Nevada
Environmental
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Project

DOE/NV-11718-187
UC-702

Closure Report for Corrective Action Unit 404: Roller Coaster Sewage Lagoons and North Disposal Trench, Tonopah Test Range, Nevada

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Closure Report for Corrective Action Unit 404: Roller Coaster Sewage Lagoons and North Disposal Trench Tonopah Test Range, Nevada

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Bechtel Nevada
Environmental Restoration Program

September 1998

Closure Report for Corrective Action Unit 404: Roller Coaster Sewage Lagoons and North Disposal Trench Tonopah Test Range, Nevada

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ACRONYMS AND ABBREVIATIONS

CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
cm	centimeter
CR	Closure Report
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DOE	U.S. Department of Energy
DOE/NV	U.S. Department of Energy, Nevada Operations Office
EPA	U.S. Environmental Protection Agency
FFACO	Federal Facilities Agreement and Compliance Order
ft	feet
ft^3	cubic feet
in	inch
km	kilometer
kg/ha	kilograms/hectar
lb	pound
lbs/ac	pounds/acre

ACRONYMS AND ABBREVIATIONS (continued)

m	meter
m^3	cubic meter
mi	mile
NDEP	Nevada Division of Environmental Protection
NTS	Nevada Test Site
PRG	Preliminary Remediation Goal
PPE	Personnel Protective Equipment
TTR	Tonopah Test Range
USAF	United States Air Force
yd^3	cubic yard

EXECUTIVE SUMMARY

This Closure Report provides the documentation for closure of the Roller Coaster Sewage Lagoons and North Disposal Trench Corrective Action Unit (CAU) 404. CAU 404 consists of the Roller Coaster Sewage Lagoons (Corrective Action Site [CAS] TA-03-001-TA-RC) and the North Disposal Trench (CAS TA-21-001-TA-RC). The site is located on the Tonopah Test Range, approximately 225 kilometers (km) (140 miles [mi]) northwest of Las Vegas, Nevada.

The sewage lagoons received liquid sanitary waste from the Operation Roller Coaster Man Camp in 1963 and debris from subsequent range and construction cleanup activities. The debris and ordnance was subsequently removed and properly disposed; however, pesticides were detected in soil samples from the bottom of the lagoons above the U.S. Environmental Protection Agency Region IX Preliminary Remediation Goals (EPA, 1996).

The North Disposal Trench was excavated in 1963. Debris from the man camp and subsequent range and construction cleanup activities was placed in the trench. Investigation results indicated that no constituents of concern were detected in soil samples collected from the trench.

Remedial alternative proposed in the Corrective Action Decision Document (CADD) for the site was "Covering" (DOE, 1997a). The Nevada Division of Environmental Protection (NDEP)-approved Correction Action Plan (CAP) proposed the "Covering" methodology (1997b). The closure activities were completed in accordance with the approved CAP and consisted of backfilling the sewage lagoons and disposal trench, constructing/planting an engineered/ vegetative cover in the area of the sewage lagoons and disposal trench, installing a perimeter fence and signs, implementing restrictions on future use, and preparing a Post-Closure Monitoring Plan.

Since closure activities for CAU 404 have been completed in accordance with the Nevada Division of Environmental Protection-approved CAP (DOE, 1997b) as documented in this Closure Report, the U.S. Department of Energy, Nevada Operations Office (DOE/NV) requests:

- CAU 404 be moved from Appendix III to Appendix IV of the Federal Facility Agreement and Consent Order.
- NDEP provide a Notice of Completion to the DOE/NV.

1.0 INTRODUCTION

The U.S. Department of Energy, Nevada Operations Office (DOE/NV) operates the Nevada Test Site (NTS) and entered into a trilateral agreement with the state of Nevada and the U.S. Department of Defense, Defense Special Weapons Agency. The trilateral agreement, which is entitled the Federal Facilities Agreement and Consent Order (FFACO), provides a framework for identifying, characterizing, remediating, and closing DOE/NV environmental sites in Nevada (NDEP, 1996). Corrective Action Units (CAUs) have been identified in the FFACO at the Tonopah Test Range (TTR) which is currently operated by the DOE/Albuquerque Operations Office and U.S. Air Force (USAF).

This Closure Report (CR) provides documentation for the closure of the Roller Coaster Sewage Lagoons and North Disposal Trench Corrective Action Unit (CAU) 404. The site is located on the TTR, approximately 225 kilometers (km) (140 miles [mi]) northwest of Las Vegas, Nevada. See Figure 1 for the site location. CAU 404 consists of two Corrective Action Sites (CASs): the Roller Coaster Sewage Lagoons (CAS TA-03-001-TA-RC) and the North Disposal Trench (CAS TA-21-001-TA-RC). A site map of the sewage lagoons and trench is provided in Figure 2.

The Roller Coaster Sewage Lagoons CAS is comprised of two unlined lagoons (East and West Sewage Lagoons) that received liquid sanitary waste in 1963 from the Operation Roller Coaster Man Camp and debris from subsequent construction and range cleanup activities (DOE, 1997a). Each lagoon is approximately 36 meters (m) (120 feet [ft]) long by 23 m (75 ft) wide by 3 m (10 ft) deep.

The North Disposal Trench was excavated in approximately 1963 and received solid waste and debris from the man camp and subsequent construction and range cleanup activities (DOE, 1997a). The North Disposal Trench is approximately 30 m (100 ft) long by 4 m (12 ft) wide by 3 m (10 ft) deep.

Detailed information of the site history and results of the investigation activities can be found in the Voluntary Corrective Action Plan for Ordnance Removal (DOE, 1995), Corrective Action Investigation Plan (CAIP) (DOE, 1996), and the Corrective Action Decision Document (CADD) (DOE, 1997a).

Site investigation results indicated the following:

- Pesticides (Dichlorodiphenyldichloroethane [DDD], Dichlorodiphenyldichloroethylene [DDE], and Dichlorodiphenyltrichloroethane [DDT]) were detected above the U.S. Environmental Protection Agency (EPA) Region IX Preliminary Remediation Goals (PRGs) (EPA, 1996) for samples collected in the East and West Sewage Lagoons.
- No other constituents were detected above regulatory levels in the sewage lagoons.
- No constituents were detected above regulatory levels in the North Disposal Trench.

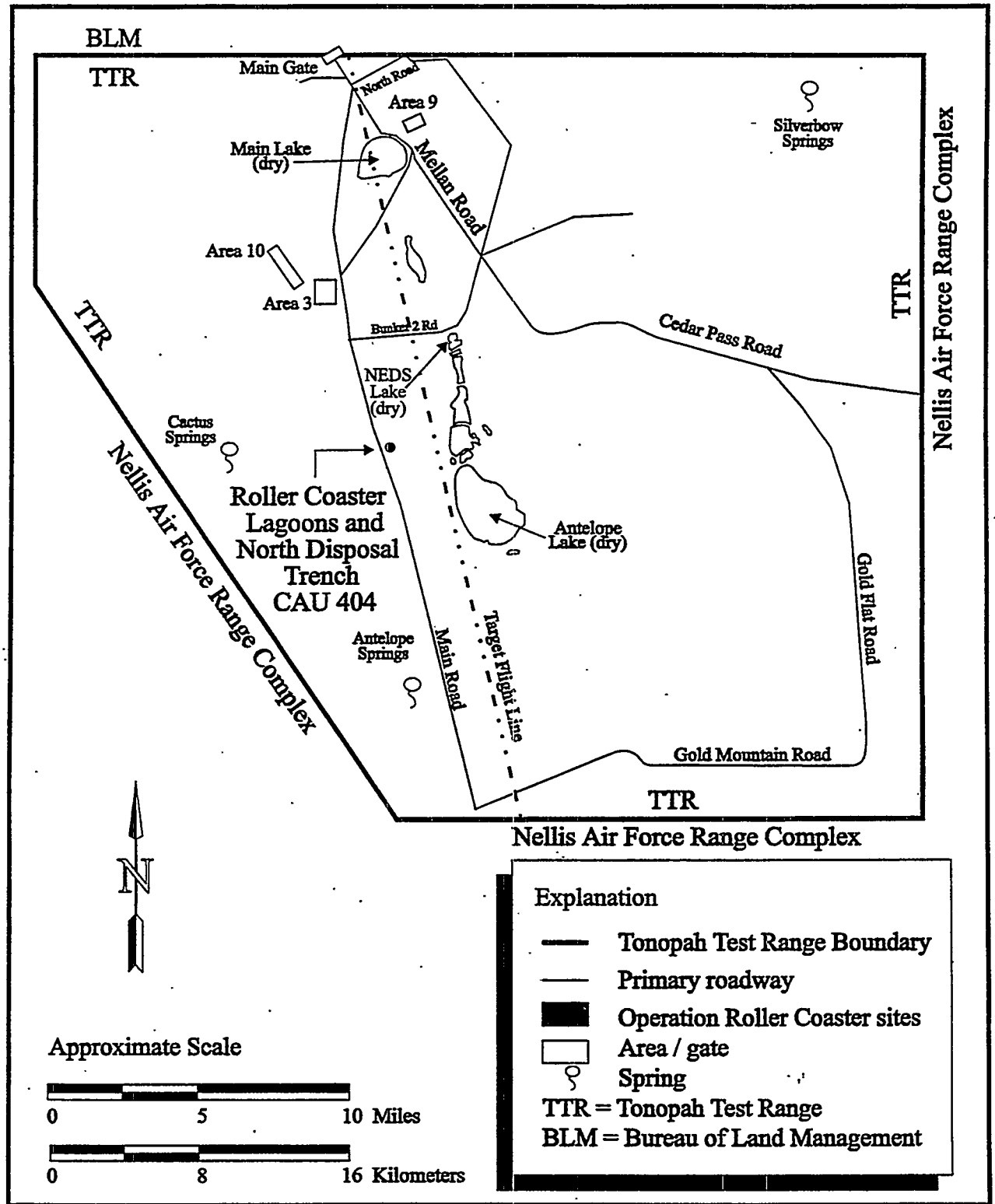


FIGURE 1
LOCATION OF ROLLER COASTER SEWAGE LAGOONS AND NORTH DISPOSAL TRENCH

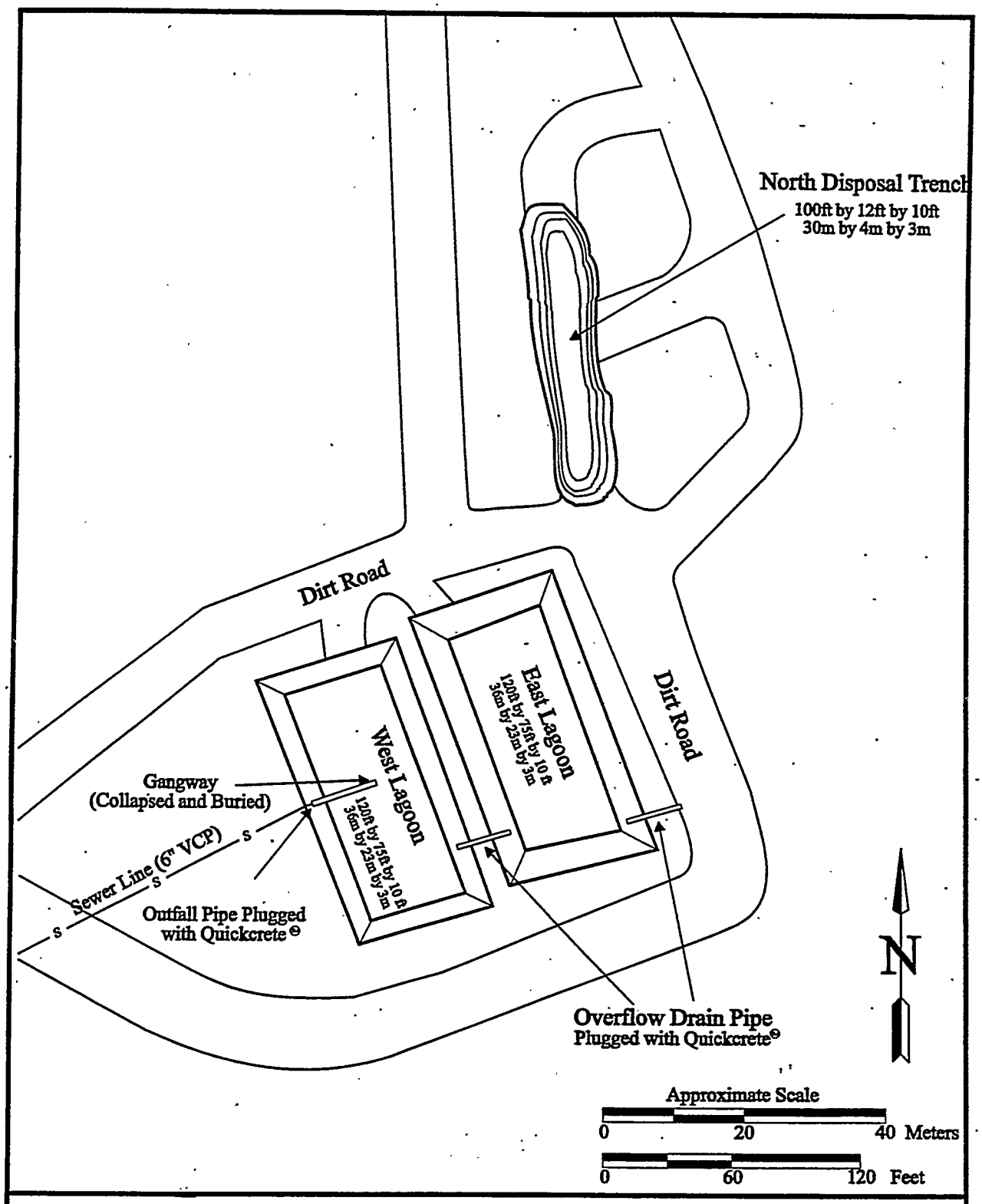


FIGURE 2
SITE MAP FOR ROLLER COASTER SEWAGE LAGOONS AND NORTH DISPOSAL TRENCH

Remedial alternatives were proposed in the CADD based upon the results of the investigation activities. The proposed remedial alternatives were "No Action, Access Restrictions, Excavation and Covering, and Covering". The Nevada Division of Environmental Protection (NDEP) approved-CADD identified "Covering" as the selected remedial alternative. The "Covering" alternative was proposed to consist of the construction of a vegetative, engineered cover, installation of a fence, and restrictions on future use (DOE, 1997a).

DOE/NV expedited the closure schedule in Fiscal Year 1997 and proposed the closure methodology for the selected remedial alternative in the Corrective Action Plan (CAP) on July 23, 1997 (DOE, 1997b). The NDEP provided an expedited review and approved the proposed activities in the CAP on July 31, 1997 (NDEP, 1997).

Field closure activities began on September 8, 1997, and were completed on September 27, 1997. Revegetation activities began on October 23, 1997, and were completed on October 30, 1997.

1.1 PURPOSE

The purpose of this CR is to:

- Document the closure activities and provide the information collected as proposed in the CAP (DOE, 1997b).
- Obtain a Notice of Completion from the NDEP.
- Recommend the movement of CAU 404 from Appendix III to Appendix IV of the FFACO.

1.2 SCOPE

The following is the scope of the closure actions implemented for CAU 404:

- Install an engineered cover over the East and West Sewage Lagoons.
- Backfill the North Disposal Trench.
- Plant native shallow rooted plants/grasses on the engineered cover over the East and West Sewage Lagoons and the backfilled area of the North Disposal Trench.
- Install a fence with signs in the areas of the East and West Sewage Lagoons and North Disposal Trench.
- Coordinate closure of the site with the USAF because of the location of the site and use status.

- Provide documentation (this report) of remedial activities and a Post-Closure Monitoring Plan and proposing closure of CAU 404.

1.3 CLOSURE REPORT CONTENTS

This CR is divided into the following sections:

- Section 1.0 - Introduction: Site background, purpose, scope, and report contents
- Section 2.0 - Closure Activities: Corrective action activities, deviations from the CAP as approved, corrective action schedule as completed, and site plan
- Section 3.0 - Waste Disposition
- Section 4.0 - Closure Verification Results
- Section 5.0 - Post-Closure Monitoring Plan
- Section 6.0 - Conclusions and Recommendations
- Section 7.0 - References
- Appendix A - Engineering Drawings
- Appendix B - Geotechnical Test Results
- Appendix C - Use Restriction Documentation
- Appendix D - Post-Closure Monitoring Checklist

This report was developed using information and guidance from the following documents:

- Corrective Action Investigation Plan: Roller Coaster Sewage Lagoons and North Disposal Trench, Tonopah Test Range, Rev.1, DOE, 1996.
- Corrective Action Decision Document For the Roller Coaster Lagoons and North Disposal Trench, DOE, 1997a.
- Corrective Action Plan For CAU 404: Roller Coaster Sewage Lagoons And North Disposal Trench, Tonopah Test Range, DOE, 1997b.
- Nevada Environmental Restoration Project, Health and Safety Plan, DOE, 1996.
- Nevada Environmental Restoration Project, Industrial Sites, Quality Assurance Project Plan, Nevada Test Site, Revision 1, DOE, 1996.
- Nevada Environmental Restoration Project, Project Management Plan, Revision 0, DOE, 1994.
- Tonopah Test Range Closure Sites REVEGETATION Plan, DOE, 1997.

2.0 CLOSURE ACTIVITIES

This section of the CR details the specific activities involved in the closure of the Roller Coaster Sewage Lagoons (CAS TA-03-001-TA-RC) and North Disposal Trench (CAS TA-21-001-TA-RC). This section also includes the rationale for deviations from the approved CAP (DOE, 1997b) and a detailed schedule of site activities as completed.

2.1 DESCRIPTION OF CORRECTIVE ACTION ACTIVITIES

Prior to implementing field closure activities, soil samples were collected for geotechnical testing from the borrow pit located approximately 7 km (4.3 mi) north of the site and a soil stockpile adjacent to the North Disposal Trench (see Engineering Drawings in Appendix A for locations of borrow pit and site soil stockpile). The soil stockpile was generated from the excavation of the North Disposal Trench and is considered to be representative of the soil at the site. The soil samples were collected to determine:

- If size reduction of the borrow pit soil would be required in the top 0.3 m (1 ft) to 0.6 m (2 ft) of the vegetative covers.
- The maximum density (ASTM, 1997a [modified proctor test]) for compaction testing in the areas of the sewage lagoons and North Disposal Trench.

The soil samples from the borrow pit and stockpile on the site were observed by the site geologist to be similar and were confirmed to be similar based upon the sieve analysis (ASTM, 1997b) of the samples (Appendix B). The samples were determined to be a silty sand with gravel. Since the borrow and site soil were similar, size reduction of the borrow material was not required for the vegetative covers. Geotechnical test results are discussed in Sections 4.0, 4.1, 4.2, and 4.3.

Belly dump trucks were used to transport the soil to the site from the borrow pit. Approximately 7,029 cubic meters (m^3) (9,200 cubic yards [yd^3]) of soil were transported to the site for backfilling and construction of engineered covers. Water for dust suppression and construction activities was obtained from the Roller Coaster Well located approximately 0.6 km (0.4 mi) west of the site (see Appendix A for location of the well). Water was introduced to and mixed with the soil at the borrow pit as dust control. Approximately 2,216,118 liters (585,500 gallons) of water was used for soil preparation and dust suppression activities. Compaction of the soil at the site was conducted using a grader, sheeps foot compactor, and traffic from the belly dump trucks. Compaction results are discussed in Sections 4.1, 4.2, and 4.3.

Diversion channels were constructed by excavating the existing soil to channel precipitation run-off away from the site and limit precipitation run-on to the site (Appendix A).

2.1.1 Roller Coaster Sewage Lagoons

The first lift of soil placed in the East and West Sewage Lagoons was conducted without construction equipment or personnel being in direct contact with the existing impacted soil. The backfill material was placed in the East and West Sewage Lagoons from the north side and pushed ahead of the sheeps foot compactor. The bottom lift of material was approximately 0.3 m (1 ft) thick. This activity resulted in the elimination of wastes from personnel, personnel protective equipment (PPE), and equipment decontamination. The gangway was collapsed and pressed into the existing surface of the bottom of the west sewage lagoon with a sheeps foot compactor after sufficient soil was placed in the first lift to provide access to the gangway without contacting the impacted soils. The first lift also covered the gangway.

After placement of the bottom lift of soil into the lagoons, the 15 centimeter (cm) (6 inch [in]) vitrified clay overflow drain pipes and steel outfall pipe were plugged with Quickcrete™ (a fast-setting and slightly expansive cement) to remove the potential of liquids being introduced to the site after closure. The locations of the overflow drain pipes and outfall pipe can be found in Figure 2.

The backfill was compacted to minimize subsidence and decrease the permeability of the backfill relative to the native, undisturbed soils as required in the CAP (DOE, 1997b). Density (compaction) tests (ASTM, 1995c [nuclear density tests]) were conducted in the bottom 0.3 m to 0.5 m (1.0 ft to 1.5 ft) horizon of compacted fill in the East and West Sewage Lagoons (see Sections 4.1, 4.2, and 4.3 for information regarding the compaction test results). A field performance specification was established to meet the 80 percent of the maximum density (ASTM, 1995a [modified proctor test]) requirement proposed in the CAP (DOE, 1997b). The field performance specification consisted of traffic from the belly dump trucks and two compaction passes using the rubber tires on the grader to exceed the 80 percent maximum density requirement.

After the field performance specification was established, additional fill was added in approximate 0.2 m (8 in) lifts and compacted in accordance with the field performance specification. No changes were made to the fill and compaction activities after establishment of the field performance specification; therefore, additional density tests (beyond those proposed in the CAP) were not required.

Density tests were also conducted in the layer of backfilled soil approximately 0.3 m to 0.5 m (1.0 ft to 1.5 ft) below the final grade in each of the fill areas to confirm compliance with the 80 percent compaction requirement (see Sections 4.1, 4.2, and 4.3 for information regarding the compaction test results).

Upon completion of the compaction tests in the cap area, approximately 0.3 m to 0.5 m (1.0 ft to 1.5 ft) of fill was placed over the cap surface for preparation of the vegetative cover (Section 2.1.4).

2.1.2 North Disposal Trench

Fill, compaction, and testing activities were similarly executed as in the East and West Sewage Lagoon areas. Since no impacted material was detected in the North Disposal Trench (DOE, 1997a), equipment and personnel were allowed direct contact with soil in the bottom of the trench. Density tests were conducted in the bottom 0.3 m (1 ft) fill horizon and approximately 0.3 m to 0.5 m (1.0 ft to 1.5 ft) below the surface as specified in the approved CAP (DOE, 1997b). The performance standard developed for the East and West Sewage Lagoon areas was used at the North Disposal Trench (see Section 2.1.1 for the field performance specification and Section 4.3 for compaction results). No changes were made to the fill and compaction activities after establishment of the field performance specification; therefore, additional density tests (beyond those proposed in the CAP) were not required.

Upon completion of the density tests in the fill area, approximately 0.3 m to 0.5 m (1.0 ft to 1.5 ft) of fill was placed over the cap surface for preparation of the vegetative cover.

2.1.3 Installation of Fence and Signs

To allow native plant species to establish and develop and inhibit unauthorized excavation into the cover, a three-strand barbed wire fence with a woven wire mesh (2.5 cm [1 in] weave) base was installed at the perimeter of the site. The woven wire mesh is approximately 0.6 m (2 ft) tall. The location of the fence can be found in Appendix A. Signs were posted near the corners and center area of each side of the fence indicating "Vegetation Area, No Excavation."

2.1.4 Vegetative Cover

After the density tests were conducted 0.3 m to 0.5 m (1.0 ft to 1.5 ft) below the final grade in the areas of the East and West Sewage Lagoons and North Disposal Trench, the soil for the vegetative cover (0.3 m to 0.5 m [1.0 ft to 1.5 ft]) was placed and loosely compacted.

Surface preparation for planting consisted of ripping the cover areas and area within the fence with a grader to an approximate depth of 0.4 m (1.3 ft) and harrowing with a spring-tooth harrow. The schedule of vegetative cover construction and planting activities can be found in Section 2.3.

Polyacrylamide gel was applied at the same time as seeding at an approximate rate of 22 kilograms per hectar (kg/ha) (20 pounds per acre [lbs/ac]) to assist in the retention of soil moisture for seed germination and plant development. The seed mixture (Table 1) was planted in October to ensure dormancy breaking requirements would be met, and that the seed would be in the ground prior to the winter precipitation. After the seeds were planted, straw was broadcast on the site at an approximate rate of 4,500 kg/ha (4,000 lbs/ac) with a straw blower. The straw was subsequently punched into the soil with a tractor-drawn disk crimper. The straw is used as a

mulch to add organic matter to the soil and is a barrier to reduce wind and water erosion.

TABLE 1 - SEED MIX FOR REVEGETATION OF CAU 404

COMMON NAME	SCIENTIFIC NAME	PERCENTAGE OF MIX kg/ha (lbs/ac)
Budsage	*Artemisia spinescens*	0.5 (0.4)
Shadscale	*Atriplex confertifolia*	17.2 (15.4)
Winterfat	*Ceratoides lanata*	14.8 (13.2)
Fourwing Saltbush	*Atriplex canescens*	3.1 (2.8)
Galleta	*Hilaria jamesii*	7.4 (6.6)
Indian Ricegrass	*Oryzopsis hymenoides*	4.9 (4.4)
Bottlebrush Squirreltail	*Sitanion hystrix*	3.5 (3.1)
Desert Globemallow	*Sphaeralcea ambigua*	0.4 (0.3)

2.2 DEVIATIONS FROM CORRECTIVE ACTION PLAN AS APPROVED

The following deviations from the approved CAP (DOE, 1997b) were implemented:

- Six compaction tests were proposed to be conducted in the bottom fill horizon (0.3 m [1 ft]) and the top fill horizon of the engineered cover (approximately 0.3 to 0.5 m [1.0 to 1.5 ft] below the surface of the vegetative cover) for a total of 12 tests in the area of each lagoon (Section 2.2 of the approved CAP) (DOE, 1997b). Additional compaction tests were conducted in the fill horizons for each lagoon to confirm the consistency of the field performance specification (see Section 4.1 and 4.2 for the discussion regarding the results of the additional tests).

- Observation of the site soil and borrow pit soil was proposed to be made by the site geologist to determine if size reduction of the borrow pit soil would be required in the vegetative cover horizon (see Section 2.1.1 of the approved CAP [DOE, 1997b]). Sieve analyses (ASTM 1997b) were conducted on the soil samples collected from the borrow pit and site soil stockpile adjacent to the North Disposal Trench to confirm observations made by the site geologist regarding the soil type and similarities between the site soil and the soil from the borrow pit (see Sections 2.1 and 4.0 for the discussion regarding the results of the sieve analyses).

2.3 CORRECTIVE ACTION SCHEDULE AS COMPLETED

The corrective action activities were completed in a timely manner. Soil samples for geotechnical testing were collected from the borrow pit and site stockpile on August 11, 1997, and August 22, 1997, respectively. Backfill of the sewage lagoons and disposal trench began on September 8, 1997. Completion of backfilling of the sewage lagoons and disposal trench to existing site grade was completed on September 12 and 20, 1997, respectively. Construction of the engineered cover began at the completion of backfilling activities and was completed on September 24, 1997, after the As-Built surveying. Construction of the fence was completed on September 27, 1997. Revegetation activities began on October 23, 1997, and were completed on October 30, 1997. A detailed schedule of the project activities as completed can be found in Figure 3.

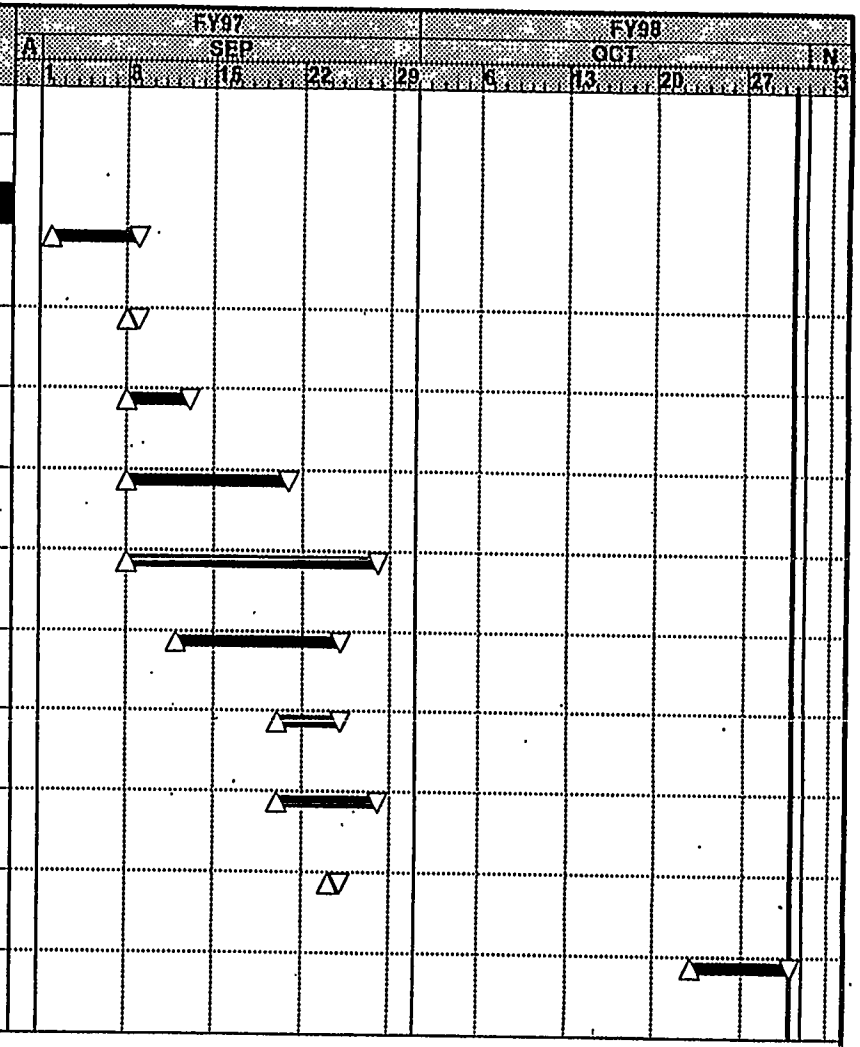
2.4 SITE PLAN/SURVEY PLAT

Figure 1 provides the location of CAU 404, and Figure 2 is the site map. As-Built engineering drawings can be found in Appendix A.

Roller Coaster Sewage Lagoons & North Disposal Trench Closure

CAU 404

Activity ID	Activity Description	Actual Start	Actual Finish
10	Mobilize to site (construction)	02SEP97	08SEP97
20	Establish field performance specifications	08SEP97	08SEP97
30	Backfill sewage lagoons to existing grade	08SEP97	12SEP97
40	Backfill North Disposal Trench to existing grade	08SEP97	20SEP97
50	Construct fence	08SEP97	27SEP97
60	Construct Sewage Lagoons engineered cover	12SEP97	24SEP97
70	Prepare vegetative cover for disking & planting	20SEP97	24SEP97
80	Demobilize from site (construction)	20SEP97	27SEP97
90	Survey for "as-built" drawings	24SEP97	24SEP97
100	Disk & plant revegetation (includes mobe/demobe)	23OCT97	30OCT97



Project Start 25AUG97
Project Finish 30OCT97
Data Date 31OCT97
Run Date 29DEC97

Early Bar
Progress Bar
Critical Activity

© Primavera Systems, Inc

ROLL

Sheet 1 of 1

Figure 3
Corrective Action Schedule
As Completed

3.0 WASTE DISPOSITION

Only minor construction debris was generated at the site from the fencing activities. The construction debris consisted of paper, plastic, wire, and wood (less than 0.1 m^3-[5 cubic feet (ft^3)]). The construction debris was disposed in the TTR USAF landfill by Kirk-Myer, Inc. Services.

Decontamination wastes were not generated at the site since backfilling of the lagoons was completed without construction equipment, personnel, or PPE in direct contact with the existing impacted soil. See Section 2.1.1 for a description of the soil placement activities in the sewage lagoons.

4.0 CLOSURE VERIFICATION RESULTS

Maximum density tests (ASTM, 1997a) and sieve analyses (ASTM, 1997b) were conducted on samples collected from the borrow pit and the soil stockpile adjacent to the North Disposal Trench. The borrow pit soil maximum density was 1,970 kg/m^3 (123.0 lb/ft^3), and the site soil stockpile was 2,026 kg/m^3 (126.5 lb/ft^3). The maximum density was used to determine the percent compaction from the field density tests (ASTM, 1997c [nuclear density testing]). Compaction tests (ASTM, 1997c) were not conducted in the soils from the site stockpile as it was used in the vegetative cover for the North Disposal Trench rather than the compacted fill. Geotechnical test results can be found in Appendix B.

Through observations by the site geologist and sieve analyses, the borrow pit and site soil were determined to be a silty sand with gravel. Since the soils were similar, size reduction was not required in the soil used for the vegetative cover.

The proposed compaction requirement for the engineered cover backfill and fill was a minimum of 80 percent of the maximum density (DOE, 1997b). Field density tests in the bottom fill horizon were used to develop a field performance standard for compaction. The surface of the fill horizon tested was 0.3 m to 0.5 m [1.0 ft to 1.5 ft] above the bottom of the existing sewage lagoons and disposal trench. The field performance standard consisted of traffic from the belly dump trucks and two compaction passes using the rubber tires of the grader. To confirm that the 80 percent compaction requirement was satisfied in the fill areas (East and West Sewage Lagoons and North Disposal Trench), compaction tests were conducted in the bottom fill horizon and the horizon below the vegetative cover (approximately 0.3 m to 0.5 m [1.0 to 1.5 ft] below the surface). Density test results are discussed in Sections 4.1 and 4.2 for the East and West Sewage Lagoons and in Section 4.3 for the North Disposal Trench.

After establishment of the field performance specification, additional fill was added in approximate 0.2 m (8 in) lifts and compacted. No modifications were made to the fill and compaction activities; therefore, additional tests were not required other than the proposed tests.

As-built surveying of the surface of the vegetative cover areas was completed and indicated that the covers were constructed as proposed in the approved CAP (DOE, 1997b).

4.1 EAST SEWAGE LAGOON COMPACTION TESTS

Compaction test results for the East Sewage Lagoon are summarized in Table 2 and presented in Appendix B. The compaction test locations can also be found in Appendix B.

Six 20 cm (8 in) deep density tests were conducted in the bottom fill horizon of the East Sewage Lagoon to confirm the field performance standard would meet the 80 percent compaction

requirement. The results exceeded the 80 percent requirement and ranged from 91.9 to 97.2 percent compaction.

Even though not required, three additional tests were conducted in the East Sewage Lagoon after an additional 20 cm (8 in) lift of soil was placed and compacted using the established field performance standard. The additional tests were used to confirm the bottom lift of soil was compacted sufficiently to maintain compliance with 80 percent compaction requirement. The results for the additional three 10 cm (4 in) deep tests also exceeded the 80 percent compaction requirement and ranged from 92.2 to 94.1 percent compaction.

Six 30 cm (12 in) density tests were conducted in the top of the fill horizon for the engineered cover. The top of the compacted engineered cover is approximately 0.3 m to 0.5 m (1.0 ft to 1.5 ft) below the vegetative surface. The results exceeded the 80 percent requirement and ranged from 93.7 to 96.2 percent compaction. Even though not required, one additional test was conducted 0.3 m (1 ft) below the top of the compacted fill horizon to confirm conformance to the 80 percent compaction requirement. The result for the additional test exceeded the 80 percent compaction requirement (87.7 percent compaction).

4.2 WEST SEWAGE LAGOON COMPACTION TESTS

Compaction test results for the West Sewage Lagoon are summarized in Table 2 and presented in Appendix B. The compaction test locations can also be found in Appendix B.

Six 20 cm (8 in) deep density tests were conducted in the bottom fill horizon of the West Sewage Lagoon to confirm the field performance standard would meet the 80 percent compaction requirement. The results exceeded the compaction requirement and ranged from 89.3 to 97.8 percent compaction.

Even though not required, three additional tests were conducted after approximately 20 cm (8 in) of soil was placed and compacted over the bottom fill horizon using the established field performance standard. The additional tests were used to confirm the bottom lift of soil was compacted sufficiently to maintain compliance with 80 percent compaction requirement. The results for the additional three 15 cm (6 in) deep tests also exceeded the 80 percent compaction requirement and ranged from 95.2 to 96.3 percent compaction.

Six 30 cm (12 in) density tests were conducted in the top of the fill horizon for the engineered cover. The top of the compacted engineered cover is approximately 0.3 m to 0.5 m (1.0 ft to 1.5 ft) below the vegetative surface. The results exceeded the compaction requirement and ranged from 91.4 to 96.2 percent compaction. Even though not required, two additional tests were conducted 0.3 m (1 ft) below the top of the compacted fill horizon to confirm conformance to the

TABLE 2 - EAST AND WEST SEWAGE LAGOONS COMPACTION TEST RESULTS

EAST SEWAGE LAGOON					WEST SEWAGE LAGOON				
TEST LOCATION	LAB NUMBER	FILL HORIZON	TEST DEPTH	PERCENT COMPACTION	TEST LOCATION	LAB NUMBER	FILL HORIZON	TEST DEPTH	PERCENT COMPACTION
1	811	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	97.2	1	820	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	89.3
2	812	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	94.6	2	821	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	97.8
3	813	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	95.6	3	822	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	90.4
4	814	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	92.3	4	823	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	94.1
5	815	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	91.9	5	824	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	93.9
6	816	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	93.7	6	825	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	94.8
7	817	Bottom 0.4 m (1.3 ft)	10 cm (4 in)	93.3	7	826	Bottom 0.4 m (1.5 ft)	15 cm (6 in)	96.3
8	818	Bottom 0.4 m (1.3 ft)	10 cm (4 in)	94.1	8	827	Bottom 0.4 m (1.5 ft)	15 cm (6 in)	95.5
9	819	Bottom 0.4 m (1.3 ft)	10 cm (4 in)	92.2	9	828	Bottom 0.4 m (1.5 ft)	15 cm (6 in)	95.2
1	860	Top of Fill	30 cm (12 in)	96.2	1	854	Top of Fill	30 cm (12 in)	93.1

EAST SEWAGE LAGOON					WEST SEWAGE LAGOON				
TEST LOCATION	LAB NUMBER	FILL HORIZON	TEST DEPTH	PERCENT COMPACTION	TEST LOCATION	LAB NUMBER	FILL HORIZON	TEST DEPTH	PERCENT COMPACTION
2	861	Top of Fill	30 cm (12 in)	95.6	2	855	Top of Fill	30 cm (12 in)	96.2
3	862	Top of Fill	30 cm (12 in)	95.3	3	856	Top of Fill	30 cm (12 in)	95.0
4	863	Top of Fill	30 cm (12 in)	93.8	4	857	Top of Fill	30 cm (12 in)	95.5
5	864	Top of Fill	30 cm (12 in)	93.7	5	858	Top of Fill	30 cm (12 in)	91.4
6	865	Top of Fill	30 cm (12 in)	95.8	6	859	Top of Fill	30 cm (12 in)	95.1
2	867	30 cm (12 in) Below Top of Fill	30 cm (12 in)	87.7	1	866	30 cm (12 in) Below Top of Fill	30 cm (12 in)	87.9
					3	868	30 cm (12 in) Below Top of Fill	30 cm (12 in)	91.1

80 percent compaction requirement. The results for the two additional tests were 87.9 and 91.1 percent compaction.

4.3 NORTH DISPOSAL TRENCH COMPACTION TESTS

Compaction test results for the North Disposal Trench are summarized in Table 3 and presented in Appendix B. The compaction test locations can be found in Appendix B.

Six 20 cm (8 in) deep density tests were conducted in the bottom fill horizon (approximately 0.3 m [1.0 ft] above the bottom of the trench) to confirm the field performance standard would meet the 80 percent compaction requirement. The results exceeded the minimum compaction requirement and ranged from 92.9 to 98.1 percent compaction.

Six 30 cm (12 in) density tests were conducted in the top of the fill horizon for the engineered cover. The top of the compacted engineered cover is approximately 0.3 m to 0.5 m (1.0 ft to 1.5 ft) below the vegetative surface. The results exceeded the minimum compaction requirement and ranged from 94.9 to 98.0 percent compaction.

4.4 USE RESTRICTIONS

Closure activities conducted at this site were coordinated with and acknowledged by the USAF (see Appendix C for USAF acknowledgment letter and CAU Use Restriction Form).

The Use Restriction Form was transmitted to the USAF on August 6, 1998 for recordation. After recordation, the USAF will provide the DOE/NV and NDEP with a confirmation of the recordation.

The future use of any land related to this CAU, as described in Appendix B, is restricted from any DOE or USAF activity that may alter or modify the containment control as identified in this CR or other documentation for this CAU unless appropriate concurrence is obtained in advance.

TABLE 3 - NORTH DISPOSAL TRENCH COMPACTION TEST RESULTS

TEST LOCATION	LAB NUMBER	FILL HORIZON	TEST DEPTH	PERCENT COMPACTION
1	805	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	97.4
2	806	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	98.1
3	807	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	97.6
4	808	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	93.8
5	809	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	97.3
6	810	Bottom 0.3 m (1.0 ft)	20 cm (8 in)	92.9
1	848	Top of Fill	30 cm (12 in)	94.9
2	849	Top of Fill	30 cm (12 in)	95.1
3	850	Top of Fill	30 cm (12 in)	91.1
4	851	Top of Fill	30 cm (12 in)	95.1
5	852	Top of Fill	30 cm (12 in)	98.0
6	853	Top of Fill	30 cm (12 in)	95.3

5.0 POST-CLOSURE MONITORING PLAN

Post-closure monitoring of the covers is intended to determine:

- If maintenance and repairs to the perimeter fence are required.
- If remedial action is necessary to establish a vegetative cover.
- If maintenance and repairs to the engineered cover is required.
- When a cessation to post-closure monitoring can be proposed.

5.1 POST-CLOSURE MONITORING

The monitoring will consist of biannual (twice per year) visual inspections of:

- The cover for condition (subsidence, significant erosion, unauthorized excavation, etc.) and plant development.
- The fence and signs to determine if repairs are required.

Additional, nonscheduled inspections may be required after severe weather events such as heavy rainfall, flash flooding, and high winds. Any identified maintenance and repair requirements will be remedied within 90 days of discovery and documented in writing at the time of repair. Additional revegetation work would be conducted during the next revegetation window (October to February).

Intrusion into or sampling of the impacted materials in the East or West Sewage Lagoons is not proposed during the post-closure monitoring period.

Monitoring of the vegetative cover will be conducted during the first, third, and fifth year after revegetation. Monitoring during the first year will determine if germination of seeded plant species has occurred. By the third year, plant establishment will be evaluated. By the fifth year, long-term survival can be predicted. Concurrently, wildlife use of the site will be evaluated with the objective of determining if burrowing animals have moved onto the site and to what depth they might be expected to penetrate the cover. The erosion condition of the soil will be evaluated using a qualitative erosion condition classification developed by the U.S. Bureau of Land Management. Information gathered will be compared to natural conditions and will be used in assessing whether or not remedial action is necessary so that a viable vegetative cover is established.

5.2 ANNUAL REPORTING

An annual report will be prepared that will provide the observations and describe modifications and/or repairs made to the cover and cover area. The annual report will be prepared following the second inspection of each year that post-closure monitoring is conducted. The annual reports will include the following information:

- Discussion of observations.
- Inspection checklist (see Appendix D for example inspection form) and maintenance record.
- Conclusions and recommendations.

A copy of each annual report will be submitted to the NDEP.

5.3 DURATION

The biannual inspections will be performed for five years after the planting of the vegetative covers, and will be documented on inspection forms (see Appendix D for an example inspection form).

Completion of post-closure monitoring of CAU 404 may be proposed after two consecutive years of visual inspections have not indicated the need to revegetate or provide maintenance to the vegetative covers. Completion of post-closure monitoring may be proposed within five years after the original revegetation of the site and include the removal of the fence since the plants will have attained a maturity to not be significantly affected by the grazing of wild horses.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The following conclusions are made based upon the completed site closure activities and information presented in this report:

- An engineered cover was constructed over the area of the East and West Sewage Lagoons.
- The North Disposal Trench was backfilled.
- Implementation of the field performance standard for the compaction of the fill resulted in compaction tests which exceeded the requirement of 80 percent of the maximum density.
- The area of the East and West Sewage Lagoons and North Disposal Trench was planted with seeds from native shallow rooted plants/grasses.
- A fence with signs was installed on the perimeter of the site to allow the plants/grasses to establish and prevent unauthorized excavation into the engineered cover.
- Closure activities have been coordinated with the USAF.
- The Use Restriction Form was transmitted to the USAF on August 6, 1998 for recordation. After recordation, the USAF will provide the DOE/NV and NDEP with a confirmation of the recordation.
- The field closure activities conducted at the site were completed in accordance to the approved CAP (DOE, 1997b).

6.2 RECOMMENDATIONS

The DOE/NV provides the following recommendations since the proposed closure activities were completed at the site:

- A Notice of Completion be provided by the NDEP to DOE/NV for the closure of CAU 404 (Roller Coaster Lagoons [CAS TA-03-001-TA-RC] and North Disposal Trench [CAS TA-21-001-TA-RC].
- CAU 404 be moved from Appendix III to Appendix IV of the FFACO.

DOE\NV will continue to perform post-closure monitoring of the site as indicated in Section 5.0 of this CR.

7.0 REFERENCES

American Society for Testing and Materials, see ASTM

ASTM, 1997a. Method D 1557-91: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort, 1997 Annual Book of ASTM Standards, Volume 04.08, Soil and Rock (I): D 420 - D 4914.

ASTM, 1997b. Method D 2922-96: Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth), 1997 Annual Book of ASTM Standards, Volume 04.08, Soil and Rock (I): D 420 - D 4914.

ASTM, 1997c. Method D 422-90: Standard Test Method for Particle-Size Analysis of Soils, and Method D 1140-92: Standard Test Method for Amount of Material in Soils Finer Than the No. 200 Sieve, 1997 Annual Book of ASTM Standards, Volume 04.08, Soil and Rock (I): D 420 - D 4914.

U.S. Department of Energy, see DOE

DOE, 1995. Voluntary Corrective Action Plan For Ordnance Removal From Five Disposal Sites At The Tonopah Test Range, DOE/NV-386 UC-700.

DOE, 1996. Corrective Action Investigation Plan: Roller Coaster Sewage Lagoons and North Disposal Trench, Tonopah Test Range, Rev.1, DOE/NV-425.

DOE, 1997a. Corrective Action Decision Document For the Roller Coaster Lagoons and North Disposal Trench, DOE/NV-474 UC-700.

DOE, 1997b. Corrective Action Plan For CAU No. 404: Roller Coaster Sewage lagoons and North Disposal Trench, Tonopah Test Range, Rev. 0, July 1997, DOE/NV-11718-103, UC-702.

U.S. Environmental Protection Agency, see EPA

EPA, 1996. Region IX Preliminary Remediation Goals (PRGs), San Francisco, CA.

Nevada Division of Environmental Protection, see NDEP

NDEP, 1996. The State of Nevada Department of Conservation and Natural Resources, Division of Environmental Protection and the U. S. Department of Energy and the U. S. Department of Defense Federal Facility Compliance Order And Agreement.

NDEP, 1997. Letter from Paul J. Liebendorfer to Stephen A. Mellington, RE: Corrective Action Plan For Corrective Action Unit 404, Roller Coaster Sewage Lagoons and North Disposal Trench, TTR, July 31, 1997.

APPENDIX A

AS-BUILT ENGINEERING DRAWINGS

UNITED STATES DEPA

NEVADA OPERA

LAS VEGAS

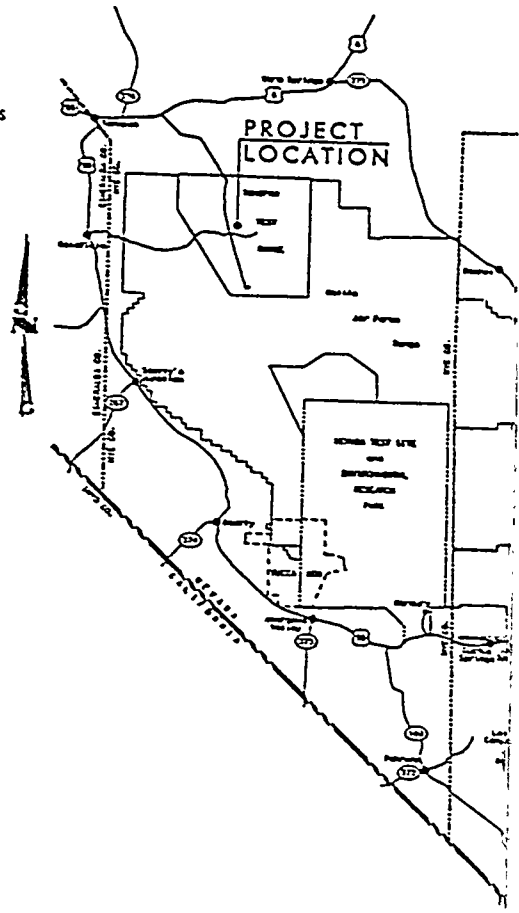
TONOPAH T

ROLLER COASTER SEWA

AREA

INDEX

DRAWING NUMBER	DRAWING TITLE	STANDARD NUMBER	DESCRIPTION
TITLE			
JS-054-133-T1 REV 1	TITLE SHEET	STD T1	STANDARDS INDEX GENERAL NOTES. DRAFTING SYMBOLS & ANSI STANDARDS
CIVIL			
JS-054-133-C1 REV 1	VICINITY MAP	STD C100	NOTES. LEGEND & SYMBOLS
JS-054-133-C2 REV 1	SITE & GRADING PLAN	STD C101	ABBREVIATIONS
JS-054-133-C3 REV 1	SECTIONS		



LOCATION MA

NOT TO SCALE

SCOPE OF WORK

THIS PROJECT SHALL CONSIST OF PLACING NATIVE AND BORROW FILL TO CLOSE THE LAGOONS AND THE DISPOSAL TRENCH NORTH OF THE LAGOONS. WORK WILL ALSO INCLUDE REVEGETATION OF THE SITE.

WORK SHALL BE PERFORMED IN ACCORDANCE WITH DOE/NV STD SPECIFICATIONS DATED DECEMBER 1994.

RTMENT OF ENERGY

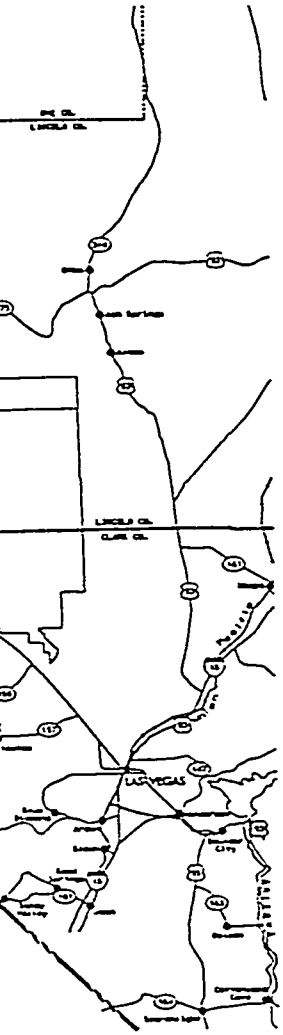
ONS OFFICE

NEVADA

EST RANGE

GE LAGOONS CAU 404

5 4



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AS-BUILT

Bechtel Nevada

UNLESS NOTED BY MARKED CHANGES, ALL DIMENSIONS, NOTES, REFERENCES AND CONSTRUCTION FEATURES ARE CORRECTED, AND WERE CONSTRUCTED AS SHOWN ON THIS DRAWING.

NO	DATE	REVISIONS
1		AS-BUILT PER SURVEY, DATED 9/25/97

U.S. DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE — LAS VEGAS, NEVADA

ORIGINAL MYLAR SIGNED BY:

DESIGNED LRE — DRAWN LRE

CHECKED JAS — CHECKED OLM

SAFETY JLA

NEVADA TEST SITE — AREA 54

TONOPAH TEST RANGE

ROLLER COASTER SEWAGE LAGOONS CAU 404

TITLE SHEET

SUBMITTED (PROJECT ENGINEER): KEN SCHEUNEMAN

APPROVED: DAVID K. COWGER

DEPT. OF ENERGY PROJ. ENGR.: KEVIN CARDLE — DATE 09/19/97

Bechtel Nevada

P.O. BOX 98521 LAS VEGAS, NV 89193-8521

P.O. NO. N/A

ACTIVITY DATA CARD/CODE

PROJ. NO. 97085TTR

DRAWING NUMBER JS-054-133-T1

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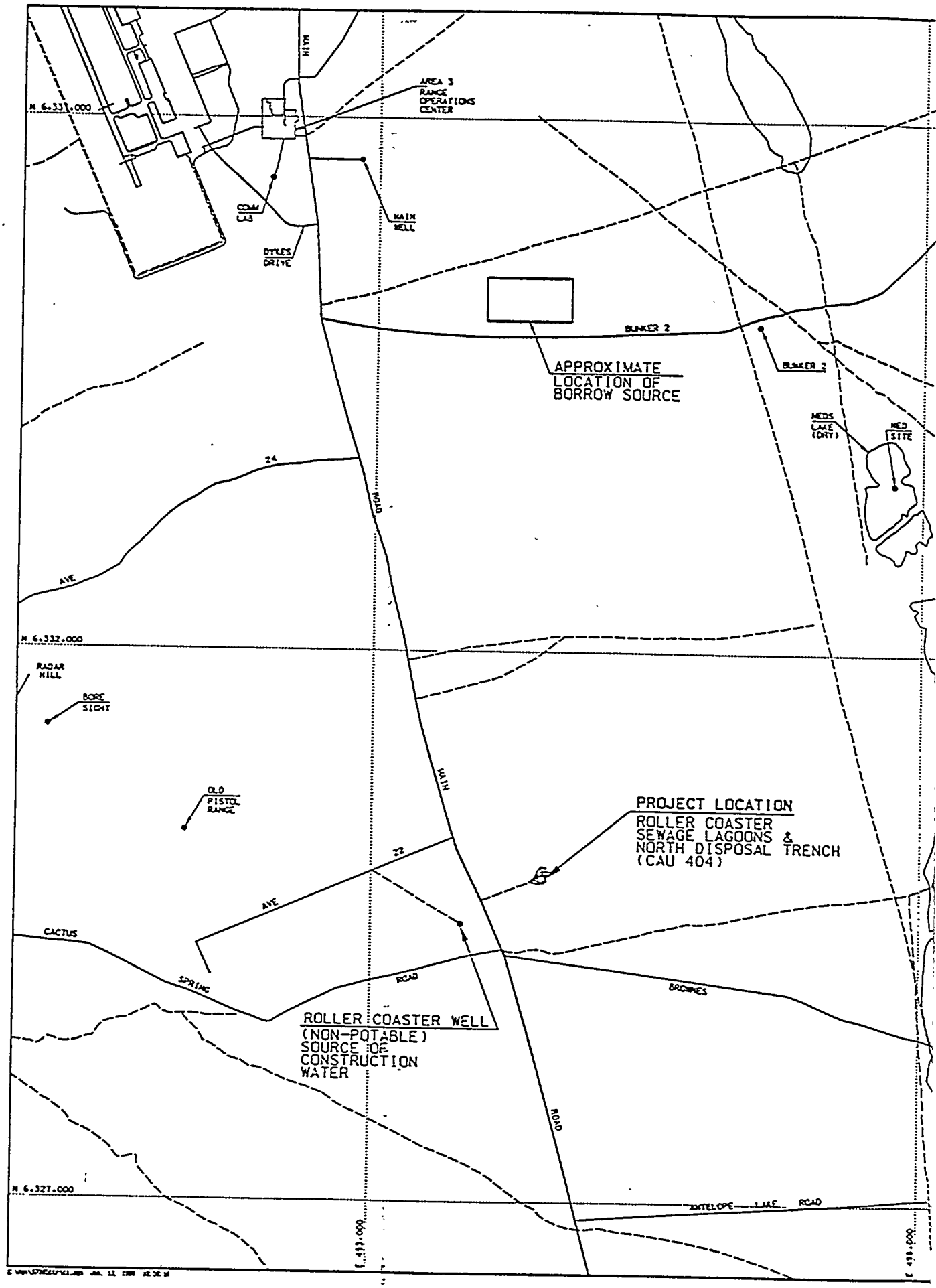
AREA 3
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BUNKER 2
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APPROXIMATE
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BORROW SOURCE
MEDS
LAKE
(DRY)
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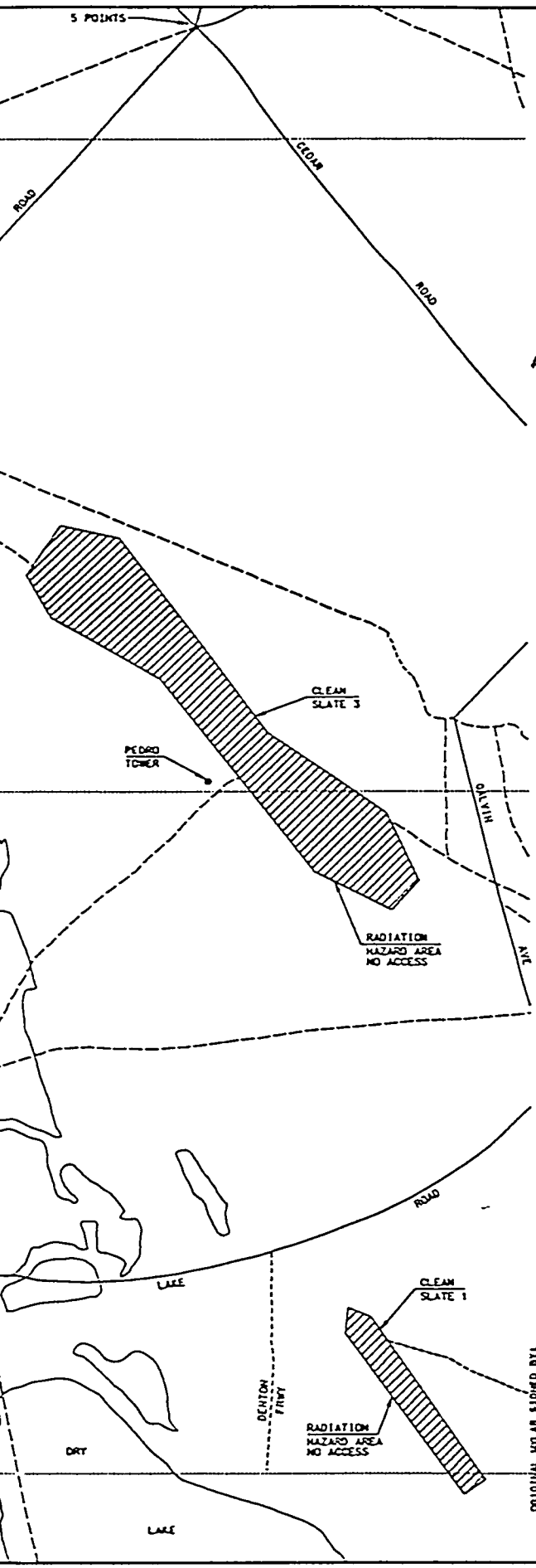
SITE
24
DYKE
AVE
RADAR
HILL
BORE
SIGHT
OLD
PISTOL
RANGE
MAIN
PROJECT LOCATION
ROLLER COASTER
SEWAGE LAGOONS &
NORTH DISPOSAL TRENCH
(CAU 404)
22
AVE
CACTUS
SPRING
ROAD
BROWNES
ROLLER COASTER WELL
(NON-POTABLE)
SOURCE OF
CONSTRUCTION
WATER
ROAD
ANTELOPE LAKE ROAD



GENERAL NOTES:

1. CAP SHALL BE CONSTRUCTED OF NATIVE AND BORROW MATERIAL PLACED IN 8" LIFTS AND COMPACTED TO 80% OF MAXIMUM DENSITY PER ASTM D1557.
2. REVEGETATION SHALL BE PERFORMED IN ACCORDANCE WITH RECOMMENDATIONS CONTAINED IN THE TONOPAH TEST RANGE CLOSURE SITES REVEGETATION PLAN, BECHTEL NEVADA, MAY 1997. SEED MIX REQUIRES MODIFICATION TO INCLUDE ONLY PLANTS AND GRASSES WITH ROOT DEPTHS TO MAXIMUM OF 3 FEET.
3. ALL MEASURED VALUES TO BE BASED ON THE NORTH AMERICAN DATUM OF 1983, NEVADA STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE, METERS.

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SCALE: 1:20,000 METERS

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1		AS-BUILT PER SURVEY, DATED 9/25/97					

U.S. DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE — LAS VEGAS, NEVADA

NEVADA TEST SITE — AREA 54

TONOPAH TEST RANGE

ROLLER COASTER SEWAGE LAGOONS CAU 404

VICINITY MAP

LRE | FIE | JAS | OLM | JLA

KEN SCHEUTER, BECHTEL NEVADA — DAVID R. CONSER

KEVIN CARDLE, DEPT OF ENERGY PROJ ENGR — DATE 08/19/97

Bechtel Nevada

N/A | C4281006 | 97085TTR

JS-054-133-C1

REVISION 1

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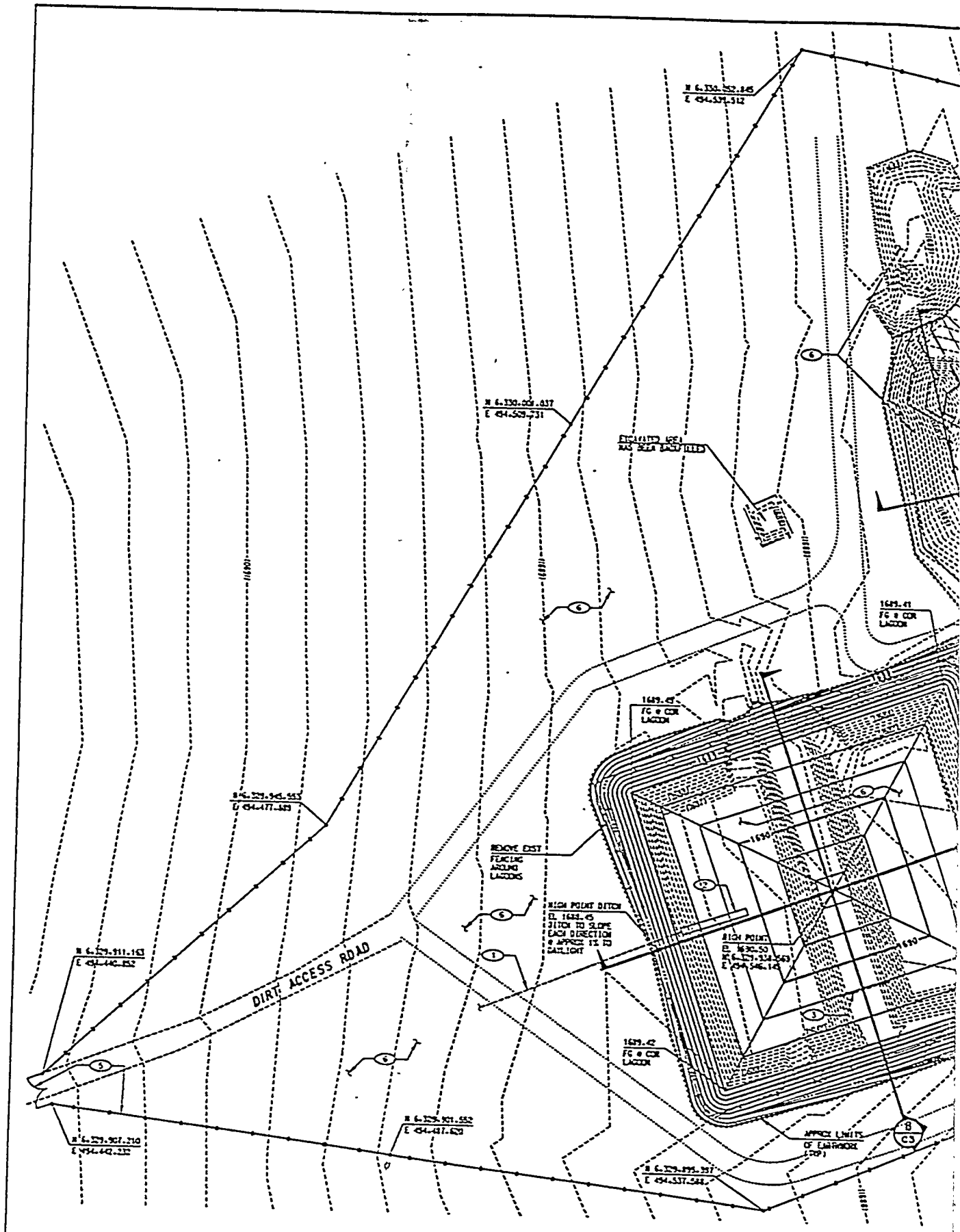

SITE & GRADING PLAN

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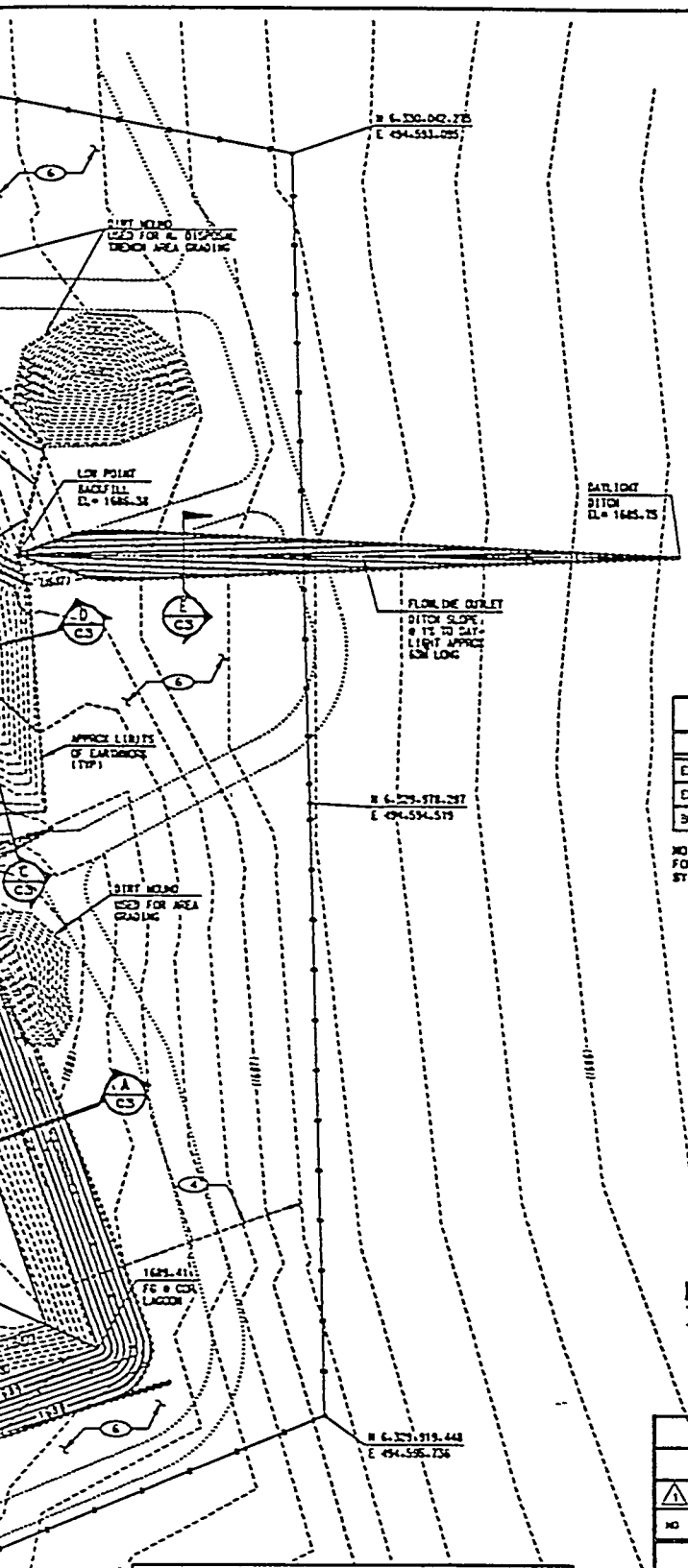

KEY NOTES

1. EXISTING INLET PIPE SHALL BE PLUGGED OR CAPPED AT THE LAGOON OR NEAREST UPSTREAM MANHOLE AND ABANDONED IN PLACE.
2. CANOPAT SHALL BE CLOSED IN PLACE DURING BACKFILLING ACTIVITIES.
3. EXISTING 6" OVERFLOW PIPE SHALL BE PLUGGED AND ABANDONED IN PLACE.
4. EXISTING 6" OVERFLOW PIPE SHALL BE PLUGGED AND ABANDONED IN PLACE.
5. A THREE STRAND, BARBED WIRE FENCE SHALL BE INSTALLED AROUND THE TRENCH AND THE SEWAGE LAGOONS. PROVIDE A 4 METER DOUBLE SWING VEHICLE ACCESS GATE AS SHOWN. WARNING SIGNS AGAINST EXCAVATION ARE TO BE INSTALLED ON THE CORNERS OF LAGOONS. SIGNS INDICATING REVEGETATION AREAS ARE TO BE MOUNTED ON NEW FENCE.
6. EXTURE AREA WITHIN NEW FENCING SHALL BE REVEGETATED.

NOTE

1. CONSTRUCTION QUALITY ASSURANCE SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 2.2 OF THE CORRECTIVE ACTION PLAN FOR CAU 404: ROLLER COASTER SEWAGE LAGOONS AND NORTH DISPOSAL TRENCH TONOPAH TEST RANGE, REV 0.

ESTIMATED QUANTITIES

DESCRIPTION	QUANTITY	UNIT
EXCAVATION	119.65	METER³
EMBANKMENT	5699.32	METER³
BORROW	5621.03	METER³

NO CUT AND FILL FACTORS APPLIED. QUANTITIES SHOWN ARE FOR ESTIMATING PURPOSES ONLY. PAYMENT SHALL BE MADE BY ACTUAL INSTALLED QUANTITIES.

N

GRAPHIC SCALE

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SCALE 1:300 METERS

(CONTOUR INTERVAL = 0.250)

REFERENCES

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U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE — LAS VEGAS, NEVADA

NEVADA TEST SITE — AREA 54
TONOPAH TEST RANGE
ROLLER COASTER SEWAGE LAGOONS CAU 404
SITE & GRADING PLAN

DRAWN LRE | CHECKED LRE | CHECKED JAS | DRAWN DLH | DATE JLA

SUBMITTED EXPLORATORY ENGINEERING: KEN SCHECHTER, MONITEL, NEVADA
CHECKED: DAVID K. GONZER

APPROVAL BLOCK: DEPT OF ENERGY PROJ ENGR KEVIN CARPLE — DATE 08/19/97

Bechtel Nevada
P.O. BOX 3134 NORTH LAS VEGAS, NV 89036

P.O. NO. N/A
ACTIVITY CODE C4281100E
DRAWING NUMBER JS-054-133-C2
97095TTR
SHEET of REVISION 1

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ORIGINAL AS-BUILT SIGNED BY

AS-BUILT
Bechtel Nevada 7/10/98

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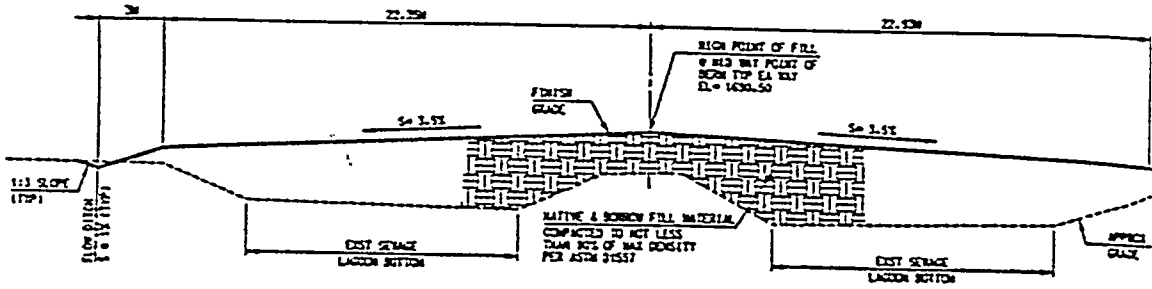

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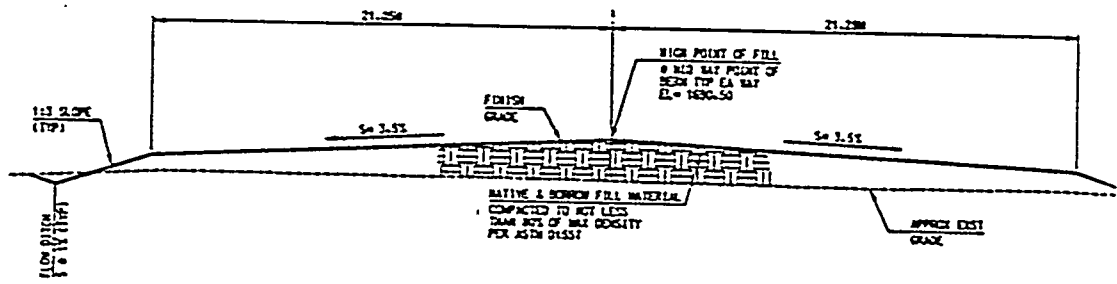

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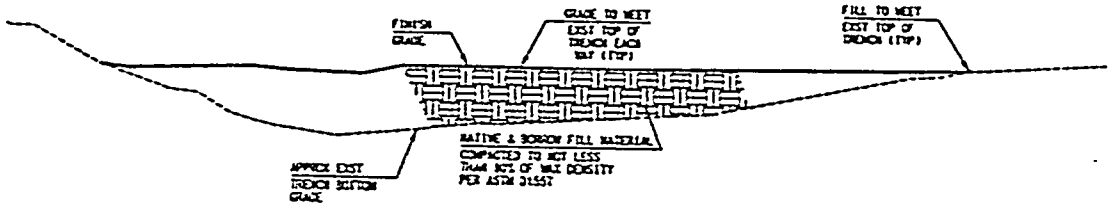

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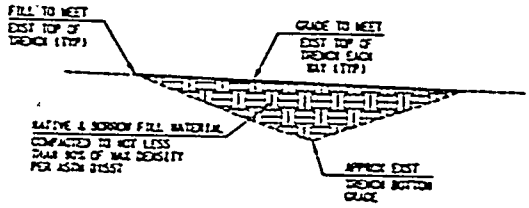

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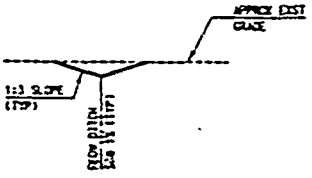

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REFERENCES

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Bechtel Nevada

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NO	DATE	REVISIONS	BY
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U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE — LAS VEGAS, NEVADA

NEVADA TEST SITE — AREA 54
TONOPAH TEST RANGE
ROLLER COASTER SEWAGE LAGOONS CAU 404
SECTIONS

DESIGNED LRE | DRAWN LRE | CHECKED JAS | CHECK CLM | APPROVED JLA

SUBMITTED (PROJECT ENGINEER) KEN SCHEUNTER — DATE
DAVID E. CONSER — DATE
APPROVAL BLOCK: DEPT OF ENERGY PROJ ENGR KEVIN CABBLE — DATE 08/19/97

Bechtel Nevada
P.O. BOX 98521 LAS VEGAS, NV 89193

FILE NO. N/A
ACTIVITY CODE CA9B100E
PROJ NO. 97015TTP

DRAWING NUMBER JS-054-133-C3
SHEET 7 REVISION 1

ORIGINAL MYLAR SIGNED BY:

APPENDIX B

GEOTECHNICAL TEST RESULTS

AUG 19 1997

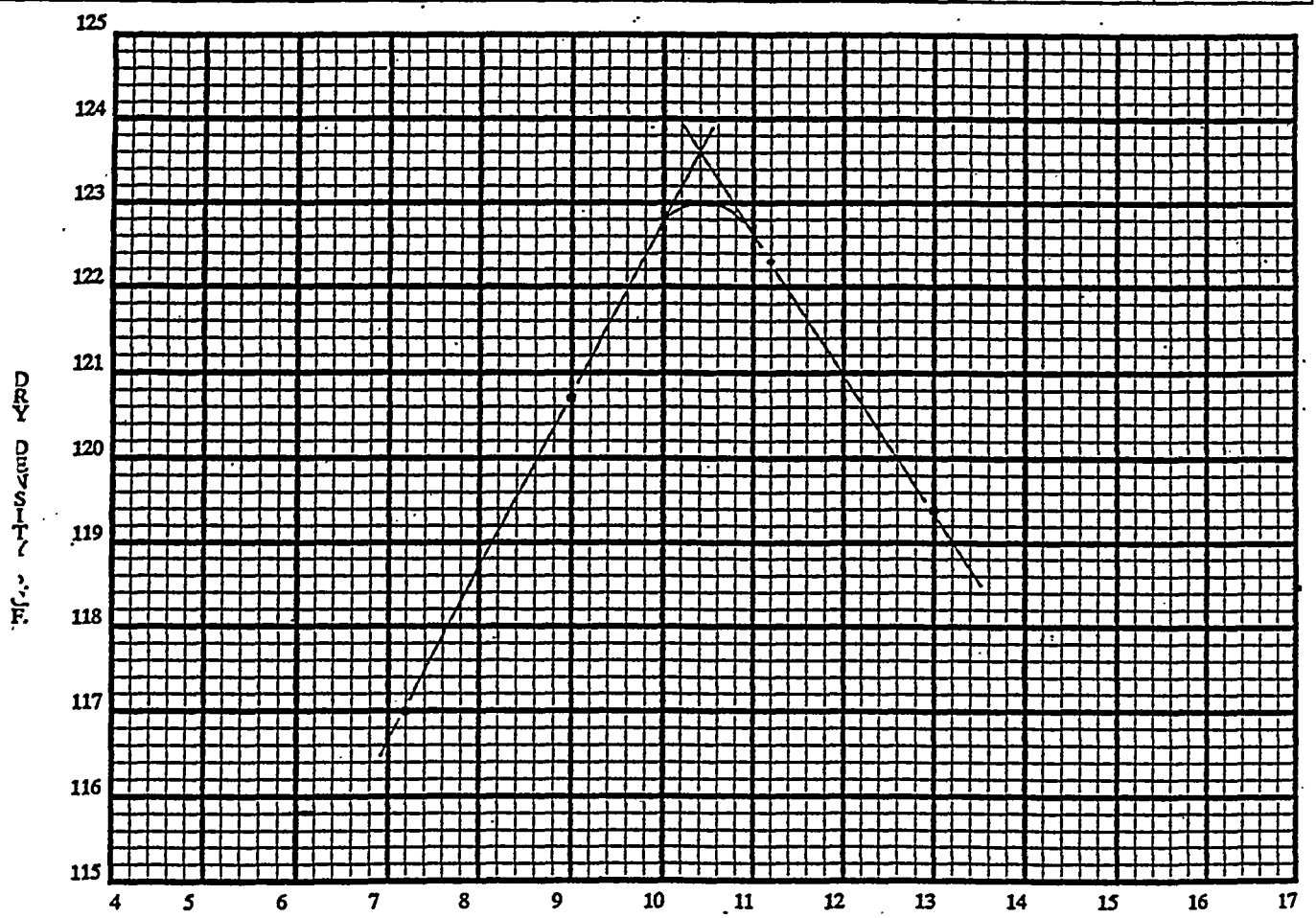
PROCTOR TEST ASTM D 1557–91 METHOD C	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521 LAS VEGAS, NV 89193–8521	CHARGE # C4RB10DE LAB # 0781 DATE 08/14/97

Project: ROLLER COASTER SEWAGE LAGOON Requested by: D. MADSEN User/Agency: BECHTEL

Sampled by: D. MADSEN Date sampled: 08/11/97 Material: TTR SANDIA BORROW PIT

Tested by: D. HERRINGTON Date tested: 08/13/97 Checked by: L.D. Johnson

	TRIAL	1	2	3	4	5	6
1	Wt.mold + wet soil	7322.9	7468.9	7433.2	7109.0	N/A	N/A
2	Wt. mold	2845.6	2845.6	2845.6	2845.6	N/A	N/A
3	Wt. wet soil	4477.3	4623.3	4587.6	4263.4	N/A	N/A
4	Wet Density, PCF	131.6	135.9	134.9	125.3	N/A	N/A
5	Moisture Tare #	A	B	C	D	N/A	N/A
6	Wt wet soil + tare	1368.1	1428.2	1431.9	1554.5	N/A	N/A
7	Wt dry soil + tare	1256.2	1286.5	1269.4	1451.8	N/A	N/A
8	Wt moisture	111.9	141.7	162.5	102.7	N/A	N/A
9	Wt tare	16.7	16.7	16.8	16.7	N/A	N/A
10	Wt dry soil	1239.5	1269.8	1252.6	1435.1	N/A	N/A
11	% Moisture	9.0	11.2	13.0	7.2	N/A	N/A
12	Dry Density, PCF	120.7	122.3	119.4	117.0	N/A	N/A



MAX. DENSITY = 123.0 PCF

OPT. MOISTURE = 10.4 %

NO SPECIFICATIONS: INFORMATION ONLY

Equipment used: PM 16, PTL W1256, Cal. date: 06/05/97, Cal. due: 06/05/98

CC: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

Bechtel Nevada
MATERIALS TESTING LABORATORY
P. O. BOX 98521
LAS VEGAS, NV 89193-8521

Request / Test Report

Requested by: D. MADSEN Charge #: C4RB10DE

User/Agency: BECHTEL Log # N/A MTL Lab #: 0781

Project:	ROLLER COASTER SEWAGE LAGOON	Material:	TTR SANDIA BORROW PIT
Sampled by:	D. MADSEN	Date Sampled:	08/11/97
Tested By:	D. HERRINGTON	Date tested:	08/14/97
Checked by:	R.D. Johnson	Date checked:	8-19-97

LABORATORY TEST REQUIRED

- [ ] Sieve Analysis (ASTM C-136-96)
- [ ] (ASTM C-117-95)
- [X] (ASTM D-422-90)
- [X] (ASTM D-1140-92)
- [ ] Moisture Content (ASTM C-566-96)
- [X] (ASTM D-2216-92)
- [ ] Unit Weight (ASTM C-29-91)
- [X] Soil Classification
- [ ] Percent Porosity
- [ ] Specific Gravity (ASTM C-127-88/128-93)
- [ ] (ASTM D-584-92)
- [ ] Other (as noted)

SIEVE ANALYSIS

U.S. Standard Sieve #	Cumulative Wt Retained	% Retained	% Passing	Spec % Passing
3	0.0	0%	100%	N/A
1 1/2	112.5	4%	96%	N/A
3/4	457.4	16%	84%	N/A
3/8	699.3	24%	76%	N/A
4	1073.3	37%	63%	N/A
10	1502.7	52%	48%	N/A
40	2064.4	72%	28%	N/A
100	2371.2	83%	17%	N/A
200	2523.6	87.9%	12.1%	N/A

Soil Class: SM Sample Wt (g): DRY = 2869.8 WET = N/A

MOISTURE CONTENT

	Native	Oversize	Proctor
Wet Weight + Tare	4051.8	N/A	N/A
Dry Weight + Tare	3806.6	N/A	N/A
Water	245.2	N/A	N/A
Tare	936.8	N/A	N/A
Dry Weight	2869.8	N/A	N/A
Moisture %	8.5%	N/A	N/A

UNIT WEIGHT

	Loose	Rodded
Container Size(ft^3)	0.0997506	0.0997506
Total Weight (lb)		
Tare Weight (lb)		
Material Weight (lb)		
Unit Weight (P.C.F.)	N/A	N/A
Percent Porosity	N/A	N/A

Oversize Specific Gravity: N/A Specific Gravity: N/A

EQUIPMENT USED: PM 16, PTL #1256, Calibration Date: 06/05/97 Calibration Due: 06/05/98

Sieve 3"	PTL # Y3221	Cal. Date: 02/06/97	Cal. Due: 02/06/98
Sieve 1 1/2"	PTL # Y303278	Cal. Date: 05/23/97	Cal. Due: 05/23/98
Sieve 3/4"	PTL # Y303276	Cal. Date: 03/17/97	Cal. Due: 03/17/98
Sieve 3/8	PTL # Y302106	Cal. Date: 03/17/97	Cal. Due: 03/17/98
Sieve # 4	PTL # Y302043	Cal. Date: 03/13/97	Cal. Due: 03/13/98
Sieve # 10	PTL # Y310018	Cal. Date: 05/22/97	Cal. Due: 05/22/98
Sieve # 40	PTL # Y310013	Cal. Date: 05/22/97	Cal. Due: 05/22/98
Sieve # 100	PTL # Y10035	Cal. Date: 05/07/97	Cal. Due: 05/07/98
Sieve # 200	PTL # Y310033	Cal. Date: 05/07/97	Cal. Due: 05/07/98

REMARKS: MED BROWN SILTY SAND WITH SOME GRAVEL.

cc: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

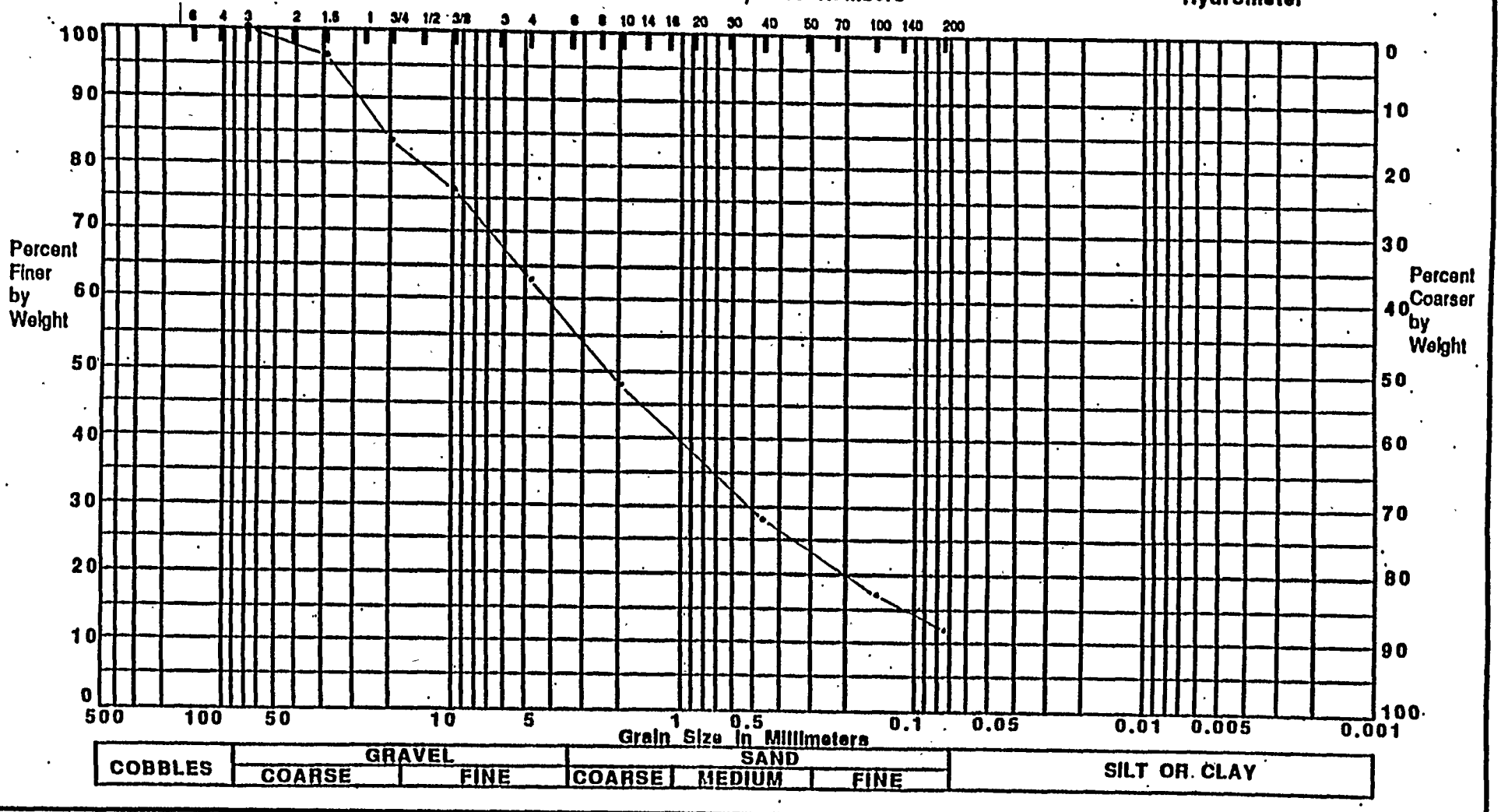
GRADATION CURVES

MATERIALS TESTING BOULDER CITY
P.O. BOX 98521
LAS VEGAS, NV 89193-8521

CHARGE # C4RB10DE
DATE 08/14/97

PROJECT: ROLLER COASTER SEWAGE LAGOON LOG # N/A CLASSIFICATION: SM

CHECKED BY: D. HERRINGTON D.L.H. DATE CHECKED: 8-19-97 MATERIAL TTR SANDIA BORROW PIT



NO EQUIPMENT USED.

CC: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

AUG 20 1997

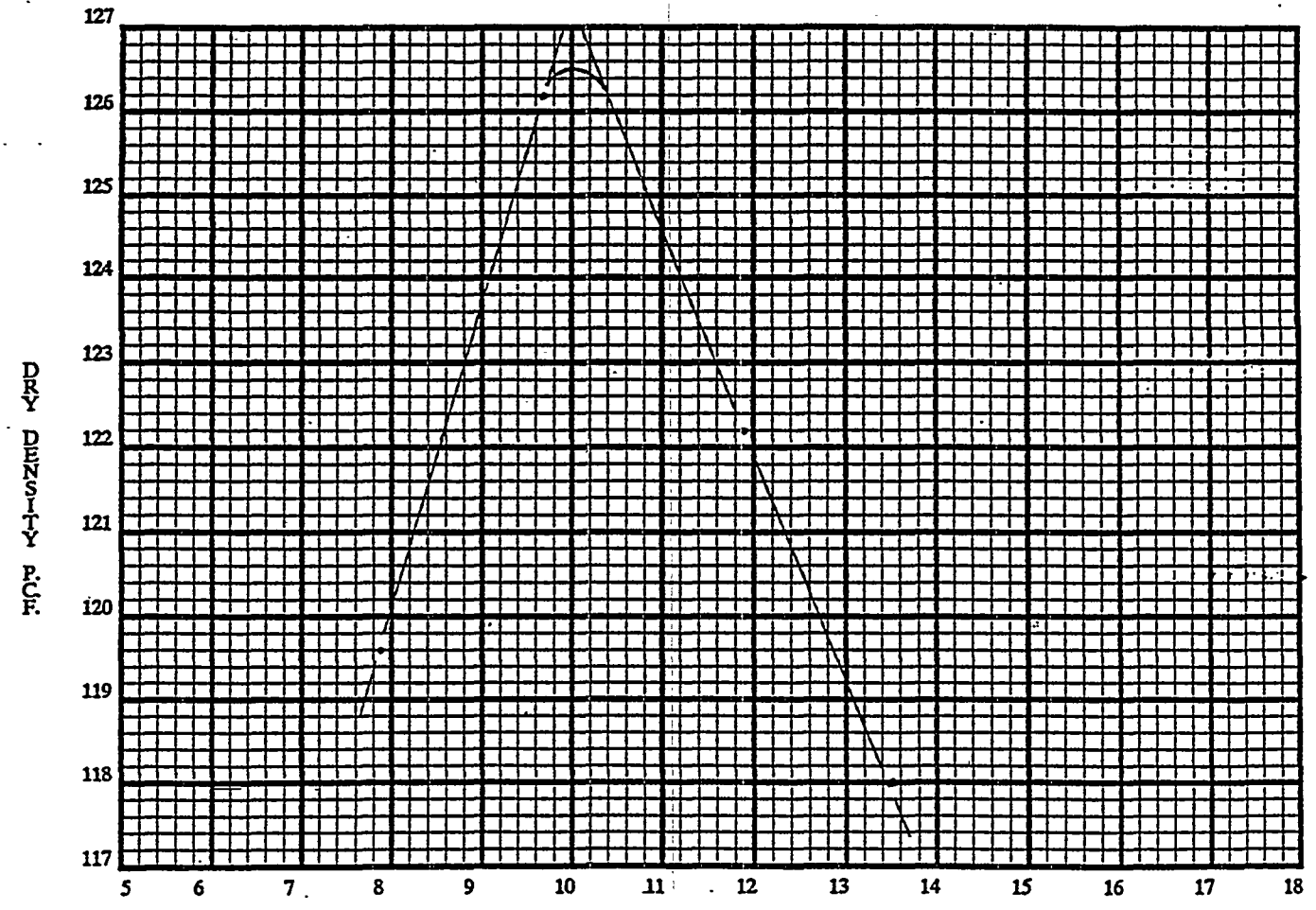
PROCTOR TEST ASTM D 1557–91 METHOD C	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521 LAS VEGAS, NV 89193–8521	CHARGE # C4RB10DE LAB # 0791 DATE 08/28/97

Project: ROLLER COASTER SEWAGE LAGOON Requested by: D. FINNEY User/Agency: BECHTEL

Sampled by: D. MADSEN Date sampled: 08/22/97 Material: NATIVE STOCKPILE

Tested by: D. HERRINGTON Date tested: 08/27/97 Checked by: R.D. Johnson 8-28-97

	TRIAL	1	2	3	4	5	6
1	Wt.mold + wet soil	7553.8	7496.8	7236.9	7401.5	N/A	N/A
2	Wt. mold	2845.1	2845.1	2845.1	2845.1	N/A	N/A
3	Wt. wet soil	4708.7	4651.7	4391.8	4556.4	N/A	N/A
4	Wet Density, PCF	138.4	136.7	129.1	133.9	N/A	N/A
5	Moisture Tare #	A	B	C	D	N/A	N/A
6	Wt wet soil + tare	1304.6	1419.2	1250.2	1278.8	N/A	N/A
7	Wt dry soil + tare	1190.7	1270.0	1159.6	1128.7	N/A	N/A
8	Wt moisture	113.9	149.2	90.6	150.1	N/A	N/A
9	Wt tare	16.9	17.0	16.9	16.9	N/A	N/A
10	Wt dry soil	1173.8	1253.0	1142.7	1111.8	N/A	N/A
11	% Moisture	9.7	11.9	7.9	13.5	N/A	N/A
12	Dry Density, PCF	126.2	122.2	119.6	118.0	N/A	N/A



MAX. DENSITY = 126.5 PCF

OPT. MOISTURE = 10.1 %

NO SPECIFICATIONS: INFORMATION ONLY

Equipment used: PM 16, PTL W1256, Cal. date: 06/02/97, Cal. due: 06/02/98

CC: E. MITCHELL BECHTEL
D. FINNEY BECHTEL
MTL BECHTEL FILES

AUG 28 1997

Bechtel Nevada
MATERIALS TESTING LABORATORY
P. O. BOX 98521
LAS VEGAS, NV 89193-8521

Request / Test Report

Requested by: D. FINNEY — Charge #: C4RB10DE
User/Agency: BECHTEL — Log # N/A — MTL Lab #: 0791

Project: ROLLER COASTER SEWAGE LAGOON — Material: NATIVE STOCKPILE
Sampled by: D. FINNEY — Date Sampled: 08/22/97
Tested By: D. HERRINGTON — Date tested: 08/28/97
Checked by: H.D. Johnson — Date checked: 8-28-97

LABORATORY TEST REQUIRED

- [ ] Sieve Analysis
- [ ] (ASTM C-136-96)
- [ ] (ASTM C-117-95)
- [X] (ASTM D-422-90)
- [X] (ASTM D-1140-92)
- Moisture Content
- [ ] (ASTM C-566-96)
- [X] (ASTM D-2216-92)
- [ ] Unit Weight (ASTM C-29-91)
- [X] Soil Classification
- [ ] Percent Porosity
- [ ] Specific Gravity
- [ ] (ASTM C-127-88/128-93)
- [ ] (ASTM D-584-92)
- [ ] Other (as noted)

SIEVE ANALYSIS

U.S. Standard Sieve #	Cumulative Wt Retained	% Retained	% Passing	Spec % Passing
3	0.0	0%	100%	N/A
1 1/2	0.0	0%	100%	N/A
3/4	38.7	2%	98%	N/A
3/8	96.3	5%	95%	N/A
4	225.1	13%	87%	N/A
10	452.1	26%	74%	N/A
40	933.6	53%	47%	N/A
100	1259.7	72%	28%	N/A
200	1395.5	79.3%	20.7%	N/A

Soil Class: SM — Sample Wt (g): DRY = 1759.1 — WET = N/A

MOISTURE CONTENT

	Native	Oversize	Proctor
Wet Weight + Tare	2693.1	N/A	700.9
Dry Weight + Tare	2667.9	N/A	635.6
Water	25.2	N/A	65.3
Tare	946.7	N/A	16.7
Dry Weight	1721.2	N/A	618.9
Moisture %	1.5%	N/A	10.6%

UNIT WEIGHT

	Loose	Rodded
Container Size(ft^3)	0.0997506	0.0997506
Total Weight (lb)		
Tare Weight (lb)		
Material Weight (lb)		
Unit Weight (P.C.F.)	N/A	N/A
Percent Porosity	N/A	N/A

Oversize Specific Gravity: N/A — Specific Gravity: N/A

EQUIPMENT USED: PM 16, PTL #1256, Calibration Date: 06/02/97 — Calibration Due: 06/02/98

Sieve 3"	PTL # Y3221	Cal. Date: 02/06/97	Cal. Due: 02/06/98
Sieve 1 1/2"	PTL # Y303278	Cal. Date: 05/23/97	Cal. Due: 05/23/98
Sieve 3/4"	PTL # Y303276	Cal. Date: 03/17/97	Cal. Due: 03/17/98
Sieve 3/8	PTL # Y302106	Cal. Date: 03/17/97	Cal. Due: 03/17/98
Sieve # 4	PTL # Y302043	Cal. Date: 03/13/97	Cal. Due: 03/13/98
Sieve # 10	PTL # Y310018	Cal. Date: 05/22/97	Cal. Due: 05/22/98
Sieve # 40	PTL # Y310013	Cal. Date: 05/22/97	Cal. Due: 05/22/98
Sieve # 100	PTL # Y10035	Cal. Date: 05/07/97	Cal. Due: 05/07/98
Sieve # 200	PTL # Y310033	Cal. Date: 05/07/97	Cal. Due: 05/07/98

REMARKS: MED BROWN SILTY FINE SAND WITH TRACE GRAVEL

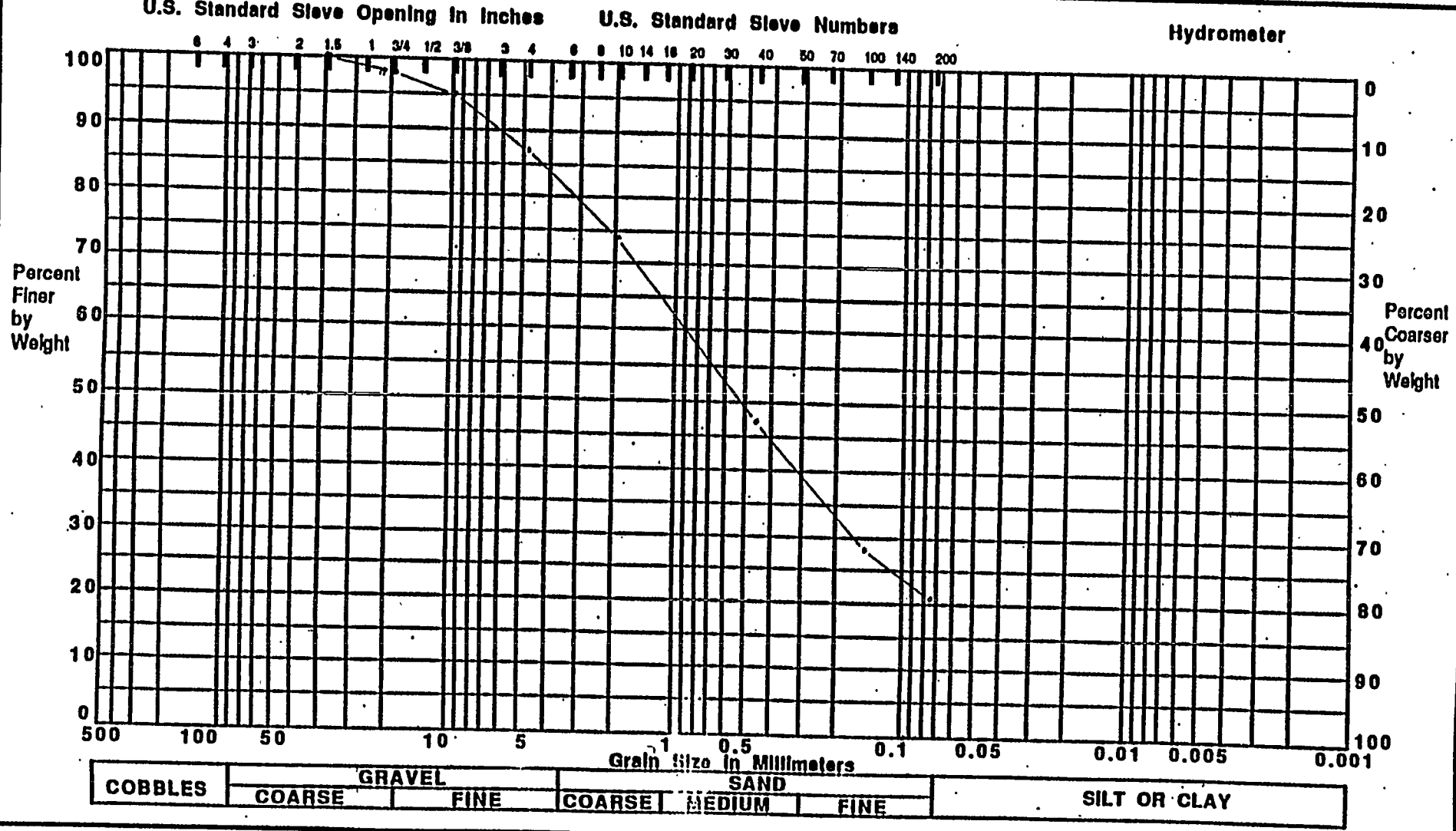
cc: E. MITCHELL BECHTEL
D. FINNEY BECHTEL
MTL BECHTEL FILES

GRADATION CURVES

Bechtel Nevada
MATERIALS TESTING LABORATORY
P.O. BOX 98521
LAS VEGAS, NV 89193-8521

LAB NO. 0791
CHARGE # C4RB10DE
DATE 08/28/97

PROJECT: ROLLER COASTER SEWAGE LAGOON
LOG # N/A
CLASSIFICATION: SM
CHECKED BY: D. HERRINGTON
DATE CHECKED: 8-28-97
MATERIAL NATIVE STOCKPILE



NO EQUIPMENT USED.

CC: E. MITCHELL BECHTEL
D. FINNEY BECHTEL
MTL BECHTEL FILES

SEP 1 0 1997

NUCLEAR DENSITY ASTM D2922-91 AMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED 09/10/97 PAGE 1 OF 1

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests NORTH DISPOSAL TRENCH

Tested by D. HERRINGTON Date Tested 09/08/97 Checked by V. Quesenberry

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/08/97

LABORATORY NO	805	806	807	808	809	810
TEST LOCATION	1	2	3	4	5	6
DEPTH OF PROBE	8"	8"	8"	8"	8"	8"
DEPTH OF TESTS	1' Placed	1' Placed	1' Placed	1' Placed	1' Placed	1' Placed
DRY DENSITY-PCF	119.8	120.7	120.1	115.4	119.7	114.2
MOISTURE %	10.1	9.5	9.8	10.2	10.4	10.3
MAX DENSITY PCF	123.0	123.0	123.0	123.0	123.0	123.0
OPTIMUM MOISTURE %	10.4	10.4	10.4	10.4	10.4	10.4
PERCENT COMPACTION	97.4	98.1	97.6	93.8	97.3	92.9
REQUIRED COMPACTION %	80.0	80.0	80.0	80.0	80.0	80.0
IN/OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN

GAUGE NO 23205 DATE OF STANDARDIZATION 09/08/97 VALUE OF STANDARDIZATION M 632 D 3007

PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: NONE

CC: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

SEP 10 1997

NUCLEAR DENSITY ASTM D2922-91 CAMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P.O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED: 09/10/97 PAGE 1 OF 2

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests EAST LAGOON

Tested by D. HERRINGTON Date Tested 09/08/97 Checked by V. Quesenberry

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/08/97

LABORATORY NO	811	812	813	814	815	816
TEST LOCATION	1	2	3	4	5	6
DEPTH OF PROBE	8"	8"	8"	8"	8"	8"
DEPTH OF TESTS	1' Placed	1' Placed	1' Placed	1' Placed	1' Placed	1' Placed
DRY DENSITY-PCF	119.6	116.3	117.6	113.5	113.0	115.3
MOISTURE %	8.1	8.2	8.1	8.0	8.3	8.1
MAX DENSITY PCF	123.0	123.0	123.0	123.0	123.0	123.0
OPTIMUM MOISTURE %	10.4	10.4	10.4	10.4	10.4	10.4
PERCENT COMPACTION	97.2	94.6	95.6	92.3	91.9	93.7
REQUIRED COMPACTION %	80.0	80.0	80.0	80.0	80.0	80.0
IN / OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN

GAUGE NO 23205 DATE OF STANDARDIZATION 09/08/97 VALUE OF STANDARDIZATION M 632 D 3007

PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: NONE

CC: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

SEP 10 1997

NUCLEAR DENSITY ASTM D2922-91 CAMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED: 09/10/97 PAGE 2 OF 2

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests EAST LAGOON

Tested by D. HERRINGTON Date Tested 09/08/97 Checked by V. Quesenberry

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/08/97

LABORATORY NO	817	818	819	N/A	N/A	N/A
TEST LOCATION	7	8	9			
DEPTH OF PROBE	4"	4"	4"			
DEPTH OF TESTS	1'4" Placed	1'4" Placed	1'4" Placed			
DRY DENSITY-PCF	114.8	115.8	113.4			
MOISTURE %	9.3	8.5	8.7			
MAX DENSITY PCF	123.0	123.0	123.0			
OPTIMUM MOISTURE %	10.4	10.4	10.4			
PERCENT COMPACTION	93.3	94.1	92.2			
REQUIRED COMPACTION %	80.0	80.0	80.0			
IN/OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN			

GAUGE NO 23205 DATE OF STANDARDIZATION 09/08/97 VALUE OF STANDARDIZATION M 632 D 3007

PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: NONE

CC: E. MITCHELL BECHTEL
D. MADSEN
MTL BECHTEL FILES

SEP 10 1997

NUCLEAR DENSITY ASTM D2922-91 CAMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED 09/10/97 PAGE 1 OF 2

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests WEST LAGOON

Tested by D. HERRINGTON Date Tested 09/08/97 Checked by V. [illegible]

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/08/97

LABORATORY NO	820	821	822	823	824	825
TEST LOCATION	1	2	3	4	5	6
DEPTH OF PROBE	8"	8"	8"	8"	8"	8"
DEPTH OF TESTS	1' Placed	1' Placed	1' Placed	1' Placed	1' Placed	1' Placed
DRY DENSITY-PCF	109.8	120.3	111.2	115.8	115.5	116.6
MOISTURE %	7.6	8.5	8.5	7.5	7.7	8.0
MAX DENSITY PCF	123.0	123.0	123.0	123.0	123.0	123.0
OPTIMUM MOISTURE %	10.4	10.4	10.4	10.4	10.4	10.4
PERCENT COMPACTION	89.3	97.8	90.4	94.1	93.9	94.8
REQUIRED COMPACTION %	80.0	80.0	80.0	80.0	80.0	80.0
IN / OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN

GAUGE NO 23205 DATE OF STANDARDIZATION 09/08/97 VALUE OF STANDARDIZATION M 632 D 3007

PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: NONE

CC: E. MITCHELL BECHTEL
D. MADSEN [illegible]
MTL BECHTEL FILES

SEP 1 0 1997

NUCLEAR DENSITY ASTM D2922-91 CAMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED 09/10/97 PAGE 2 OF 2

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests WEST LAGOON

Tested by D. HERRINGTON Date Tested 09/09/97 Checked by V. [illegible]

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/09/97

LABORATORY NO	826	827	828	N/A	N/A	N/A
TEST LOCATION	7	8	9			
DEPTH OF PROBE	6"	6"	6"			
DEPTH OF TESTS	1'6" Placed	1'6" Placed	1'6" Placed			
DRY DENSITY-PCF	118.4	117.5	117.1			
MOISTURE %	8.9	9.3	7.7			
MAX DENSITY PCF	123.0	123.0	123.0			
OPTIMUM MOISTURE %	10.4	10.4	10.4			
PERCENT COMPACTION	96.3	95.5	95.2			
REQUIRED COMPACTION %	80.0	80.0	80.0			
IN / OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN			

GAUGE NO 23205 DATE OF STANDARDIZATION 09/09/97 VALUE OF STANDARDIZATION M 632 D 3007

PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: NONE

CC: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

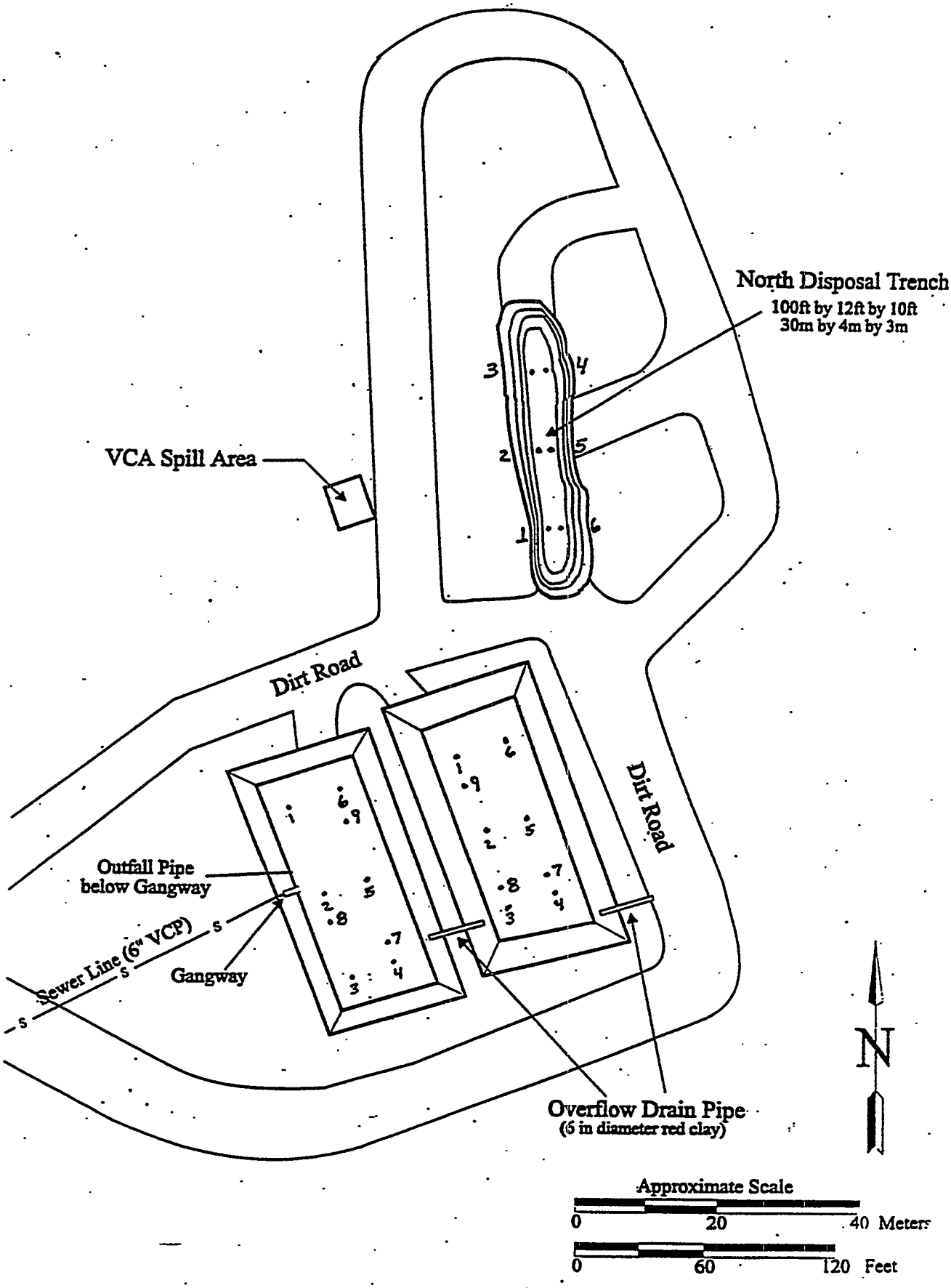


Figure 2
Roller Coaster Lagoons, North Disposal Trench,

SEP 2 2 1997

NUCLEAR DENSITY ASTM D2922-91 CAMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED: 09/22/97 PAGE 1 OF 1

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests NORTH DISPOSAL TRENCH

Tested by D. HERRINGTON Date Tested 09/18/97 Checked by L. D. Johnson

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/18/97

LABORATORY NO	848	849	850	851	852	853
TEST LOCATION	1	2	3	4	5	6
DEPTH OF PROBE	12"	12"	12"	12"	12"	12"
DEPTH OF TESTS	GRADE	GRADE	GRADE	GRADE	GRADE	GRADE
DRY DENSITY-PCF	116.7	117.0	112.1	117.0	120.5	117.2
MOISTURE %	7.6	6.7	7.1	7.2	6.6	7.4
MAX DENSITY PCF	123.0	123.0	123.0	123.0	123.0	123.0
OPTIMUM MOISTURE %	10.4	10.4	10.4	10.4	10.4	10.4
PERCENT COMPACTION	94.9	95.1	91.1	95.1	98.0	95.3
REQUIRED COMPACTION %	80.0	80.0	80.0	80.0	80.0	80.0
IN / OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN

GAUGE NO 23205 DATE OF STANDARDIZATION 09/18/97 VALUE OF STANDARDIZATION M 632 D 3007

PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: NONE

CC: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

SEP 22 1997

NUCLEAR DENSITY ASTM D2922-91 CAMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED: 09/22/97 PAGE 1 OF 1

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests WEST LAGOON

Tested by D. HERRINGTON Date Tested 09/18/97 Checked by L. D. Johnson

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/18/97

LABORATORY NO	854	855	856	857	858	859
TEST LOCATION	1	2	3	4	5	6
DEPTH OF PROBE	12"	12"	12"	12"	12"	12"
DEPTH OF TESTS	GRADE	GRADE	GRADE	GRADE	GRADE	GRADE
DRY DENSITY-PCF	114.5	118.3	116.9	117.5	112.4	117.0
MOISTURE %	7.4	5.8	5.8	6.9	6.5	5.7
MAX DENSITY PCF	123.0	123.0	123.0	123.0	123.0	123.0
OPTIMUM MOISTURE %	10.4	10.4	10.4	10.4	10.4	10.4
PERCENT COMPACTION	93.1	96.2	95.0	95.5	91.4	95.1
REQUIRED COMPACTION %	80.0	80.0	80.0	80.0	80.0	80.0
IN / OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN

GAUGE NO 23205 DATE OF STANDARDIZATION 09/18/97 VALUE OF STANDARDIZATION M 532 D 3007

PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: NONE

CC: E. MITCHELL BECHTEL
D. MADSEN ~~BECHTEL~~
MTL BECHTEL FILES

SEP 2 2 1997

NUCLEAR DENSITY ASTM D2922-91 CAMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED 09/22/97 PAGE 1 OF 1

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests EAST LAGOON

Tested by D. HERRINGTON Date Tested 09/18/97 Checked by R.D. Johnson

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/18/97

LABORATORY NO	860	861	862	863	864	865
TEST LOCATION	1	2	3	4	5	6
DEPTH OF PROBE	12"	12"	12"	12"	12"	12"
DEPTH OF TESTS	GRADE	GRADE	GRADE	GRADE	GRADE	GRADE
DRY DENSITY-PCF	118.3	117.6	117.2	115.4	115.2	117.8
MOISTURE %	6.7	6.4	5.5	6.3	6.8	6.0
MAX DENSITY PCF	123.0	123.0	123.0	123.0	123.0	123.0
OPTIMUM MOISTURE %	10.4	10.4	10.4	10.4	10.4	10.4
PERCENT COMPACTION	96.2	95.6	95.3	93.8	93.7	95.8
REQUIRED COMPACTION %	80.0	80.0	80.0	80.0	80.0	80.0
IN OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN	WITHIN

GAUGE NO 23205 DATE OF STANDARDIZATION 09/18/97 VALUE OF STANDARDIZATION M 632 D 3007

PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: NONE

CC: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

SEP 22 1997

NUCLEAR DENSITY ASTM D2922-91 CAMPBELL MC-2/MC-3	BECHTEL NEVADA MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193-8521	CHARGE #: C4RB10DE DATE TYPED: 09/22/97 PAGE 1 OF 1

Requested by D. MADSEN User/Agency BECHTEL Material SANDIA BORROW PIT

Project ROLLER COASTER Location of Tests EAST LAGOON & WEST LAGOON

Tested by D. HERRINGTON Date Tested 09/18/97 Checked by R.O. Johnson

Information transmitted to D. FINNEY By D. HERRINGTON How VERBAL Date 09/18/97

LABORATORY NO	866	867	868	N/A	N/A	N/A
TEST LOCATION	1	2	3			
DEPTH OF PROBE	12"	12"	12"			
DEPTH OF TESTS	-12"	-12"	-12"			
DRY DENSITY-PCF	108.1	107.9	112.0			
MOISTURE %	11.1	11.0	10.3			
MAX DENSITY PCF	123.0	123.0	123.0			
OPTIMUM MOISTURE %	10.4	10.4	10.4			
PERCENT COMPACTION	87.9	87.7	91.1			
REQUIRED COMPACTION %	80.0	80.0	80.0			
IN / OUT of SPECIFICATION	WITHIN	WITHIN	WITHIN			

GAUGE NO 23205 DATE OF STANDARDIZATION 09/18/97 VALUE OF STANDARDIZATION M 632 D 3007

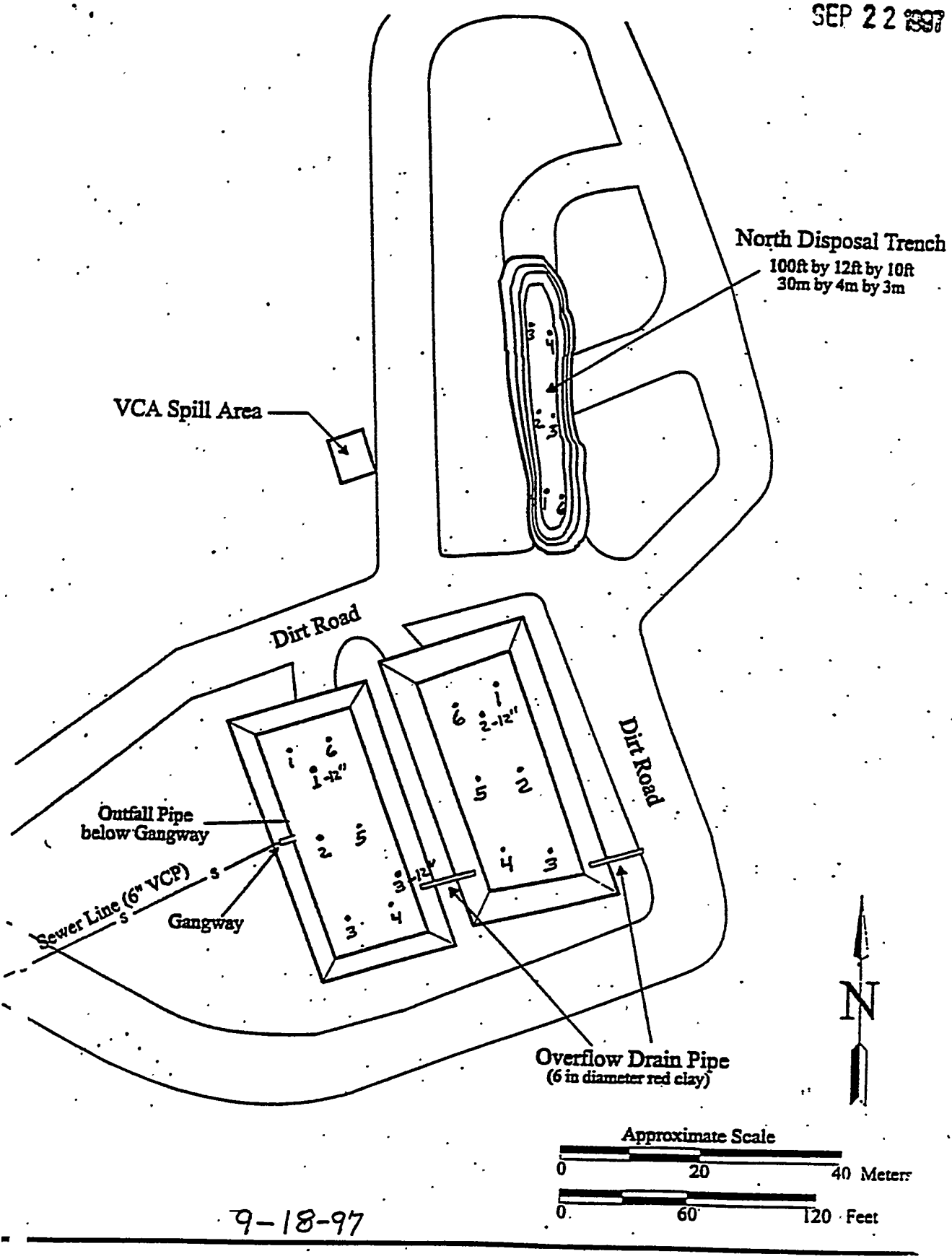
PLOT PLAN

SEE ATTACHED PLOT PLAN FOR TEST LOCATIONS

REMARKS: HOLES WERE DUG TO TEST AT -12"

CC: E. MITCHELL BECHTEL
D. MADSEN BECHTEL
MTL BECHTEL FILES

SEP 22 1997



9-18-97

Figure 2
Roller Coaster Lagoons, North Disposal Trench,

APPENDIX C

USE RESTRICTION DOCUMENTATION

USAF ACKNOWLEDGMENT LETTER

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 99TH AIR BASE WING (ACC)
NELLIS AIR FORCE BASE, NEVADA

JUL 15 1998

Colonel Michael F. Fukey
Director, Environmental Management
4349 Duffer Dr., Ste. 1601
Nellis AFB NV 89191-7007

Ms. Runore C. Wycoff,
Director, Environmental Restoration Division
DOE Nevada Operations Office
P.O. Box 98518
Las Vegas NV 89193-8518

ACKNOWLEDGEMENT OF CORRECTIVE ACTION UNIT (CAU) 404

Nellis Air Force Base (Nellis) has reviewed the U. S. Department of Energy's (DOE) Corrective Action Decision Document for Corrective Action Unit (CAU) 404. Nellis has the right to use this land for military purposes under Public Law 99-606, as amended, and Public Land Order 7131.

Nellis can only impose restrictions on its use of the land while under its control. For the above referenced site, these self-imposed restrictions by Nellis on its use of this section of NAFR (hereafter "use restrictions") will be placed in the Geographic Information System (GIS) for NAFR. The Range Management Office (RMO) at Nellis will administer use restrictions to ensure that there are institutional controls on users of the NAFR, ensuring that they are aware of these restrictions located in the GIS, which should assist the DOE in working with the state regulators on Corrective Active Units. If RMO determines that a proposed mission use would not comport with existing use restrictions or that there is a proposed transfer/relinquishment of all or part of the NAFR, it will notify DOE of the proposed transfer/relinquishment. Then DOE must contact the regulators or transferee/returnee to address and resolve cleanup issues associated with the proposed use or transfer/relinquishment.

If RMO needs to modify its use restrictions thereby causing additional cleanup requirements to meet the proposed land-use scenarios, then DOE will clean the restricted land up to the level to meet the proposed land-use scenarios in an expeditious manner so that RMO may amend the use restrictions.

Also, Nellis and DOE are negotiating a Memorandum of Understanding that will address DOE's future obligations to clean up any of its contaminated areas.

Please contact me at 652-6828 if you have any questions.

Sincerely

Michael F. Fukey

MICHAEL F. FUKEY, Colonel, USAF

cc:
HQAWC RMO/RML
HQ AWFC/JAV

CAU USE RESTRICTION FORM

CAU Use Restriction Information

CAU Number/Description: CAU 404 Roller Coaster Sewage Lagoons and North Disposal Trench, Tonopah Test Range, Nevada

Applicable CAS Numbers/Descriptions: CAS TA-03-001-TARC (Roller Coaster Sewage Lagoons) and CAS TA-21-001-TARC (Roller Coaster North Disposal Trench)

Contact (organization/project): DOE/NV Industrial Sites Project Manager

Surveyed Area (UTMs): N6,329,951.254 E494,518.273; N6,329,965.994 E494,561.086; N6,329,911.230 E494,532.054; N6,329,925.970 E494,574.868

Survey Date 09/25/97 **Survey Method (GPS, etc.)** GPS **Datum** NAD 83

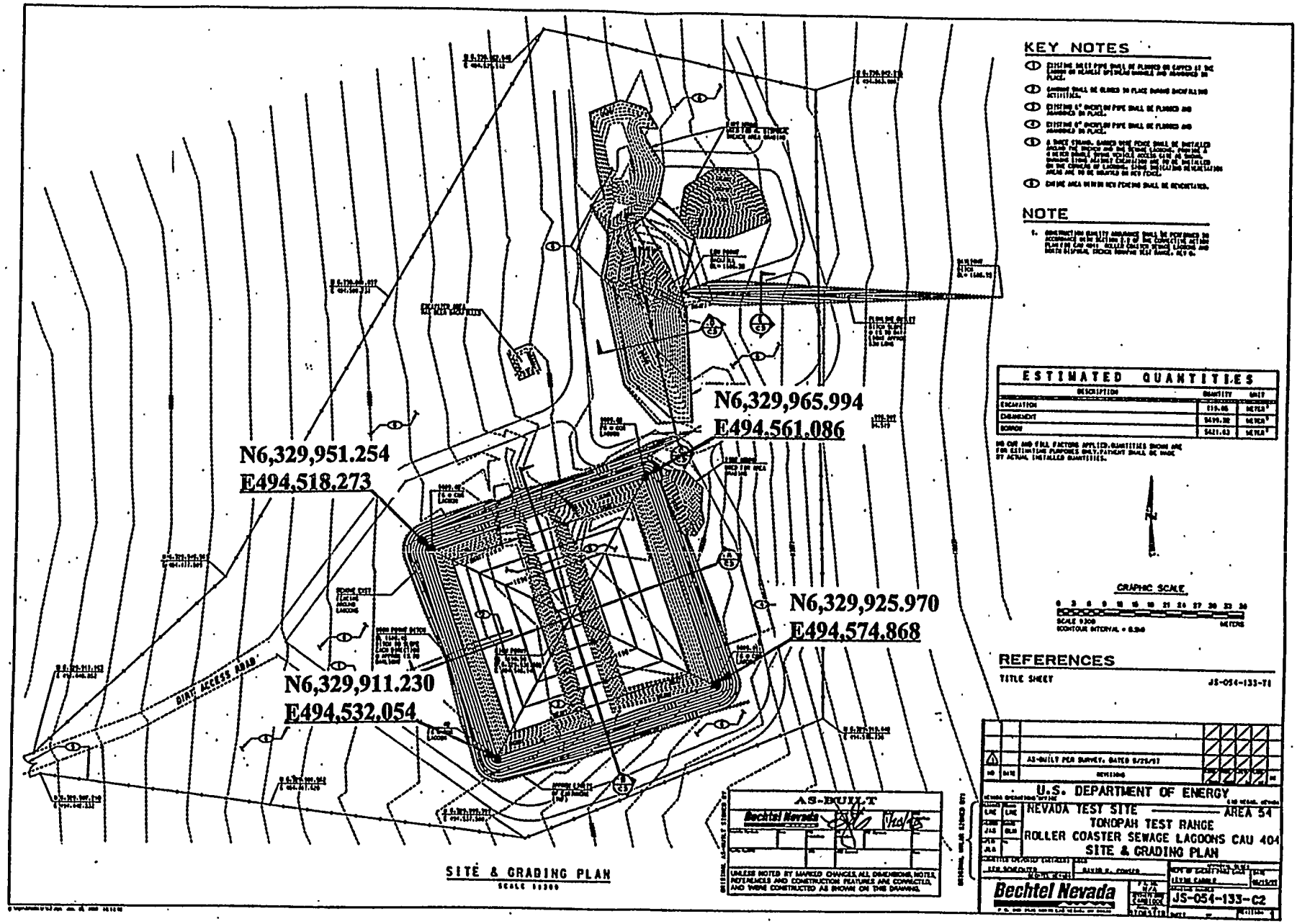
Use Restrictions

The future use of any land related to this Corrective Action Unit (CAU), as described by the above surveyed location, is restricted from any DOE or Air Force activity that may alter or modify the containment control as approved by the state and identified in the CAU Closure Report or other CAU documentation unless appropriate concurrence is obtained in advance.

Comments: The North Disposal Trench (CAS TA-21-001-TA-RC) was clean closed by removal and disposal of the debris and backfilling. See the Closure Report for additional information on the condition of the site(s) and any monitoring and/or inspection requirements.

Submitted By: Kevin Cabble **Date:** 8/4/98

Attachments: Survey Map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E494,518.273
N6,329,925.970
E494,574.868
N6,329,911.230
E494,532,054
DIRT ACCESS ROAD
SITE & GRADING PLAN
SCALE 1:300
KEY NOTES
NOTE
ESTIMATED QUANTITIES
DESCRIPTION
QUANTITY
UNIT
EXCAVATION
EMBANKMENT
BORROW
REFERENCES
TITLE SHEET
JS-054-133-T1
GRAPHIC SCALE
AS-BUILT
Bechtel Nevada
UNLESS NOTED BY MARKED CHANGES, ALL DIMENSIONS, NOTES, REFERENCES AND CONSTRUCTION FEATURES ARE CORRECTED AND WERE CONSTRUCTED AS SHOWN ON THIS DRAWING.
AS-BUILT PER SURVEY, DATED 5/25/97
REVISIONS
U.S. DEPARTMENT OF ENERGY
NEVADA TEST SITE
AREA 54
TONOPAH TEST RANGE
ROLLER COASTER SEWAGE LAGOONS CAU 404
SITE & GRADING PLAN
Bechtel Nevada
JS-054-133-C2

APPENDIX D

POST-CLOSURE MONITORING CHECKLIST

ROLLER COASTER LAGOONS & N. DISPOSAL TRENCH, POST-CLOSURE MONITORING CHECKLIST

Date of Last Inspection:	Reason for Last Inspection:
Responsible Agency:	Project Manager:
Inspection Date:	
Inspector (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.
3. Any checklist line item marked by an inspector in a SHADED BOX, must be fully explained or an appropriate reference to previous reports provided. The purpose of this requirement is to provide a written explanation of inspector observations and the inspector's rationale for conclusions and recommendations. Explanations are to be placed on additional attachments and cross-referenced appropriately. Explanations, in addition to narrative, will take the form of sketches, measurements, annotated site maps.
4. The site inspection is a walking inspection of the entire site including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist.
5. A standard set of color 35mm photographs is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.
6. This unit will be inspected biannually with formal reporting to the Nevada Division of Environmental Protection to be done annually. The annual report will include an executive summary, this inspection checklist with field notes and photo log attached, and recommendations and conclusions.

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

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

ROLLER COASTER LAGOONS & N. DISPOSAL TRENCH, POST-CLOSURE MONITORING CHECKLIST

3. Waste Unit cover.	YES	NO	EXPLANATION
a. Is there evidence of settling?			
b. Is there cracking?			
c. Is there evidence of erosion around the cap (wind or water)?			
d. Is there evidence of animal burrowing?			
e. Have the site markers been disturbed by man or natural processes?			
f. Do natural processes threaten to integrity of any cover or site marker?			
g. Other?			
4. Vegetative cover.			
a. Is perimeter fence or mesh fencing damaged?			
b. Is there evidence of horses or rabbits on site?			
c. Is organic mulch adequate to prevent erosion?			
d. Are weedy annual plants present? If yes, are they a problem?			
e. Are seeded plant species found on site?			
f. Is there evidence of plant mortality?			
5. Photo Documentation			
a. Has a photo log been prepared?			
c. Number of photos exposed ( )			

D. FIELD CONCLUSIONS

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

6. Rationale for field conclusions:

E. CERTIFICATION

I have conducted an inspection of the Roller Coaster Sewage Lagoons & North Disposal Trench, CAU 404, at the TTR in accordance with the Post-Closure Monitoring Plan (see Closure Report) as recorded on this checklist, attached sheets, field notes, photo logs, and photographs.

Chief Inspector's Signature:	Printed Name:
Title:	Date:

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DOE/NV--11718-187-ADD-REV 1

Addendum to the Closure Report for Corrective Action Unit 404: Roller Coaster Sewage Lagoons and North Disposal Trench, Tonopah Test Range, Nevada

Controlled Copy No.: ___
Revision No.: 1

February 2009

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DOE/NV--11718-187-ADD-REV 1

ADDENDUM TO THE CLOSURE REPORT FOR CORRECTIVE ACTION UNIT 404: ROLLER COASTER SEWAGE LAGOONS AND NORTH DISPOSALTRENCH, TONOPAH TEST RANGE, NEVADA

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
Las Vegas, Nevada

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February 2009

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Addendum to the Closure Report for Modification of the Use Restriction

This document constitutes an addendum to the September 1998, Closure Report for Corrective Action Unit 404: Roller Coaster Lagoons and Trench, Tonopah Test Range, Nevada as described in the document *Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office Federal Facility Agreement and Consent Order* (UR Modification document) dated February 2008. The UR Modification document was approved by NDEP on February 26, 2008. The approval of the UR Modification document constituted approval of each of the recommended UR modifications. In conformance with the UR Modification document, this addendum consists of:

- This cover page that refers the reader to the UR Modification document for additional information
- The cover and signature pages of the UR Modification document
- The NDEP approval letter
- The corresponding section of the UR Modification document

This addendum provides the documentation justifying the modification of the UR for CAS TA-03-001-TARC Roller Coaster Lagoons.

This UR was established as part of *Federal Facility Agreement and Consent Order* (FFACO) corrective actions and was based on the presence of contaminants at concentrations greater than the action levels established at the time of the initial investigation (FFACO, 1996; as amended August 2006).

Since this UR was established, practices and procedures relating to the implementation of risk-based corrective actions (RBCA) have changed. Therefore, this UR was re-evaluated against the current RBCA criteria as defined in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006c). This re-evaluation consisted of comparing the original data (used to define the need for the UR) to risk-based final action levels (FALs) developed using the current Industrial Sites RBCA process.

The re-evaluation resulted in a recommendation to modify the UR for CAS TA-03-001-TARC to an administrative UR. Administrative URs differ from standard URs in that they do not require onsite postings (i.e., signs) or other physical barriers (e.g., fencing, monuments), and they do not require periodic inspections (see Section 6.2 of the Industrial Sites Project Establishment of Final Action Levels [NNSA/NSO, 2006c]). This Administrative UR was based on a "Remote Work Sites" future land use scenario that was used to calculate the FAL. The administrative UR will protect workers from an exposure exceeding that used in the calculation of the FAL (i.e., 336 hours per year). Any proposed activity within these use restricted areas that would potentially cause an exposure exceeding this exposure limit would require approval from the Nevada Division of Environmental Protection (NDEP).

Requirements for inspecting and maintaining this UR will be canceled, and the postings and signage at each site will be removed. Fencing and posting may be present at these sites that are unrelated to the FFACO URs such as for radiological control purposes as required by the *NV/YMP Radiological Control Manual* (NNSA/NSO, 2004f). This modification will not affect or modify any non-FFACO requirements for fencing, posting, or monitoring at these sites.

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DOE/NV--1237

Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office

Federal Facility Agreement and Consent Order

Controlled Copy No.: ___
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February 2008

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Environmental Restoration
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U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office

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Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
Federal Facility Agreement and Consent Order

Approved by: /s/ Kevin J. Cabble Date: 02/05/2008

Kevin J. Cabble
Federal Sub-Project Director
Industrial Sites Sub-Project

Approved by: /s/ John B. Jones Date: 02/04/2008

John B. Jones
Acting Federal Project Director
Environmental Restoration Project

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

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

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

February 26, 2008

John B. Jones
Acting Federal Project Director
Environmental Restoration Project
National Nuclear Security Administration
Nevada Site Office
P. O. Box 98518
Las Vegas, NV 89193-8518

RE: Approval of Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office *Federal Facility Agreement and Consent Order*

Dear Mr. Jones:

The Nevada Division of Environmental Protection, Bureau of Federal Facilities (NDEP) staff has received and reviewed the February 2008 final report for Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office. The NDEP approves the requested changes to the previously agreed upon use restrictions for those Corrective Action Sites (CASs) as described in the report.

Address any questions regarding this matter to either Ted Zaferatos at (702) 486-2850, ext. 234, or me at (702) 486-2850, ext. 231.

Sincerely

/s/ Tim Murphy

T.H. Murphy
Chief
Bureau of Federal Facilities

TZ

cc: E.F. DiSanza, WMP, NNSA/NSO
FFACO Group, PSG, NNSA/NSO, Las Vegas, NV
David C. Loewer, DTRA/CXT1, M/S 645, Mercury, NV
W.R. Griffin, SNJV/DTRA, M/S 645, Mercury, NV
T.A. Thiele, NSTec, Las Vegas, NV
R.F. Boehlecke, SNJV, Las Vegas, NV
K. J. Cabble, ERP, NNSA/NSO, Las Vegas, NV
John Wong, Jeff MacDougall, Dennis Nicodemus, NDEP Las Vegas, NV

23.0 CAU 404, CAS TA-03-001-TARC – Roller Coaster Lagoons

23.1 CAS Description

The CAU consists of two separate areas: CAS TA-03-001-TARC, Roller Coaster Lagoons, and CAS TA-21-001-TARC, Roller Coaster N. Disposal Trench. Both CASs are co-located approximately 4.3 mi south of Area 3 along the Main Road South on the Tonopah Test Range (TTR). Associated with the CAU is an additional area where a small spill occurred during Voluntary Corrective Action (VCA) activities (DOE/NV, 1996).

The Roller Coaster Lagoons site consists of two large unlined sewage lagoons that received liquid sanitary wastes from the Operation Roller Coaster man camp. The man camp supported up to 600 people for approximately two months in 1963. The sanitary sewer system is approximately 120 by 75 by 10 ft. Subsequent to Operation Roller Coaster, the lagoons received debris from construction and range cleanup activities conducted on the TTR (DOE/NV, 1996).

The North Disposal Trench, located north of the eastern-most lagoon, was installed in 1963 to receive solid waste and construction debris from the Operation Roller Coaster man camp. Subsequent to Operation Roller Coaster, the trench continued to receive construction debris and range cleanup debris (including ordnance) from Sandia National Laboratories (SNL) and other operators. The trench is approximately 100 by 12 by 10 ft (DOE/NV, 1996).

A VCA operation removed ordnance and other debris from the two lagoons and trench. The debris and waste was segregated into: (1) recyclable ordnance and debris, (2) nonrecyclable debris, (3) hazardous waste, (4) suspected asbestos-containing materials, and (5) hydrocarbon-contaminated material. All items removed from the lagoons and trench, were screened for radiological contamination with handheld instruments and radiation swipes. No radiological contamination was detected (DOE/NV, 1996).

The UR applies only to CAS TA-03-001-TARC, Roller Coaster Lagoons as the North Disposal Trench (CAS TA-21-001-TARC) was clean closed by removal and disposal of the debris and backfilling the pit to grade (DOE/NV, 1998a).

23.2 Current Use Restriction Description

The future use of any land affected by this UR is restricted from any DOE or Air Force activity that may alter or modify the containment control, as approved by the state and identified in the

CAU CR or other CAU documentation, unless appropriate concurrence is obtained in advance. The monitoring will consist of biannual visual inspections of:

- The cover for condition (e.g., subsidence, significant erosion unauthorized excavation) and plant development.
- The fence and signs to determine whether repairs are required.

Nonscheduled inspections may also be required after severe weather events such as heavy rainfall, flash flooding, and high winds. Any identified maintenance and repair requirements will be remedied within 90 days of discovery and documented in writing at the time of repair. Monitoring of the vegetative cover will be conducted during the first, third, and fifth year after revegetation. Monitoring during the first year will determine whether germination of seeded plant species has occurred. By the third year, plant establishment will be evaluated. By the fifth year, long-term survival can be predicted. Concurrently, wildlife use of the site will be evaluated with the objective of determining whether burrowing animals have moved onto the site and to what depth they might be expected to penetrate the cover. The erosion condition of the soil will be evaluated using a qualitative erosion condition classification developed by the Bureau of Land Management. Information gathered will be compared to natural conditions and will be used in assessing whether or not remedial action is necessary so that a viable vegetative cover is established (DOE/NV, 1998a).

It should be noted that the UR description includes a comment that the N. Disposal Trench was clean closed. The N. Disposal Trench is not included in the UR.

23.3 Basis for Current Use Restriction

Samples from this CAU were analyzed for VOCs, SVOCs, RCRA metals, TPH, and pesticides. In both the East and West Lagoons, dichlorodiphenyl-dichlorethylene (DDE), dichlorodiphenyl-trichloroethane (DDT), and dichlorodiphenyl-dichloroethane (DDD) concentrations were identified in the surface soil samples above residential PRGs. In the West Lagoon, DDE and DDT concentrations exceeded industrial PRGs (DOE/NV, 1997).

Table 23-1 contains analytical results of all COCs at CAU 404 that are the basis for the current UR. The sample matrix for all samples is soil.

Table 23-1
Sample Results for COCs at CAU 404
Used To Establish Current Use Restriction

Sample ID	Lagoon	DDD	DDE	DDT
		Residential Soil PRGs		
		1,851 μg/kg	1,307 μg/kg	1,307 μg/kg
		Industrial Soil PRGs		
		7,948 μg/kg	5,610 μg/kg	5,610 μg/kg
TTR00084	West	--	2,200	2,500
TTR00087	West	3,800	3,500	9,900
TTR00095	West	2,300	8,400	7,900
TTR00113	West	5,400	15,000	14,000
TTR00076	East	--	--	1,900
TTR00077	East	--	1,600	2,600

DDD = Dichlorodiphenyl-dichloroethane
DDE = Dichlorodiphenyl-dichlorethylene
DDT = Dichlorodiphenyl-trichloroethane
ID = Identification
PRG = Preliminary remediation goal
μg/kg = Micrograms per kilogram

-- = No detects above action levels

23.4 Basis for Use Restriction Modification

The revised FALs for DDE, DDT, and DDD as listed in Table 20-2 were established using the Tier 2-based FAL process as presented in Section 2.2.2. These FALs were calculated using the Remote Work Area site-specific exposure scenario. This scenario assumes that a worker will be exposed to the site contaminants for 336 hours per year for 25 years (a total exposure equivalent of 1,050 work days). This exposure scenario is for remote work sites that are not occupied during normal work assignments but where workers may occasionally be sent to perform work (NNSA/NSO, 2006c). Because CAS TA-03-001-TARC, Roller Coaster Lagoons is located in an inactive area approximately 4.3 mi south of any industrial type sites (Area 3), no current or foreseeable future activities would cause any worker to be exposed to this site for a period of time exceeding that assumed in the remote work area scenario (i.e., 336 hours per year for 25 years).

The UR modification would be to modify the UR for CAS TA-03-001-TARC, Roller Coaster Lagoons to an administrative UR as described in Section 2.0. This administrative UR would restrict any activity that would result in any worker being within the UR boundary for a lifetime-duration of more than 1,050 total workdays.

Table 23-2 presents the sample results that are the basis for the current UR and demonstrate that none exceed the revised FALs (based on a Remote Work Area land use scenario).

Table 23-2
Revised Final Action Levels for CAU 404

Sample ID	Lagoon	DDD	DDE	DDT
		Revised FALs 33,900 µg/kg	Revised FALs 23,900 µg/kg	Revised FALs 21,400 µg/kg
TTR00084	West	--	2,200	2,500
TTR00087	West	3,800	3,500	9,900
TTR00095	West	2,300	8,400	7,900
TTR00113	West	5,400	15,000	14,000
TTR00076	East	--	--	1,900
TTR00077	East	--	1,600	2,600

DDD = Dichlorodiphenyl-dichloroethane
DDE = Dichlorodiphenyl-dichlorethylene
DDT = Dichlorodiphenyl-trichloroethane
ID = Identification
FAL = Final action level
µg/kg = Micrograms per kilogram

-- = No detects above original action levels

23.5 Proposed Modification

Implement an administrative UR for the East and West Lagoons as described in Section 2.0 restricting any activity that would result in any worker being within the UR boundary for a lifetime-duration of more than 1,050 total work days. Remove all fencing and postings as well as inspection and maintenance requirements.

References

DOE/NV, see U.S. Department of Energy, Nevada Operations Office.

FFACO, see *Federal Facility Agreement and Consent Order.*

Federal Facility Agreement and Consent Order. 1996 (as amended). Agreed to by the State of Nevada; U.S. Department of Energy, Environmental Management; U.S. Department of Defense; and U.S. Department of Energy, Legacy Management.

NNSA/NSO, see U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2004f. *NV/YMP Radiological Control Manual*, DOE/NV--11718-079, Rev. 5. Prepared by Bechtel Nevada. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2006c. *Industrial Sites Project Establishment of Final Action Levels*, Rev. 0, DOE/NV--1107. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1996. *Corrective Action Investigation Plan: Roller Coaster Lagoons and North Disposal Trench, Tonopah Test Range, Nevada*, Rev. 0, DOE/NV--425. June. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1997. *Corrective Action Decision Document for the Roller Coaster Lagoons and North Disposal Trench (Corrective Action Unit No. 404)*, Rev. 0, DOE/NV--474. March. Las Vegas, NV.

U.S. Department of Energy, Nevada Operations Office. 1998a. *Closure Report for Corrective Action Unit 404: Roller Coaster Sewage Lagoons and North Disposal Trench, Tonopah Test Range, Nevada*, Rev. 0, DOE/NV/11718-187. September. Las Vegas, NV.

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RECORD OF TECHNICAL CHANGE

Technical Change No. ROTC CR-1 Page 1 of 1

Project/Job No. Industrial Sites Date: November 21, 2008

Project/Job Name Closure Report for Corrective Action Unit 404: Roller Coaster Sewage Lagoons and North Disposal Trench, Tonopah Test Range, Nevada, Revision 0, September 1998

The following technical changes (including justification) are requested by:

/s/ Wayne R. Griffin — SNJV Industrial Sites Project Manager

Wayne Griffin (Title)

Description of Change:

Delete "and CAS TA-21-001-TARC (Roller Coaster North Disposal Trench)" from the *Applicable CAS Numbers/Descriptions* section of the *CAU Use Restrictions Information* form in Appendix C, *Use Restriction Documentation.*

Justification:

CAS TA-21-001-TARC, Roller Coaster N. Disposal Trench was erroneously listed in the UR form for CAS TA-03-001-TARC, Roller Coaster Lagoons. No use restriction is required for this CAS as the CAS was clean closed and verification samples taken after the corrective actions were completed did not contain any contaminant concentrations greater than action levels. Therefore, there will not be a UR associated with CAS TA-21-001-TARC, Roller Coaster N. Disposal Trench.

The project time will be **Unchanged.**

Applicable Project-Specific Document(s): **Closure Report for Corrective Action Unit 404: Roller Coaster Sewage Lagoons and North Disposal Trench, Tonopah Test Range, Nevada (DOE/NV-11718-187) September 1998.**

CC:

Approved By: /s/ Kevin Cabble Date 11/21/2008
NNSA/NSO Federal Subproject Director

/s/ Robert F. Boehlecke Date 11/21/2008
NNSA/NSO Federal Project Director

NDEP Concurrence Yes X No __ Date 11/24/2008
NDEP Signature /s/ Jeff MacDougall

Contract Change Order Required Yes __ No ___

Contract Change Order No. _____

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DOE/NV--11718-187-ADD

Addendum to the Closure Report for Corrective Action Unit 404: Roller Coaster Lagoons and Trench, Tonopah Test Range, Nevada

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October 2008

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DOE/NV--11718-187-ADD

ADDENDUM TO THE CLOSURE REPORT FOR CORRECTIVE ACTION UNIT 404: ROLLER COASTER LAGOONS AND TRENCH, TONOPAH TEST RANGE, NEVADA

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Addendum to the Closure Report for Modification of the Use Restriction

This document constitutes an addendum to the September 1998, Closure Report for Corrective Action Unit 404: Roller Coaster Lagoons and Trench, Tonopah Test Range, Nevada as described in the document *Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office Federal Facility Agreement and Consent Order* (UR Modification document) dated February 2008. The UR Modification document was approved by NDEP on February 26, 2008. The approval of the UR Modification document constituted approval of each of the recommended UR modifications. In conformance with the UR Modification document, this addendum consists of:

- This cover page that refers the reader to the UR Modification document for additional information
- The cover and signature pages of the UR Modification document
- The NDEP approval letter
- The corresponding section of the UR Modification document

This addendum provides the documentation justifying the cancellation of the URs for:

- CAS TA-03-001-TARC Roller Coaster Lagoons
- CAS TA-21-001-TARC Roller Coaster N. Disposal Trench

These URs were established as part of *Federal Facility Agreement and Consent Order* (FFACO) corrective actions and were based on the presence of contaminants at concentrations greater than the action levels established at the time of the initial investigation (FFACO, 1996; as amended August 2006).

Since these URs were established, practices and procedures relating to the implementation of risk-based corrective actions (RBCA) have changed. Therefore, these URs were re-evaluated against the current RBCA criteria as defined in the *Industrial Sites Project Establishment of Final Action Levels* (NNSA/NSO, 2006c). This re-evaluation consisted of comparing the original data (used to define the need for the URs) to risk-based final action levels (FALs) developed using the current Industrial Sites RBCA process.

The re-evaluation resulted in a recommendation to modify these URs to administrative URs. Administrative URs differ from standard URs in that they do not require onsite postings (i.e., signs) or other physical barriers (e.g., fencing, monuments), and they do not require periodic inspections (see Section 6.2 of the Industrial Sites Project Establishment of Final Action Levels [NNSA/NSO, 2006c]). These Administrative URs were based on a "Remote Work Sites" future land use scenario that was used to calculate the FAL. The administrative UR will protect workers from an exposure exceeding that used in the calculation of the FAL (i.e., 336 hours per year). Any proposed activity within these use restricted areas that would potentially cause an exposure exceeding this exposure limit would require approval from the Nevada Division of Environmental Protection (NDEP).

Requirements for inspecting and maintaining these URs will be canceled, and the postings and signage at each site will be removed. Fencing and posting may be present at these sites that are unrelated to the FFACO URs such as for radiological control purposes as required by the *NV/YMP Radiological Control Manual* (NNSA/NSO, 2004f). This modification will not affect or modify any non-FFACO requirements for fencing, posting, or monitoring at these sites.

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DOE/NV--1237

Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office

Federal Facility Agreement and Consent Order

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Revision No.: 0

February 2008

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

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Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
Federal Facility Agreement and Consent Order

Approved by: /s/ Kevin J. Cabble Date: 02/05/2008

Kevin J. Cabble
Federal Sub-Project Director
Industrial Sites Sub-Project

Approved by: /s/ John B. Jones Date: 02/04/2008

John B. Jones
Acting Federal Project Director
Environmental Restoration Project

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

Jim Gibbons, Governor
Allen Biaggi, Director
Leo M. Drozdoff, P.E., Administrator

February 26, 2008

John B. Jones
Acting Federal Project Director
Environmental Restoration Project
National Nuclear Security Administration
Nevada Site Office
P. O. Box 98518
Las Vegas, NV 89193-8518

RE: Approval of Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office *Federal Facility Agreement and Consent Order*

Dear Mr. Jones:

The Nevada Division of Environmental Protection, Bureau of Federal Facilities (NDEP) staff has received and reviewed the February 2008 final report for Recommendations and Justifications for Modifications for Use Restrictions Established under the U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office. The NDEP approves the requested changes to the previously agreed upon use restrictions for those Corrective Action Sites (CASs) as described in the report.

Address any questions regarding this matter to either Ted Zaferatos at (702) 486-2850, ext. 234, or me at (702) 486-2850, ext. 231.

Sincerely

/s/ Tim Murphy

T.H. Murphy
Chief
Bureau of Federal Facilities

TZ

cc: E.F. DiSanza, WMP, NNSA/NSO
FFACO Group, PSG, NNSA/NSO, Las Vegas, NV
David C. Loewer, DTRA/CXT1, M/S 645, Mercury, NV
W.R. Griffin, SNJV/DTRA, M/S 645, Mercury, NV
T.A. Thiele, NSTec, Las Vegas, NV
R.F. Boehlecke, SNJV, Las Vegas, NV
K. J. Cabble, ERP, NNSA/NSO, Las Vegas, NV
John Wong, Jeff MacDougall, Dennis Nicodemus, NDEP Las Vegas, NV

23.0 CAU 404, CAS TA-03-001-TARC – Roller Coaster Lagoons, and TA-21-001-TARC – Roller Coaster N. Disposal Trench

23.1 CAS Descriptions

The CAU consists of two separate areas: CAS TA-03-001-TARC, Roller Coaster Lagoons, and CAS TA-21-001-TARC, Roller Coaster N. Disposal Trench. Both CASs are co-located approximately 4.3 mi south of Area 3 along the Main Road South on the Tonopah Test Range (TTR). Associated with the CAU is an additional area where a small spill occurred during Voluntary Corrective Action (VCA) activities (DOE/NV, 1996).

The Roller Coaster Lagoons site consists of two large unlined sewage lagoons that received liquid sanitary wastes from the Operation Roller Coaster man camp. The man camp supported up to 600 people for approximately two months in 1963. The sanitary sewer system is approximately 120 by 75 by 10 ft. Subsequent to Operation Roller Coaster, the lagoons received debris from construction and range cleanup activities conducted on the TTR (DOE/NV, 1996).

The North Disposal Trench, located north of the eastern-most lagoon, was installed in 1963 to receive solid waste and construction debris from the Operation Roller Coaster man camp. Subsequent to Operation Roller Coaster, the trench continued to receive construction debris and range cleanup debris (including ordnance) from Sandia National Laboratories (SNL) and other operators. The trench is approximately 100 by 12 by 10 ft (DOE/NV, 1996).

A VCA operation removed ordnance and other debris from the two lagoons and trench. The debris and waste was segregated into: (1) recyclable ordnance and debris, (2) nonrecyclable debris, (3) hazardous waste, (4) suspected asbestos-containing materials, and (5) hydrocarbon-contaminated material. All items removed from the lagoons and trench, were screened for radiological contamination with handheld instruments and radiation swipes. No radiological contamination was detected (DOE/NV, 1996).

The North Disposal Trench (CAS TA-21-001-TARC) was clean closed by removal and disposal of the debris and backfilling the pit to grade (DOE/NV, 1998a).

23.2 Current Use Restriction Description

The future use of any land affected by this UR is restricted from any DOE or Air Force activity that may alter or modify the containment control, as approved by the state and identified in the

CAU CR or other CAU documentation, unless appropriate concurrence is obtained in advance. The monitoring will consist of biannual visual inspections of:

- The cover for condition (e.g., subsidence, significant erosion unauthorized excavation) and plant development.
- The fence and signs to determine whether repairs are required.

Nonscheduled inspections may also be required after severe weather events such as heavy rainfall, flash flooding, and high winds. Any identified maintenance and repair requirements will be remedied within 90 days of discovery and documented in writing at the time of repair. Monitoring of the vegetative cover will be conducted during the first, third, and fifth year after revegetation. Monitoring during the first year will determine whether germination of seeded plant species has occurred. By the third year, plant establishment will be evaluated. By the fifth year, long-term survival can be predicted. Concurrently, wildlife use of the site will be evaluated with the objective of determining whether burrowing animals have moved onto the site and to what depth they might be expected to penetrate the cover. The erosion condition of the soil will be evaluated using a qualitative erosion condition classification developed by the Bureau of Land Management. Information gathered will be compared to natural conditions and will be used in assessing whether or not remedial action is necessary so that a viable vegetative cover is established (DOE/NV, 1998a).

It should be noted that the UR description includes a comment that the N. Disposal Trench was clean closed. The N. Disposal Trench is not included in the UR boundary.

23.3 Basis for Current Use Restriction

Samples from this CAU were analyzed for VOCs, SVOCs, RCRA metals, TPH, and pesticides. Contaminant levels were below PALs at the N. Disposal Trench CAS; therefore, it is not included in the UR boundary (DOE/NV, 1997). In both the East and West Lagoons, dichlorodiphenyl-dichlorethylene (DDE), dichlorodiphenyl-trichloroethane (DDT), and dichlorodiphenyl-dichloroethane (DDD) concentrations were identified in the surface soil samples above residential PRGs. In the West Lagoon, DDE and DDT concentrations exceeded industrial PRGs.

Table 23-1 contains analytical results of all COCs at CAU 404 that are the basis for the current UR. The sample matrix for all samples is soil.

Table 23-1
Sample Results for COCs at CAU 404
Used To Establish Current Use Restriction

Sample ID	Lagoon	DDD	DDE	DDT
		Residential Soil PRGs		
		1,851 μg/kg	1,307 μg/kg	1,307 μg/kg
		Industrial Soil PRGs		
		7,948 μg/kg	5,610 μg/kg	5,610 μg/kg
TTR00084	West	--	2,200	2,500
TTR00087	West	3,800	3,500	9,900
TTR00095	West	2,300	8,400	7,900
TTR00113	West	5,400	15,000	14,000
TTR00076	East	--	--	1,900
TTR00077	East	--	1,600	2,600

DDD = Dichlorodiphenyl-dichloroethane
DDE = Dichlorodiphenyl-dichlorethylene
DDT = Dichlorodiphenyl-trichloroethane
ID = Identification
PRG = Preliminary remediation goal
μg/kg = Micrograms per kilogram

-- = No detects above action levels

23.4 Basis for Use Restriction Modification

The revised FALs for DDE, DDT, and DDD as listed in Table 20-2 were established using the Tier 2-based FAL process as presented in Section 2.2.2. These FALs were calculated using the Remote Work Area site-specific exposure scenario. This scenario assumes that a worker will be exposed to the site contaminants for 336 hours per year for 25 years (a total exposure equivalent of 1,050 work days). This exposure scenario is for remote work sites that are not occupied during normal work assignments but where workers may occasionally be sent to perform work (NNSA/NSO, 2006c). Because CAS TA-03-001-TARC, Roller Coaster Lagoons, and CAS TA-21-001-TARC, Roller Coaster N. Disposal Trench, are both located in an inactive area approximately 4.3 mi south of any industrial type sites (Area 3), no current or foreseeable future activities would cause any worker to be exposed to this site for a period of time exceeding that assumed in the remote work area scenario (i.e., 336 hours per year for 25 years).

The UR modification would be to remove CAS TA-21-001-TARC, Roller Coaster N. Disposal Trench, from the UR and to implement an administrative UR for the East and West Lagoons as described in Section 2.0. This administrative UR would restrict any activity that would result in any worker being within the UR boundary for a lifetime-duration of more than 1,050 total workdays.

Table 23-2 presents the sample results that are the basis for the current UR and demonstrate that none exceed the revised FALs (based on a Remote Work Area land use scenario).

Table 23-2
Revised Final Action Levels for CAU 404

Sample ID	Lagoon	DDD	DDE	DDT
		Revised FALs 33,900 µg/kg	Revised FALs 23,900 µg/kg	Revised FALs 21,400 µg/kg
TTR00084	West	--	2,200	2,500
TTR00087	West	3,800	3,500	9,900
TTR00095	West	2,300	8,400	7,900
TTR00113	West	5,400	15,000	14,000
TTR00076	East	--	--	1,900
TTR00077	East	--	1,600	2,600

DDD = Dichlorodiphenyl-dichloroethane
DDE = Dichlorodiphenyl-dichlorethylene
DDT = Dichlorodiphenyl-trichloroethane
ID = Identification
FAL = Final action level
µg/kg = Micrograms per kilogram

-- = No detects above original action levels

23.5 Proposed Modification

Implement an administrative UR for the East and West Lagoons as described in Section 2.0 restricting any activity that would result in any worker being within the UR boundary for a lifetime-duration of more than 1,050 total work days. Remove all fencing and postings as well as inspection and maintenance requirements. Remove the N. Disposal Trench from any UR because it was clean closed and contaminant levels were below PALs.

References

DOE/NV, see U.S. Department of Energy, Nevada Operations Office.

FFACO, see *Federal Facility Agreement and Consent Order.*

Federal Facility Agreement and Consent Order. 1996 (as amended). Agreed to by the State of Nevada; U.S. Department of Energy, Environmental Management; U.S. Department of Defense; and U.S. Department of Energy, Legacy Management.

NNSA/NSO, see U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office.

U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office. 2004f. *NV/YMP Radiological Control Manual*, DOE/NV--11718-079, Rev. 5. Prepared by Bechtel Nevada. Las Vegas, NV.

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U.S. Department of Energy, Nevada Operations Office. 1996. *Corrective Action Investigation Plan: Roller Coaster Lagoons and North Disposal Trench, Tonopah Test Range, Nevada*, Rev. 0, DOE/NV--425. June. Las Vegas, NV.

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