSURE INSPECTION CHECKLIST PAGE 1 OF 3

Inspection Start Date and Time: 9/24/2001 at 1600

Responsible Agency: Bechtel Nevada Remediation Projects

Address: Nevada Test Site, Mercury, Nevada

Responsible Agency Official: Wayne Johnson, Project Manager

Date of Last Post-Closure Inspection: 6/18/2001 at 1145

Reason for Last Post-Closure Inspection: Quarterly

Chief Inspector: James Traynor Associate Scientist Environmental Restoration

Name	Title	Organization
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Assistant Inspector:

Name	Title	Organization
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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.
2. 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, and/or annotated site maps.
3. The site inspection is a walking inspection of the entire site (i.e., the area within the fence line around the cover), including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist. Every monument, sign, and fence section will be inspected.
4. Field notes taken to assist in completion of this checklist will become part of the inspection record. No form is specified for field notes, however, they must be legible and in sufficient detail to enable review by succeeding inspectors and the responsible agency.

B. PREPARATION (To be completed prior to site visit)

YES	NO	EXPLANATION
-----	----	-------------

1. Post-Closure Permit reviewed.

X

2. Design basis documents reviewed.

X

3. Site as-built plans and site base map reviewed.

X

4. Previous inspection reports reviewed.

X

a. Were anomalies or trends detected on previous inspections?

X

Surface water had been pooling at monitoring wells and seeping down casing of wells.
One outer lid bolt missing at wells S2-1, S2-3, C-8, and C-16.
Rolls of plastic stored within fence.

b. Was maintenance performed?

X

Recontoured so elevation at wells slightly above grade; added additional bentonite around well casings.

5. Site maintenance and repair records reviewed.

X

a. Has site repair resulted in a change from as-built conditions?

X

b. Are revised as-builts available that reflect repair changes?

N/A

C. SITE INSPECTION PREPARATION

Assemble the following equipment, as needed, to conduct inspections

a. Keys to locks

b. Clipboard

c. Other miscellaneous support equipment

AREA 23, HAZARDOUS WASTE TRENCHES
POST-CLOSURE INSPECTION CHECKLIST (cont.)

YES

NO

EXPLANATION

PAGE 2 OF 3

D. SITE INSPECTION (To be completed during inspection)

1. Adjacent off-site features of Area 23 Hazardous Waste Trenches.

- a. Have there been any changes in use of adjacent area?
- b. Are there any new roads or trails?
- c. Other?

	X	
	X	
	X	

2. Access roads, fences, gates, and signs.

- a. Is there a break in the fence?
- b. Have any posts been damaged or their anchoring weakened?
- c. Does the gate show evidence of tampering or damage?
- d. Is there any evidence of human intrusion?
- e. Is there any evidence of animal intrusion/burrowing?
- f. Have any signs been damaged or removed?
(Number of signs replaced: _____)
- g. Other?

	X	
	X	
	X	
	X	
	X	
	X	
	X	

3. Monuments and other permanent features

- a. Have the site markers or neutron monitoring access wells been disturbed by man or natural processes?
- b. Do natural processes threaten the integrity of any site marker or monitoring well?
- c. Are all neutron monitoring access well covers closed?
- d. Other?

	X	
	X	
X		
	X	

4. Area 23 Hazardous Waste Trenches covers and overland flow diversion trenches

- a. Is there evidence of settling?
- b. Is there evidence cracking?
- c. Is there evidence of erosion on the covers or diversion trenches (wind or water)?
- d. Is there evidence of animal burrowing?
- e. Is there vegetation growing on the cover or in the diversion trenches?
- f. Other (including trash, debris, etc. within fenced area)?

	X	
	X	
	X	
	X	
X		
	X	

Vegetation on and around covers.

AREA 23, HAZARDOUS WASTE TRENCHES POST-CLOSURE INSPECTION CHECKLIST (cont.)		YES	NO	EXPLANATION	PAGE 3 OF 3
E. FIELD CONCLUSIONS					
1. Is there an imminent hazard to the integrity of the Area 23 Hazardous Waste Trenches Covers? (Immediate report required)			X		
Person/Agency to whom report made: _____					
2. Are more frequent inspections required?			X		
3. Are existing maintenance/repair actions satisfactory?		X			
4. Is other maintenance/repair necessary?			X		
5. Rationale for field conclusions: <u>All observations indicate continued integrity of the cover.</u>					

Inspector's Conclusions:					
<u>The Hazardous Waste Trenches covers, diversion trenches, fence, and signing are secure and in adequate condition.</u>					
<u>Vegetation within the fence line should be removed.</u>					

F. CERTIFICATION					
I have conducted an inspection of the Area 23 Hazardous Waste Trenches Covers at the NTS in accordance with the procedures of the Post-Closure Permit (including the Post-Closure Plan) as recorded on this checklist, attached sheets, and field notes.					
Chief Inspector's Signature		Printed Name James Traynor			
Title Associate Scientist		Date 9/24/01			

APPENDIX C

SUBSIDENCE SURVEY PLAT

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NEVADA TEST SITE SUBSIDENCE SURVEY SIXTH YEAR OF POST CLOSURE MONITORING JULY 1999		U.S. DEPARTMENT OF ENERGY NEVADA
AREA 23 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998	AREA 23 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998	AREA 23 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998 AT SURVEY DATED AUGUST 1998

NOTES:

1. THE OWNER OR OPERATOR OF THIS SITE MUST RESTRICT DISTURBANCE OF THIS HAZARDOUS WASTE DISPOSAL UNIT IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS CONTAINED IN 40 CFR, PART 264, SUBPART B.
2. ALL COORDINATES BASED ON THE NEVADA STATE PLANE GRID, CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983, FEET.
3. ALL ELEVATIONS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1929, FEET.

SURVEYORS CERTIFICATE

I, SCOTT J. ELLISON, A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE STATE OF NEVADA, DO HEREBY CERTIFY THAT THE MONUMENTS SHOWN ON THIS MAP WERE LOCATED AND SET IN THE SUBSIDENCE MONUMENT LOCATION TABLE ON JULY 2001. I AM ALSO THAT THE MONUMENTS SHOWN FOR THE DATE OF JULY 2001, ARE THE CHARACTER SHOWN AND TO ACCEPT THE POSITIONS INDICATED.

Scott J. Ellison
 SURVEYOR
 NEVADA CERTIFICATE NO. 1014

DETAIL "B"
N.T.S.

DETAIL "A"
N.T.S.

NOT FOR CONSTRUCTION

PROJECT CONTROL MONUMENTS

MON	COORDINATES	ELEV.	DATE
1	2038001.35	182754.82	7/20/01
2	2038001.35	182754.82	7/20/01
3	2038001.35	182754.82	7/20/01
4	2038001.35	182754.82	7/20/01
5	2038001.35	182754.82	7/20/01
6	2038001.35	182754.82	7/20/01
7	2038001.35	182754.82	7/20/01
8	2038001.35	182754.82	7/20/01
9	2038001.35	182754.82	7/20/01
10	2038001.35	182754.82	7/20/01

LEGEND

- SB = REVISION ACCESS TUBE ENTRANCE STRUCTURE (SEE CONSTRUCTION FOR DETAIL)
- O = MONUMENT (SEE DETAIL "A")
- A = SUBSIDENCE MONUMENT (SEE DETAIL "B")
- = PROJECT MONUMENT

MON	COORDINATES	ELEV.	DATE	MON	COORDINATES	ELEV.	DATE
1	2038001.35	182754.82	7/20/01	11	2038001.35	182754.82	7/20/01
2	2038001.35	182754.82	7/20/01	12	2038001.35	182754.82	7/20/01
3	2038001.35	182754.82	7/20/01	13	2038001.35	182754.82	7/20/01
4	2038001.35	182754.82	7/20/01	14	2038001.35	182754.82	7/20/01
5	2038001.35	182754.82	7/20/01	15	2038001.35	182754.82	7/20/01
6	2038001.35	182754.82	7/20/01	16	2038001.35	182754.82	7/20/01
7	2038001.35	182754.82	7/20/01	17	2038001.35	182754.82	7/20/01
8	2038001.35	182754.82	7/20/01	18	2038001.35	182754.82	7/20/01
9	2038001.35	182754.82	7/20/01	19	2038001.35	182754.82	7/20/01
10	2038001.35	182754.82	7/20/01	20	2038001.35	182754.82	7/20/01

APPENDIX D

PRECIPITATION RECORDS

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October 2000

ea 12 Dip Stick Rain Gage Reading:	1.32 inches of precipitation from 10/03/00 to 11/01/00.
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data Tabulated By:	Russell D. Dennis	11/06/2000
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Data Quality Control: Raymond D. Demmi 11/05/2000

Certified By:	<i>[Signature]</i>	11-06-2000
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NTS PRECIPITATION

November 2000

	A12	BJY	CS	DRA	DAF	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5																	
6																	
7	0.01																
8	0.03																
9	0.21		0.01		0.07	0.18	0.06	0.03		0.19	0.14	0.01	0.06		0.10		0.26
10	0.22	0.06	0.03	0.01	0.02	0.11		0.04		0.06	0.09	0.23	0.18		0.04		
11		0.06	0.02		0.04	0.01		0.03									0.02
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
TOTAL	0.47	0.12	0.06	0.01	0.13	0.30	0.06	0.10	0.00	0.25	0.23	0.24	0.24	0.00	0.14	0.00	0.28

Area 12 Dip Stick Rain Gage Reading: .40 inches of precipitation from 11/01/00 to 12/01/00.

Data Tabulated By:

Raymond D. Desmaris 12/04/2000

Data Quality Control:

Raymond D. Desmaris 12/04/2000

Certified By:

Raymond D. Desmaris 12-04-2000

NTS PRECIPITATION

December 2000

	A12	BJY	CS	DRA	DAF	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8													0.09				
9																	
10																	
11																	
12				T													
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
TOTAL	0.00	0.00	0.00	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00

12 Dip Stick Rain Gage Reading: 0.00 inches of precipitation from 12/01/00 to 01/02/01.

Tabulated By: *Raymond D. Dennis* 01/03/2001

Data Quality Control: *Raymond D. Dennis* 01/03/2001

Reviewed By: *Dyl. R. L.* 01/03/2001

	NTS PRECIPITATION																
	January 2001																
	A12	BJY	CS	DAF	DRA	E Tu	4JA	40 Mi	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8	0.35	0.23	0.27	0.24	0.34	0.37	0.44	0.38	0.30	0.26	0.45	0.18	0.30	0.37	0.36	0.17	0.30
9	0.01	0.04	0.01			0.02		0.02	0.05				0.03		0.03		0.04
10	0.93	0.01	0.32	0.32	T	0.31	1.02	0.42	0.31		0.83	0.14		0.43	0.83	0.05	0.25
11	0.59	0.98	1.12	0.68	0.44	1.27	0.58	0.99	0.96	0.42	0.63	0.27	1.22	0.89	0.70	1.07	1.13
12	0.06																
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24	0.31	0.04		0.03	0.03	0.33		0.11	0.18	0.02	0.06	0.27	0.11	0.04	0.24	0.06	0.01
25	0.01	0.07	0.01			0.04	0.61	0.02	0.05		0.01		0.04		0.02	0.01	
26	0.52	0.15	0.19	0.26	0.30	0.57	0.03	0.07	0.03	0.19	0.42	0.08	0.24	0.42	0.38	0.20	0.24
27	0.27	0.10	0.28		0.06	0.15		0.07	0.03	0.06	0.14	0.02	0.04	0.03	0.06	0.03	0.14
28																	
29																	
30																	
31																	
TOTAL	3.05	1.62	2.20	1.53	1.17	3.06	2.68	2.08	1.91	0.95	2.54	0.96	1.98	2.18	2.62	1.59	2.11

NOTE: Updated April 03, 2001 to include data from A12 and PM1.

Area 12 Dip Stick Rain Gage Reading: 6.80 inches of precipitation from 01/02/2001 to 04/03/2001

Data Tabulated By: *Raymond O. Dennis* 04/04/01

Data Quality Control: *Raymond O. Dennis* 04/04/01

Certified By: *Gregory A. Felt* 04-04-01

Certified By: James R. D. 14-11-01

NTS PRECIPITATION

March 2001

	A12	BJY	CS	DAF	DRA	E Tu	4JA	40 Mi	LF2	MER	MV	PM1	PHS	RV	TS2	W5B	UCC
1																	
2												0.08					
3																	
4																	
5																	
6	0.66	0.27	0.43	0.29	0.33	0.47	0.40	0.44	0.40	0.38	0.40	0.33	0.25	0.39	0.43	0.18	0.25
7					0.02												
8																	
9												0.18					
10	0.05				0.11					0.08		0.08				0.04	
11	0.12					0.05						0.08	0.03				
12	0.02																
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
TOTAL	0.85	0.27	0.43	0.29	0.46	0.52	0.40	0.44	0.40	0.46	0.40	0.75	0.28	0.39	0.43	0.22	0.25

Area 12 Dip Stick Rain Gage Reading: 6.80 inches of precipitation from 01/02/2001 to 04/03/2001

Data Tabulated By: *Raymond D. Dennis* 04/04/01

Data Quality Control: *Raymond D. Dennis* 04/04/01

Certified By: *Raymond D. Dennis* 04-04-01

[illegible]

	NTS PRECIPITATION															
	May 2001															
	A12	BJY	CS	DRA	DAF	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B UC
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12	0.09	0.05		0.05	0.05	0.10	0.04	0.02	0.05	0.03	0.08	0.10	0.06		0.05	0.04 0.05
13								0.02					0.02			
14																
15																
16			0.02	0.05			0.03	0.03	0.09			0.03		0.06		
17				0.01												
18	0.10	0.01	0.01	0.01		0.05	0.03	0.01	0.08	0.03	0.03	0.02			0.03	0.01
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21																
22																
23																
24																
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TOTAL	0.19	0.06	0.03	0.12	0.05	0.15	0.10	0.08	0.22	0.06	0.11	0.15	0.08	0.06	0.08	0.05 0.05

Area 12 Dip Stick Rain Gage Reading: 0.20 inches of precipitation from 05/01/01 to 06/01/01.

Data Tabulated By: *Raymond D. Dermis* 06/05/01

Data Quality Control: *Raymond D. Dermis* 06/05/01

Certified By: *Douglas G. Smith* 06-05-01

NTS PRECIPITATION

June 2001

	A12	BJY	CS	DRA	DAF	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UCC
1																	
2																	
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31																	
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Area 12 Dip Stick Rain Gage Reading: 0.00 inches of precipitation from 06/01/00 to 07/03/00.

Data Tabulated By: Raymond D. Dennis 07/09/01

Data Quality Control: Raymond D. Dennis 07/09/01

Certified By: Douglas P. Felt 07-07-01

NTS PRECIPITATION																	
July 2001																	
	A12	BJY	CS	DRA	DAF	E Tu	4JA	LF2	MER	MV	40 Mi	PM1	PHS	RV	TS2	W5B	UC
1																	
2	0.13	0.01	0.01	0.01	0.03	0.12	0.04		0.03				0.02				
3	0.12	0.03		T		0.06	0.01		0.01	0.02	0.01	0.02	0.01	0.01	0.01		
4	0.02	0.02	0.60	0.10	0.01	0.01	0.02	0.08	0.17	0.15	0.07	0.14		0.17	0.01	0.15	
5	0.42	0.04		0.09		0.20	0.02	0.09		0.01	0.02	0.29	0.10	0.02		0.02	0.03
6	0.22	0.05	0.05	0.10	0.03		0.57	0.25	0.15	0.05	0.28	0.66	0.11	0.32	0.02	0.07	
7				0.02			0.03	0.10	0.25	0.02	0.02	0.10		0.02			
8								0.32	0.02			0.08	0.02				
9		0.02			0.02	0.20	0.02	0.01	0.02	0.28		0.03	0.02			0.03	0.3
10												0.02					
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31																	
TOTAL	0.91	0.17	0.66	0.32	0.09	0.59	0.71	0.85	0.65	0.53	0.40	1.34	0.28	0.54	0.04	0.27	0.34

Area 12 Dip Stick Rain Gage Reading: 0.40 inches of precipitation from 07/03/00 to 08/01/00.

Data Tabulated By: *Raymond D. Dennis* 08/02/01

Data Quality Control: *Raymond D. Dennis* 08/02/01

Certified By: *Stephen A. Smith* 08-02-01

APPENDIX E

BASELINE DIFFERENCE GRAPHS

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BASELINE DIFFERENCE

ROW A

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Mercury Hazardous Waste Trenches Baseline Difference - Tube A-1

—•— January 30, 2001 —•— Baseline (1st yr. ave.) —•— Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube A-1

Mercury Hazardous Waste Trenches Baseline Difference - Tube A-2

January 30, 2001 Baseline (1st yr. ave.) Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube A-2

—♦— July 18, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube A-4

—•— January 23, 2001 —•— Baseline (1st yr. ave.) —•— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube A-4

—♦— July 19, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

BASELINE DIFFERENCE

ROW B

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Mercury Hazardous Waste Trenches

Baseline Difference - Tube B-2

—♦— January 23, 2001 —■— Baseline (1st yr. ave.) —●— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube B-2

July 19, 2001 Baseline (1st yr. ave.) Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube B-4

◆ January 23, 2001 ■ Baseline (1st yr. ave.) ● Residual from Baseline

Mercury Hazardous Waste Trenches **Baseline Difference - Tube B-4**

—♦— July 19, 2001 —■— Baseline (1st yr. ave.) —♦— Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Differenece - Tube B-7

Mercury Hazardous Waste Trenches Baseline Differencecne - Tube B-7

July 19, 2001 Baseline (1st yr. ave.) Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube B-10

Mercury Hazardous Waste Trenches

Baseline Difference -Tube B-10

Mercury Hazardous Waste Trenches

Baseline Difference - Tube B-13

--- January 24, 2001 -- Baseline (1st yr. ave.) -- Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube B-13

◆ July 18, 2001 ■ Baseline (1st yr. ave.) ● Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube B-16

—♦— January 24, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube B-16

—♦— July 18, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube B-19

—♦— January 24, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube B-19

--- July 18, 2001 --- Baseline (1st yr. ave.) --- Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube B-22

◆ January 24, 2001 ■ Baseline (1st yr. ave.) ▲ Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube B-22

◆ July 18, 2001 ■ Baseline (1st yr. ave.) ● Residual from Baseline

BASELINE DIFFERENCE

ROW C

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Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-1

—•— January 30, 2001 —■— Baseline (1st yr. ave.) - - - Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube C-1

Mercury Hazardous Waste Trenches **Baseline Difference - Tube C-3**

— January 30, 2001 — Baseline (1st yr. ave.) -- Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-3

—♦— July 19, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube C-6

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-6

—♦— July 25, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-9

—♦— January 22, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube C-9

--- July 25, 2001 --- Baseline (1st yr. ave.) --- Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-12

—♦— January 22, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-12

—♦— July 25, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-15

—♦— January 22, 2001 —■— Baseline (1st yr. ave.) —●— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-15

—♦— July 25, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-18

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-18

◆ July 25, 2001 ■ Baseline (1st yr. ave.) ● Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube C-21

Mercury Hazardous Waste Trenches

Baseline Difference - Tube C-21

—♦— July 25, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

BASELINE DIFFERENCE

ROW S1

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Mercury Hazardous Waste Trenches

Baseline Difference - Tube S1-2

—♦— January 23, 2001 —■— Baseline (1st yr. ave.) —●— Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube S1-2

◆ July 26, 2001 ■ Baseline (1st yr. ave.) ▲ Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube S1-5

Mercury Hazardous Waste Trenches **Baseline Difference - Tube S1-5**

-♦- July 26, 2001 -■- Baseline (1st yr. ave.) -♦- Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference Tube S1-8

Mercury Hazardous Waste Trenches Baseline Difference Tube S1-8

Mercury Hazardous Waste Trenches

Baseline Difference - Tube S1-11

—•— January 23, 2001 —•— Baseline (1st yr. ave.) —•— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube S1-11

—♦— July 26, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube S1-14

Mercury Hazardous Waste Trenches Baseline Difference - Tube S1-14

BASELINE DIFFERENCE

ROW S2

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Mercury Hazardous Waste Trenches Baseline Difference - Tube S2-2

Mercury Hazardous Waste Trenches

Baseline Difference - Tube S2-2

—♦— July 19, 2001 —■— Baseline (1st yr. ave.) —○— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube S2-5

Mercury Hazardous Waste Trenches Baseline Difference - Tube S2-5

Mercury Hazardous Waste Trenches

Baseline Difference - Tube S2-8

—♦— January 25, 2001 —■— Baseline (1st yr. ave.) —●— Residual from Baseline

Mercury Hazardous Waste Trenches

Baseline Difference - Tube S2-8

◆ July 25, 2001 ■ Baseline (1st yr. ave.) ● Residual from Baseline

Mercury Hazardous Waste Trenches Baseline Difference - Tube S2-11

Mercury Hazardous Waste Trenches Baseline Difference - Tube S2-11

Mercury Hazardous Waste Trenches Baseline Difference - Tube S2-14

Mercury Hazardous Waste Trenches Baseline Difference - Tube S2-14

--- July 26, 2001 --- Baseline (1st yr. ave.) --- Residual from Baseline

BASELINE DIFFERENCE

TUBE V-1

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Mercury Hazardous Waste Trenches Baseline Difference - Tube V-1

Mercury Hazardous Waste Trenches

Baseline Difference - Tube V-1

—♦— July 26, 2001 —■— Baseline (1st yr. ave.) —▲— Residual from Baseline

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