DOE/NV-235
UC-702

CORRECTIVE ACTION PLAN FOR CORRECTIVE ACTION UNIT 453: AREA 9 UXO LANDFILL TONOPAH TEST RANGE, NEVADA

Prepared for
U. S. Department of Energy
Nevada Operations Office
Under Contract No. DE-AC08-96NV11718

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Prepared by
Bechtel Nevada
Environmental Restoration

September 1998

DISCLAIMER

CORRECTIVE ACTION PLAN
FOR CORRECTIVE ACTION UNIT 453:
AREA 9 UXO LANDFILL
TONOPAH TEST RANGE, NEVADA

Approved by: _____ Date: 9/10/98
Janet L. Appenzeller-Wing, Project Manager
Industrial Sites Subproject

Approved by: _____ Date: 9/10/98
Runore C. Wycoff, Project Manager
Nevada Environmental Restoration Project

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ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
CADD	Corrective Action Decision Document
CAIP	Corrective Action Investigation Plan
CAP	Corrective Action Plan
CAS	Corrective Action Site
CAU	Corrective Action Unit
cm	centimeters
DOE	U. S. Department of Energy
EPA	U. S. Environmental Protection Agency
ft	feet
ft^3	cubic feet
in	inches
km	kilometers
lbs	pounds
m	meters
m^3	cubic meters
mi	miles
NDEP	Nevada Division of Environmental Protection
PRG	Preliminary Remediation Goal

ACRONYMS AND ABBREVIATIONS (continued)

RCRA	Resource Conservation and Recovery Act
sec	second
TTR	Tonopah Test Range
UXO	unexploded ordnance
yd^3	cubic yards

EXECUTIVE SUMMARY

This Corrective Action Plan (CAP) proposes the closure methods for the Area 9 Unexploded Ordnance (UXO) Landfill, Corrective Action Unit (CAU) 453, located at the Tonopah Test Range (TTR). The Area 9 UXO Landfill CAU consists of Corrective Action Site (CAS) No. 09-55-001-0952 and is comprised of three individual landfill cells designated as A9-1, A9-2, and A9-3.

The three landfill cells received wastes from daily operations at Area 9 and from range cleanups which were performed after weapons testing. Cell locations and contents were not well documented due to the unregulated disposal practices commonly associated with early landfill operations. However, site process knowledge indicates that the landfill cells were used for solid waste disposal, including disposal of UXO.

A corrective action investigation was performed in 1997 and results were reported in the Corrective Action Decision Document (CADD) (DOE, 1998). Although cell contents were not investigated directly due to the potential for live UXO, undisturbed soils beneath the cells were sampled using angled borings. The CADD reported that no hazardous waste was found in the corrective action investigation. The Environmental Protection Agency (EPA) Preliminary Remediation Goal (PRG) for arsenic was exceeded in approximately half of the soil samples collected from beneath the landfill cells and in five of six background soil samples. In addition, the highest arsenic concentration was measured in a background sample. The corrective action objective is to prevent inadvertent contact with landfill debris and live UXO, and will be accomplished with the following closure activities:

- Backfill and grade the open portion of Cell A9-1 to minimize surface depressions.
- Erect signs to warn of buried wastes, monuments to denote cell locations, and a perimeter fence to restrict access.
- Enact use restrictions to control access and prevent intrusive activities.

1.0 INTRODUCTION

This Corrective Action Plan (CAP) describes the selected corrective action alternative and proposes the closure methods for the Area 9 Unexploded Ordnance (UXO) Landfill Corrective Action Unit (CAU) No. 453 at the Tonopah Test Range (TTR). The TTR is located approximately 225 kilometers (km) (140 miles [mi]) northwest of Las Vegas, Nevada (Figure 1).

The Area 9 UXO Landfill CAU consists of a single Corrective Action Site (CAS) No. 09-55-001-0952, which is comprised of three northeast-southwest trending landfill cells designated as Cells A9-1, A9-2, and A9-3 (Figure 2). The landfill cells were operated during different time intervals beginning in the early 1960s through 1993, and received waste generated from daily operations at Area 9 and from range cleanups which occurred after weapons testing. Cell contents were not well documented during early landfill operations, but site process knowledge indicates they were used for solid waste disposal, including disposal of UXO. The landfill cells are backfilled to grade except for a depression in the northeast end of Cell A9-1 where all debris was removed during a voluntary cleanup performed in 1995 and described in the Corrective Action Investigation Plan (CAIP) (Department of Energy [DOE], 1997).

The CAIP (DOE, 1997) described how cell locations were identified from worker interviews, TTR reports, historical aerial photographs, and geophysical surveys. The Corrective Action Decision Document (CADD) (DOE, 1998) described the 1997 field investigation to characterize the landfill cells. Buried contents of the landfill cells were not investigated in the 1997 corrective action investigation due to the potential for live UXO. Instead, undisturbed soil from beneath the landfill cells was sampled using angled borings. Although no landfill wastes were found in excess of regulatory action levels or background concentrations, the CADD (DOE, 1998) concluded that corrective actions were needed to prevent inadvertent contact with landfill debris and potential live UXO.

1.1 PURPOSE

The purpose of this CAP is to provide the methods for undertaking the corrective action alternative as provided in the CADD (DOE, 1998).

1.2 SCOPE

The scope of this plan is to provide the methods for implementation of the closure of CAU 453. Corrective action Alternative 2 was selected in the CADD (DOE, 1998) and includes a number

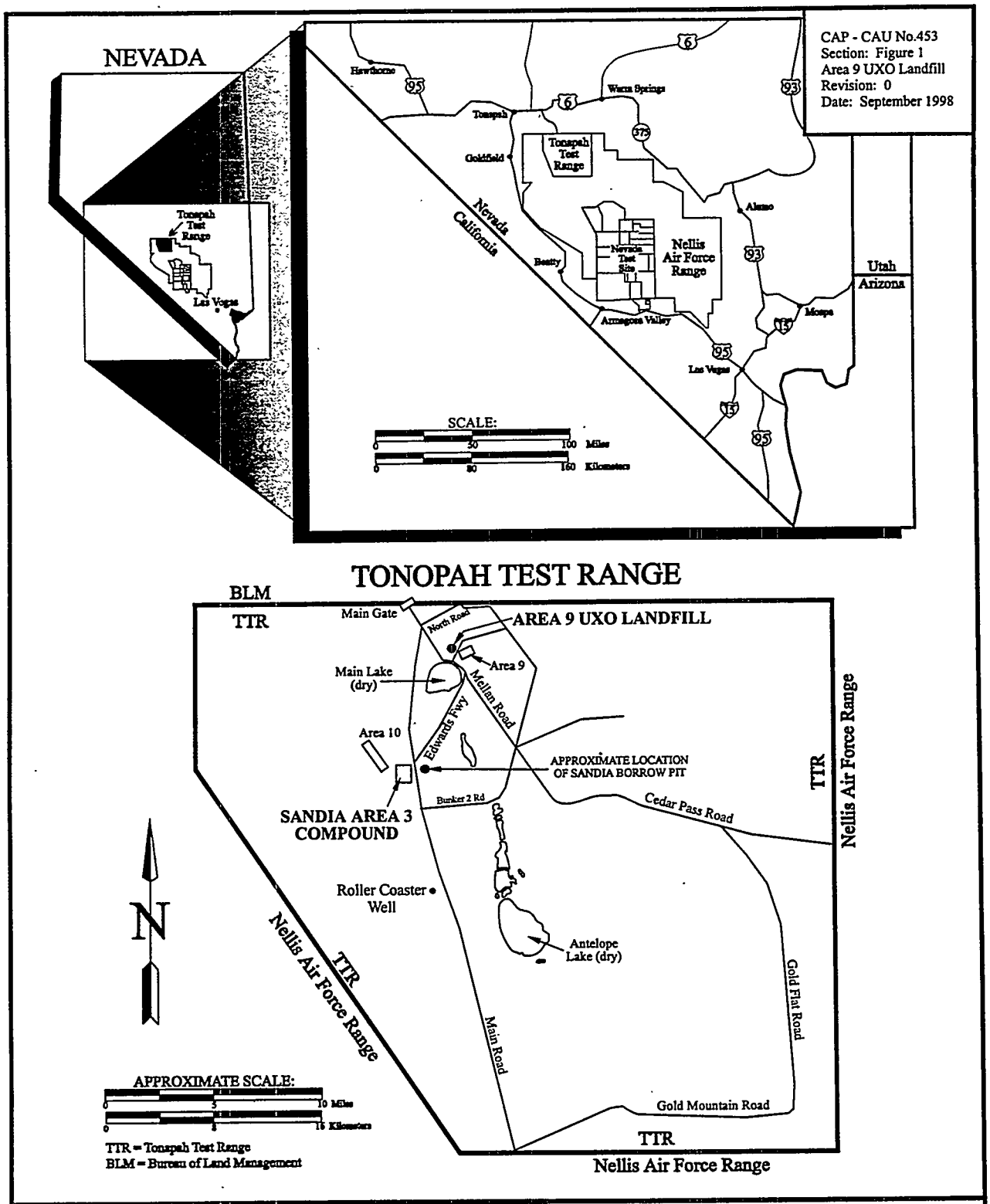

FIGURE 1
LOCATION OF THE AREA 9 UXO LANDFILL
AT THE TONOPAH TEST RANGE

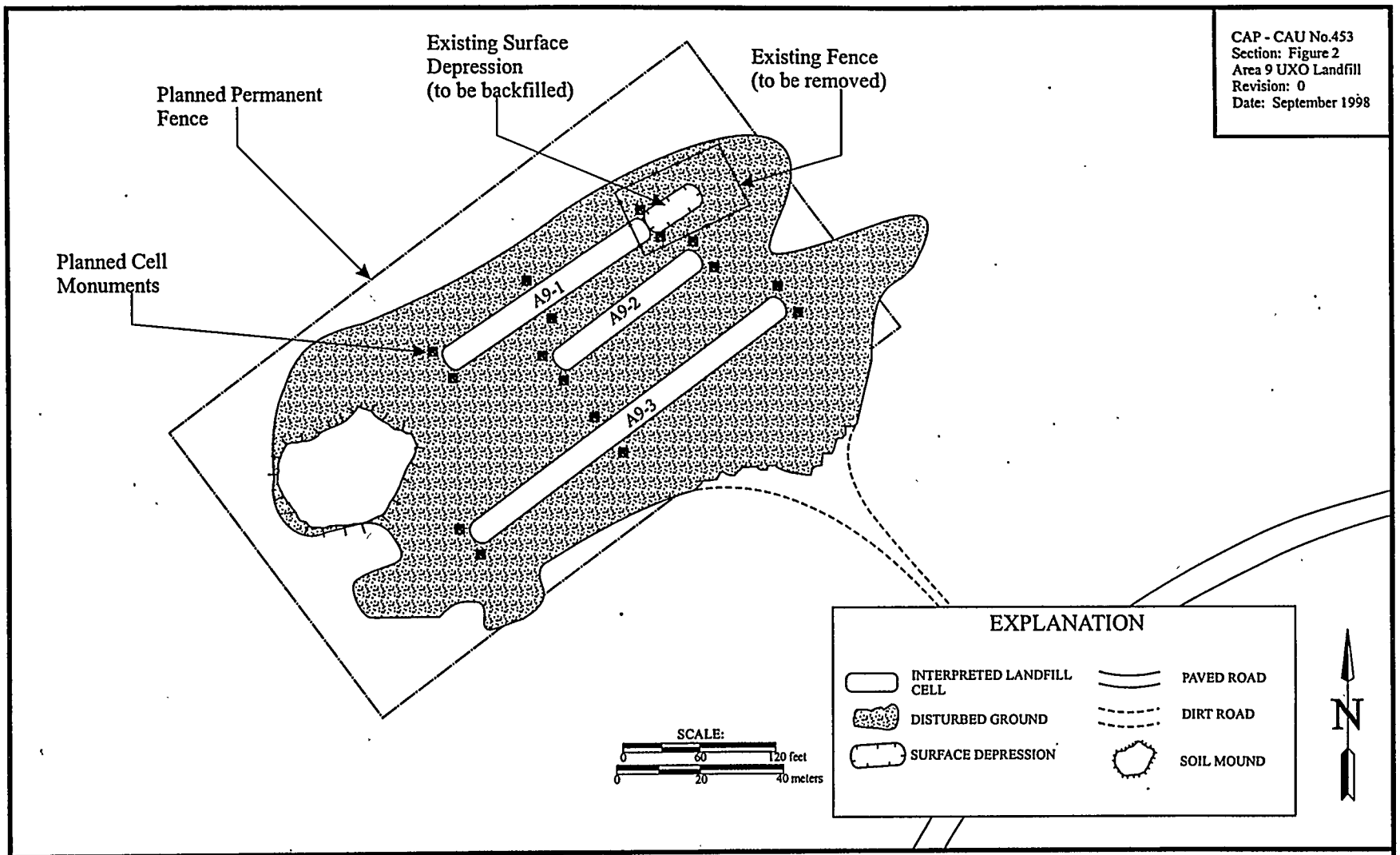

FIGURE 2
SITE PLAN FOR THE AREA 9 UXO LANDFILL

of steps to prevent inadvertent contact with landfill debris and UXO. Alternative 2 consists of the following closure activities:

- Backfill and grade the open portion of Cell A9-1.
- Install warning signs, cell-corner monuments, and perimeter fencing.
- Enact use restrictions to control access and prevent intrusive activities.

Additionally, the Nevada Division of Environmental Protection (NDEP) requested justification for not installing additional capping material at the existing landfill cells by providing permeability, compaction, and existing cap thickness information (NDEP, 1998). Compaction and permeability testing was conducted in July and August, 1998. The existing cap thicknesses were determined during the 1997 investigation activities. The results are discussed in Section 2.1.

1.3 CORRECTIVE ACTION PLAN CONTENTS

This CAP is divided into the following sections:

- Section 1.0 Introduction.
- Section 2.0 Detailed Statement of Work.
- Section 3.0 Schedule.
- Section 4.0 Post-Closure Monitoring Plan.
- Section 5.0 References.
- Appendix A Engineering Drawings.
- Appendix B Geotechnical Test Results.

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

- 1997 Annual Book Of ASTM Standards, Volume 04.08, Soil and Rock (I): D 420 - D 4914.

- Corrective Action Decision Document, Area 9 UXO Landfill, Rev. 0, DOE/NV-497, DOE, 1998.
- Corrective Action Investigation Plan, Area 9 UXO Landfill, Rev. 0, DOE/NV-475, DOE, 1997.
- NDEP, 1998, July 13, 1998 Letter from Karen K. Beckley to Runore C. Wycoff, RE: Draft CAP for CAU 453: Area 9 UXO Landfill, TTR, June 1998.
- Nevada Environmental Restoration Project, Health and Safety Plan, DOE, 1996.
- Nevada Environmental Restoration Project, Industrial Sites, Quality Assurance Project Plan, Nevada Test Site, Rev. 1, DOE/NV-425, DOE, 1996.
- Region IX Preliminary Remediation Goals (PRGs), EPA, 1996.
- Voluntary Corrective Action Plan For Ordnance Removal From Five Disposal Sites At The Tonopah Test Range, DOE/NV-386 UC-700, DOE, 1995.

2.0 DETAILED STATEMENT OF WORK

2.1 ALTERNATIVE IMPLEMENTATION

The objective of the corrective action alternative selected in the CADD (DOE, 1998) is to prevent inadvertent intrusion and contact with the solid waste and potentially live UXO.

On July 13, 1998, the NDEP requested engineering information for the existing landfill cap (permeability, compaction, and thickness) and justification for not conducting additional capping of the landfill cells (NDEP, 1998). Compaction tests (ASTM, 1997a [nuclear density testing]) were conducted at the surface of the existing covers. Soil samples of the existing covers were collected for permeability testing (ASTM, 1997b [constant head permeability]) on July 15, 1998. Geotechnical soil samples were composited from three locations in each landfill cell, an undisturbed area north of Landfill A9-1, and the Sandia Borrow Pit. Geotechnical test results are summarized in Table 1 and can be found in Appendix B.

The existing soil landfill caps consist of sands with silt and minor gravel (see sieve analysis results [ASTM, 1997c] in Appendix B). The maximum density (ASTM, 1997d) of the existing caps ranged from 1,822.8 kg/m^3 (113.8 lb/ft^3) to 1,986.2 kg/m^3 (124.0 lb/ft^3). The maximum density of native, undisturbed soil north of Landfill A9-1 was 1,665.9 kg/m^3 (104.0 lb/ft^3). The maximum densities were used to determine the percent compaction from the field density tests (ASTM, 1997a) and the density to mold the permeability samples to be representative of in-situ conditions.

The permeability samples were composited from three sample points. They were molded in the Bechtel Nevada Materials Testing Laboratory located in Mercury, Nevada at the approximate average wet density of the soil sample points to be representative of in-situ conditions. The permeabilities were 2.84 x 10^{-6} centimeters/second (cm/sec) (Landfill A9-1), 1.53 x 10^{-4} cm/sec (Landfill A9-2), and 1.60 x 10^{-4} cm/sec (Landfill A9-3). The native soil sample collected north of Landfill A9-1 has a higher permeability than the existing landfill caps by approximately an order of magnitude (5.06 x 10^{-3} cm/sec). The permeability samples collected from the Sandia Borrow Pit were molded at approximately 85, 90, and 95 percent of the maximum density since compaction results achieved during the closure activities at CAU 404 (Roller Coaster Sewage Lagoons and North Disposal Trench) and CAU 426 (Cactus Spring Waste Trenches) were within this range. The permeability of the Sandia Borrow Pit soil were 8.82 x 10^{-4} cm/sec (85.6 percent compaction), 3.80 x 10^{-5} cm/sec (91.1 percent compaction), and 1.39 x 10^{-5} cm/sec (96.5 percent compaction). The Sandia Borrow Pit soil permeability when compacted to 85 to 95 percent is up to an order of magnitude lower than the permeability of the existing covers at Landfills A9-2 and A9-3 and is up to approximately an order of magnitude higher than the existing cover at

TABLE 1 -- SUMMARY OF GEOTECHNICAL TEST RESULTS

SAMPLE LOCATION	SAMPLE NUMBER	MAXIMUM DENSITY Kg/m^3 (lbs/ft^3)	AVERAGE PERCENT COMPACTION (Compaction Test in field)	PERMEABILITY cm/sec	PERCENT COMPACTION (Remolded Permeability Sample)
Native soil north of A9-1	A9/4ABC	1665.9 (104.0)	89.9	5.06E-03	92.6
A9-1 Cap	A9/3ABC	1986.2 (124.0)	84.7	2.84E-06	84.9
A9-2 Cap	A9/2ABC	1946.2 (121.5)	80.4	1.53E-04	80.2
A9-3 Cap	A9/1ABC	1822.8 (113.8)	85.7	1.60E-04	85.7
Sandia Borrow Pit	Borrow	2034.3 (127.0)	N/A	8.82E-04	85.6
Sandia Borrow Pit	Borrow	2034.3 (127.0)	N/A	3.80E-05	91.1
Sandia Borrow Pit	Borrow	2034.3 (127.0)	N/A	1.39E-05	96.5

Landfill A9-1.

Three compaction tests (field density tests) were conducted in each landfill cell and the native, undisturbed soil north of Landfill A9-1. The average compaction results were similar between the landfill cells and the native, undisturbed area north of Landfill A9-1 (ranged from 80.4 percent [Landfill A9-2] to 89.9 percent compaction [native, undisturbed area north of Landfill A9-1]).

The existing landfill cap thicknesses were determined during the site investigation activities in 1997 (Luke, et al., 1997). The Landfill A9-1 cap ranged from approximately 0.2 m (0.7 ft) to 0.7 m (2.3 ft). The caps at Landfills A9-2 and A9-3 were approximately 0.3 m (1.0 ft).

Alternative 2 (Administrative Controls) was selected based upon:

- The detailed and comparative evaluation of alternatives presented in the CADD (DOE, 1998).
- Inadvertent intrusion and contact with the solid waste and potentially live UXO would be prevented during and after implementation.
- No hazardous waste was encountered below the landfill cells in the 1997 investigation activities.
- Surface or subsurface disturbances during the implementation of other remedial alternatives (installation of additional capping material or clean closure) would greatly increase the risk to site worker safety from the potential detonation of UXO.

Administrative Controls consists of the following activities:

- Backfill and grade the open portion of Cell A9-1.
- Install warning signs, perimeter fencing, and/or monuments.
- Enact use restrictions.

2.1.1 Backfilling and Grading the Open Portion of Cell A9-1

Critical locations such as corners of all three cells and the open portion of Cell A9-1 will be staked and surveyed for as-built documentation and land-use restrictions. During field activities,

cell boundaries will be clearly delineated with brightly-colored rope or chain to prevent inadvertent access. All site personnel will be instructed to avoid potential UXO debris and areas of potential live UXO.

The northeast end of Cell A9-1 is an open depression which was cleared of all debris in 1995 (DOE, 1997). The open portion will be backfilled with soil from the Sandia Borrow Pit located southwest of the site. The backfill will be placed in 0.2 meter (m) (8 inch [in]) lifts, and compacted by the field equipment. Precautions will be taken to prevent personnel and equipment working in the open portion from contacting the covered portion immediately to the southwest. Backfill to be in contact with the covered portion will be pushed or dropped into place and not compacted. The edge of the covered portion will be delineated with a brightly-colored rope or chain and a site worker will be dedicated to constantly monitor this sensitive area whenever there are work activities in the immediate area. The monitor will be equipped with a warning horn to alert workers who are about to contact the covered portion. In order to account for gradual settling and consolidation of the uncompacted backfill, the uncompacted backfill will be mounded up to 1.0 m (3.3 feet [ft]) above grade, approximately one-third the depth of backfill below grade.

Based on information in the CADD (DOE, 1998), the open portion of Cell A9-1 is approximately 15 m (50 ft) long, 6 m (20 ft) wide, and 3 m (10 ft) deep. Assuming vertical walls on three sides and the bottom rising to the existing ground surface at the northeast end, the approximate volume of the surface depression is 135 cubic meters (m^3) (177 cubic yards [yd^3]).

Standard construction equipment will be used for loading, moving, compaction, and grading activities. Equipment may consist of, but will not be limited to a front-end loader, sheeps-foot compactor, vibratory roller, and water truck. Backfill will be obtained from the soil stockpile located 18 m (60 ft) southwest of Cell A9-1. Water for backfill conditioning, dust suppression, and other construction activities will be obtained from the Roller Coaster Well located approximately 14 km (9 mi) west of the site (Figure 1).

2.1.2 Installation of Fencing, Warning Signs, and Monuments

To inhibit inadvertent site entry, a perimeter chain-link fence will be installed with at least three m (10 ft) of clearance beyond cell boundaries to allow for equipment access.

Warning signs will be posted on the fence at intervals of 15 to 30 m (50 to 100 ft) with the following information:

- Landfill identification (for example, "CAU 453 - Area 9 UXO Landfill").

- Warning (for example, "Danger, Potential Unexploded Ordnance").

- Instructions (for example, "Contact [office] at [phone no.] before entering this site, digging or trenching in this site, or removing this sign").

At the beginning of field activities, the cell locations will be marked with monuments placed either at actual cell boundary corners, or set back at a consistent distance to provide a safety margin, 1 m (3.3 ft) for example. During field activities, bright orange or yellow rope or chain will be strung between monuments to further denote cell boundaries. Additional monuments may be necessary at intermediate locations between cell corners. The monument posts will be embedded in the ground and constructed of concrete. The fence, signs, and monuments are intended to last at least 30 years and will require periodic maintenance and replacement.

2.1.3 Implementation of Administrative Controls to Restrict Use

Administrative controls will be used to restrict use on the CAU 453 site through coordination with TTR administrative, maintenance, and operational organizations. Coordination of the closure will include the U. S. Air Force because of the location of the site and use status. The future use of any land related to this CAU will be restricted from activities that may alter or modify the containment control as identified in the Closure Report, unless appropriate concurrence is obtained in advance. Administrative controls should be effective because the TTR is a restricted access facility.

2.2 CONSTRUCTION QUALITY ASSURANCE / QUALITY CONTROL

The native, undisturbed soil density is estimated to be approximately 80 percent of the maximum density. Excluding the backfill over the UXO interface zone, the backfill material will be compacted to a minimum of 80 percent of maximum density. Prior to implementing field activities, at least one maximum density (Proctor) test (ASTM, 1997d) will be done on the backfill material to determine its maximum density. A minimum of four field nuclear-density tests (ASTM, 1997a) will then be done at the beginning of compaction activities on lifts of 0.2 m (8 in). The number of passes of compaction equipment over the lift, needed to compact the lift to at least 80 percent maximum density will be the field performance specification. Additional field tests will be done periodically during compaction activities to confirm or modify the field performance specification so that a compaction of at least 80 percent maximum density is achieved. A minimum of four field tests will be done in an intermediate lift, in the final lift, and

whenever changes occur in the backfill material (such as significant visual change in the grain size distribution).

2.3 WASTE MANAGEMENT

Resource Conservation and Recovery Act (RCRA), hydrocarbon, and hazardous wastes are not expected to be generated. Nonhazardous solid wastes are expected to be generated and may include construction debris from fence and monument installation activities. If hydrocarbon or hazardous wastes are generated, the wastes will be managed and disposed of in accordance with U.S. DOE orders, U.S. Department of Transportation requirements, state and federal regulations, and agreements and permits between DOE/Nevada Operations Office and the NDEP. Construction debris will be disposed in a TTR or Nevada Test Site landfill.

3.0 SCHEDULE

The following schedule is anticipated for TTR Area 9 UXO Landfill CAU 453 closure activities:

- Begin TTR Area 9 UXO Landfill field closure activities within 60 calendar days from the date that NDEP grants approval of the CAP.
- Complete field closure activities for TTR Area 9 UXO Landfill within 60 calendar days after beginning field closure activities.
- Prepare the Closure Report for submittal to NDEP within approximately 120 calendar days after completion of field closure activities.

Flexibility has been placed in the project schedule to account for minor difficulties (weather, equipment breakdowns, etc.). DOE will keep the NDEP apprised of any condition that may impact the project schedule.

4.0 POST-CLOSURE MONITORING PLAN

A post-closure monitoring of the Area 9 UXO Landfill is proposed and will consist of biannual (twice per year) visual inspections to verify that the soil covers remain intact and level, warning signs and monuments are in place and readable, and use restrictions are maintained. 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 calendar days of discovery and documented in writing at the time of repair. The biannual inspections will be performed for approximately five years after site closure, and will be documented on inspection forms.

The proposed monitoring plan includes an annual report, which will describe observations, 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 and maintenance record.
- Conclusions and recommendations.

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

5.0 REFERENCES

American Society for Testing and Materials, see ASTM

ASTM, 1997a, Method D 2922-91: 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, 1997b, Method D 2434-68: Standard Test Method for Permeability of Granular Soils (Constant Head), 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.

ASTM, 1997d, Method D 1557-91: Standard 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.

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, Nevada Environmental Restoration Project, Health and Safety Plan.

DOE, 1996, Nevada Environmental Restoration Project, Industrial Sites, Quality Assurance Project Plan, Nevada Test Site, Rev. 1, DOE/NV-425.

DOE, 1997, Corrective Action Investigation Plan For CAU No. 453: Area 9 Landfill, Tonopah Test Range, DOE/NV-475 UC-700.

DOE, 1998, Corrective Action Decision Document For The Area 9 UXO Landfill, Tonopah Test Range, CAU 453, DOE/NV-497 UC-700.

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

Luke, B. A., Stone, R., Hartzell, L., 1997. Seismic Surface Wave Measurements at the Area 9 Landfill Complex, Tonopah Test Range, Nevada. University of Nevada, Las Vegas, July 11, 1997.

NDEP, 1998, July 13, 1998 Letter from Karen K. Beckley to Runore C. Wycoff , RE: Draft CAP for CAU 453: Area 9 UXO Landfill, TTR, June 1998.

Nevada Division of Environmental Protection, see NDEP

U.S. Department of Energy, see DOE

U.S. Environmental Protection Agency, see EPA

APPENDIX A

ENGINEERING DRAWINGS

UNITED STATES DEPAR'

NEVADA OPERATIO

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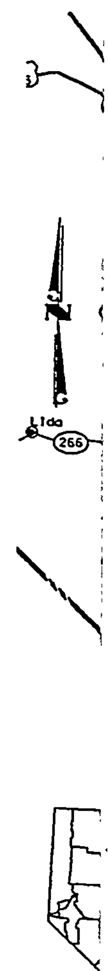
TONOPAH TES

AREA 9 LANDFILL CL

AREA

INDEX

DRAWING NUMBER		DRAWING TITLE	STANDARD NUMBER	DESCRIPTION
TITLE				
JS-052-133-T4	REV 0	TITLE SHEET	STD T1 SHT 1	STANDARDS INDEX
			STD T2 SHT 1	GENERAL NOTES. DRAFTING SYMBOLS & ANSI STANDARDS
CIVIL				
JS-052-133-C17	REV 0	VICINTY MAP	STD C100 SHT 1	NOTES. LEGEND & SYMBOLS
JS-052-133-C18	REV 0	A9 LANDFILL COMPLEX SITE PLAN	STD C101 SHT 1	ABBREVIATIONS
JS-052-133-C19	REV 0	A9-1.2.3. SITE PLAN	STD C113 SHT 1 & 2	FENCING
JS-052-133-C20	REV 0	MONUMENT DETAILS		



SCOPE OF WORK

THIS PROJECT INCLUDES THE RESTORATION OF 1 EXISTING LANDFILL LOCATION. WORK WILL PRIMARILY INVOLVE FILLING OF LOCAL SURFACE DEPRESSION WITH NATIVE SOILS. AND INSTALLATION OF NEW FENCE AROUND ENTIRE SITE.

AREA EVALUATION FOR RESIDUAL SOIL CONTAMINATION SHALL BE PERFORMED BY THE CONTRACTOR IN ACCORDANCE WITH DOE/NV 5480.11 AND THE CONTRACTOR'S STANDARD OPERATING PROCEDURES PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES

PROJECT NOTES

ALL CONSTRUCTION FEATURES. MATERIALS. TESTS AND DETAILS SHALL CONFORM TO "USDOE/NV STANDARD SPECIFICATIONS. DATED DECEMBER 1994". FOR STANDARDS REFERENCED ON THIS PROJECT. SEE THE NTS OVERHEAD POWER LINE STANDARDS AND THE RSN DESIGN DRAWING STANDARDS.

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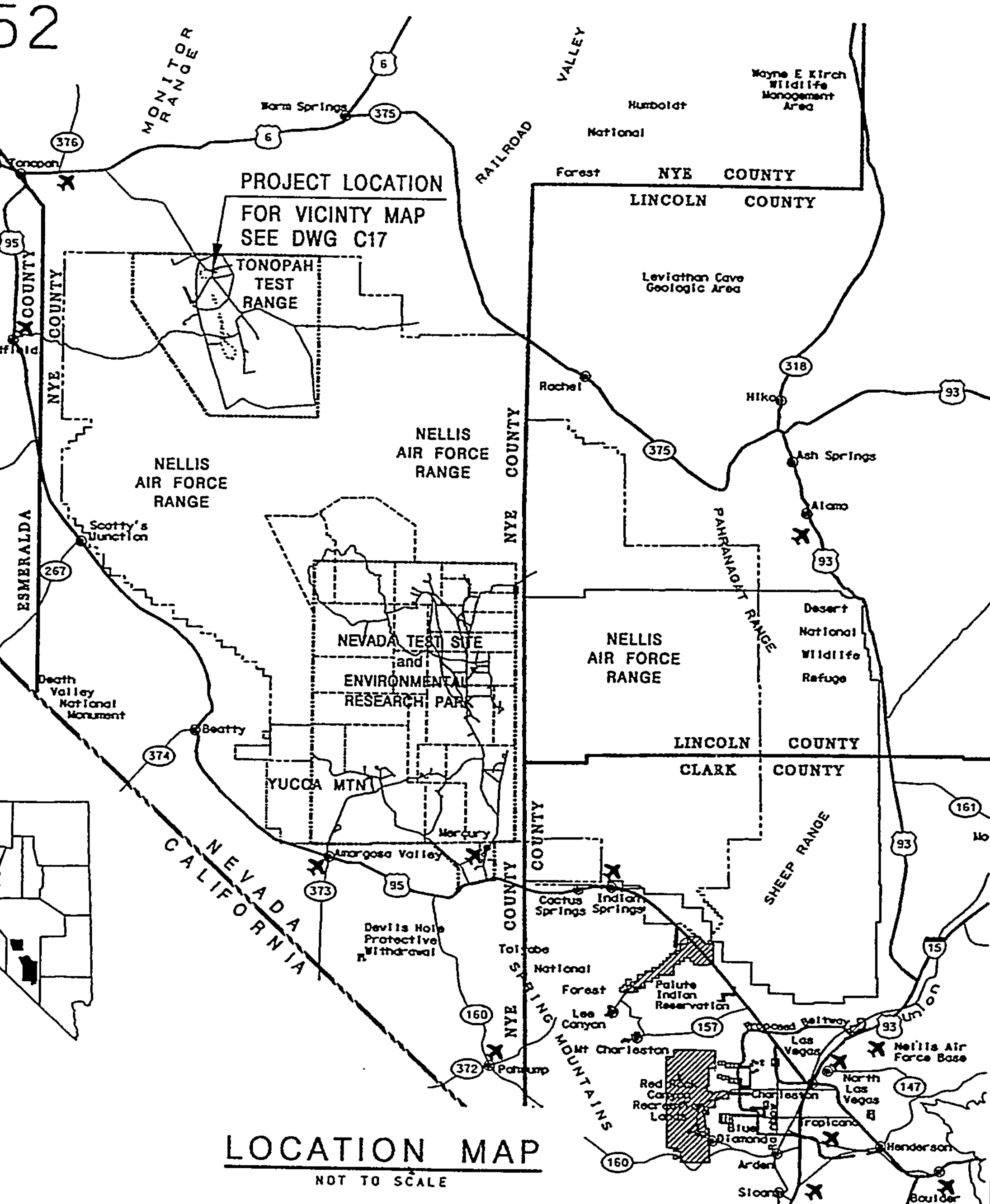
OSURE CAU 453

52



LOCATION MAP

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0		ISSUED FOR CONSTRUCTION, DATED 7/14/98						

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				N/A				98195.A52	N/A	C4P1BODE

TONOPAH TEST RANGE ——— AREA 52

AREA 9 LANDFILL CLOSURES

CAU 453

TITLE SHEET

U.S. DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA

Bechtel Nevada

DRAWING NUMBER JS-052-133-T4

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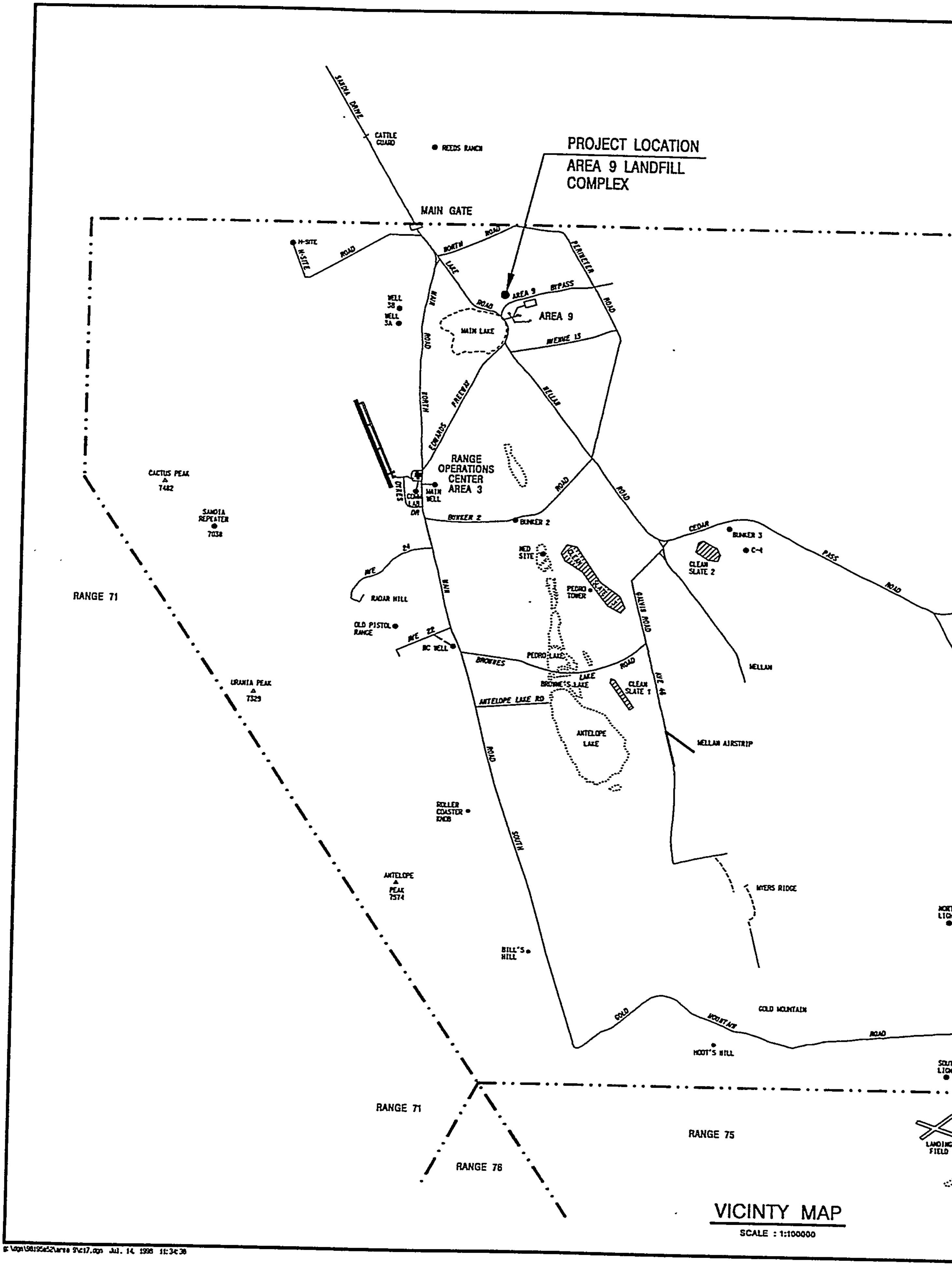

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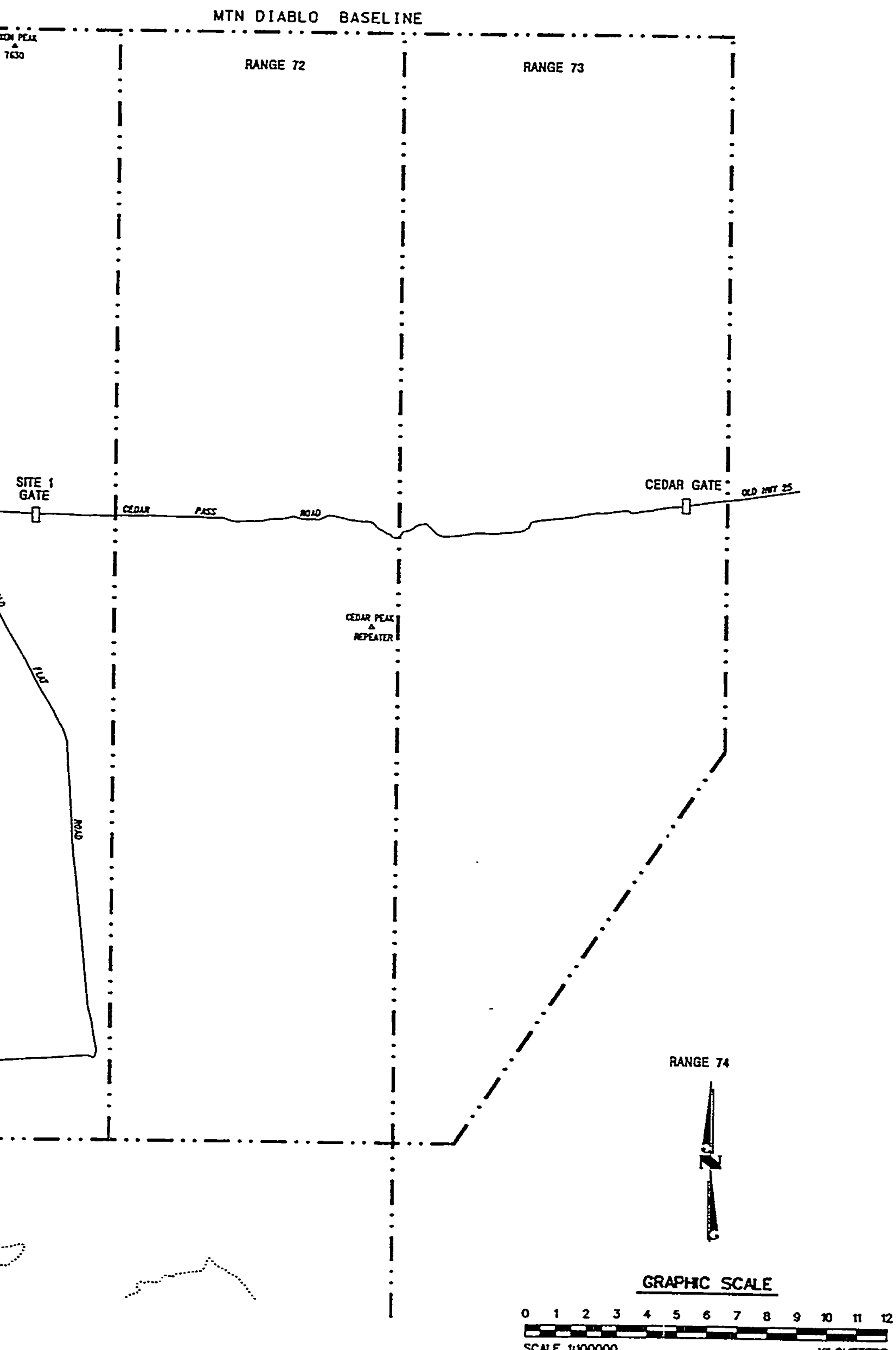

TONOPAH TEST RANGE — AREA 52

AREA 9 LANDFILL CLOSURES

CAU 453

VICINITY MAP

U.S. DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE, LAS VEGAS, NEVADA

Bechtel Nevada

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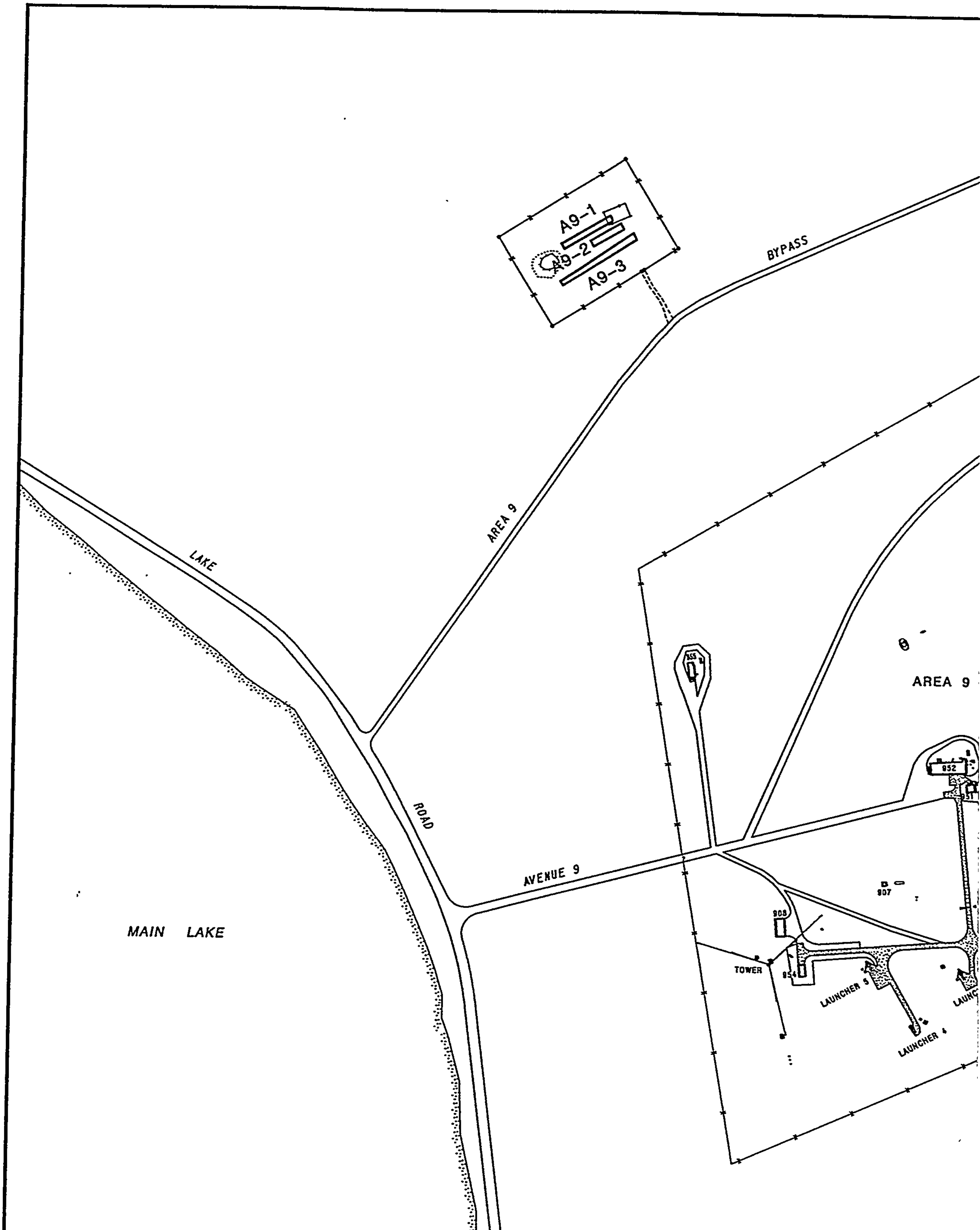

A9 LANDFILL COMPLEX SITE PLAN

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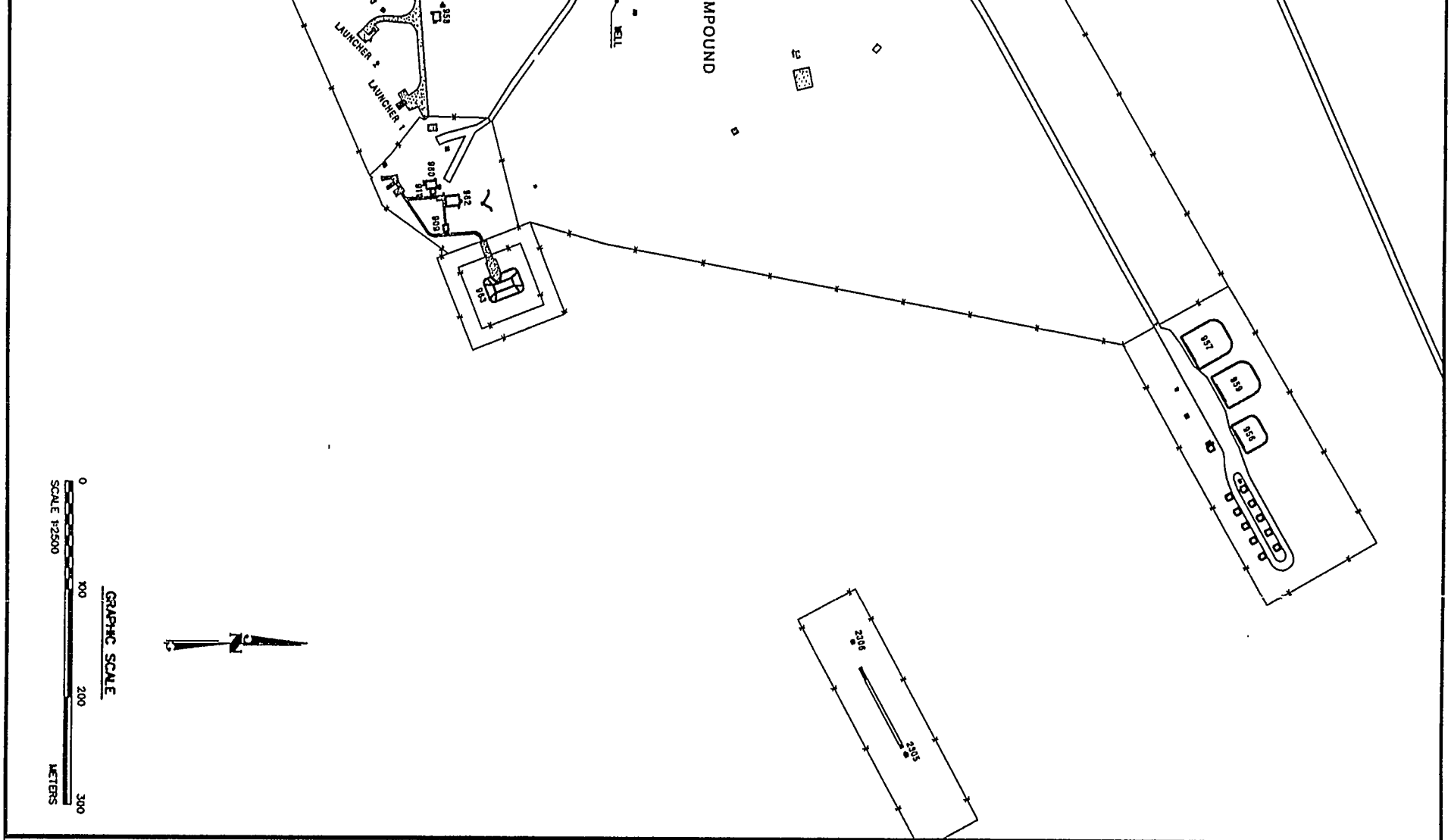

U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
LAS VEGAS, NEVADA

Bechtel Nevada

TONOPAH TEST RANGE — AREA 52
AREA 9 LANDFILL CLOSURES
CAU 453

A9 LANDFILL COMPLEX SITE PLAN

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SUBMITTED BECHTEL NEVADA — DATE
USER — DATE
DEPT OF ENERGY PROJECT ENGINEER — DATE

PROJECT NUMBER	PROJECT AUTH NO	ACTIVITY CODE
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NO	DATE	REVISION DESCRIPTION
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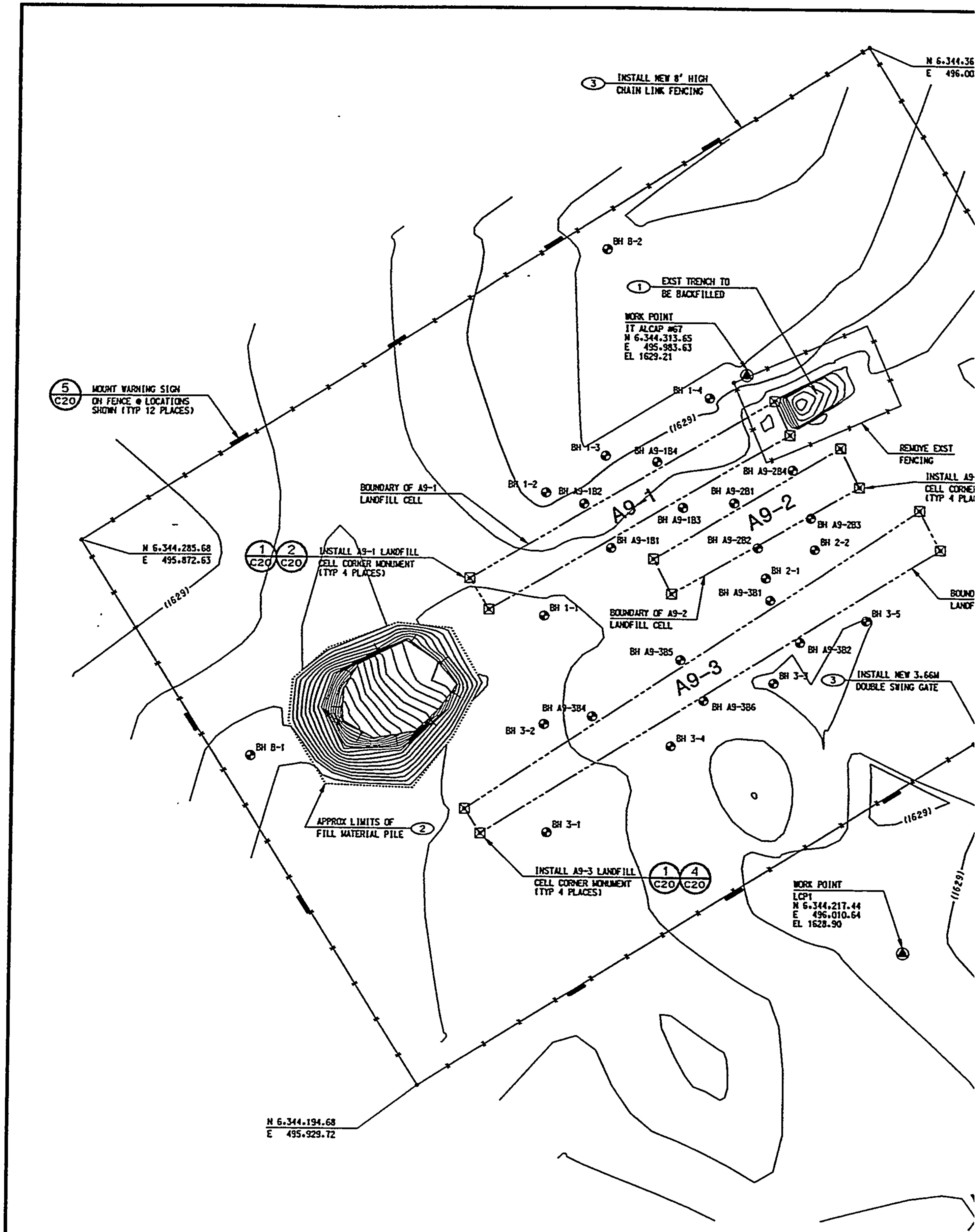
REV 0



A9-1,2,3 SITE PLAN

SCALE 1:400

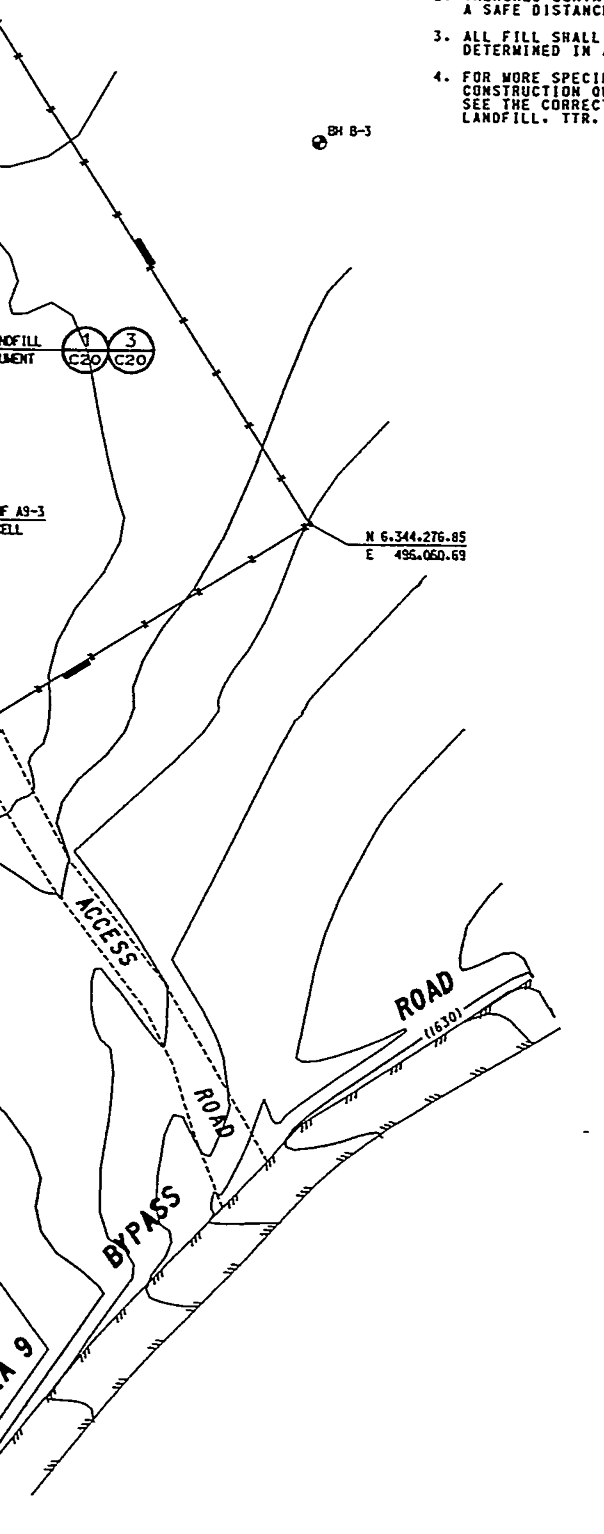
c:\dgn\98195e52\area 9\c19.dgn Jul. 14, 1998 11:43:48

KEY NOTES

1. FILL EXISTING OPEN PORTION OF TRENCH.
2. EXISTING STOCKPILE TO BE USED FOR FILL.
3. FOR FENCING AND GATE DETAILS SEE RSN DESIGN DRAWING STANDARDS C113 SHEETS 1 & 2.

NOTES

1. DEPRESSIONS WITHIN LANDFILL CELLS SHALL BE FILLED AND SHAPED TO DRAIN.
2. TRENCHES CONTAIN UXO. HEAVY EQUIPMENT TO REMAIN A SAFE DISTANCE FROM EDGE OF EACH TRENCH.
3. ALL FILL SHALL BE COMPACTED TO 80% OF MAXIMUM DENSITY DETERMINED IN ACCORDANCE WITH ASTM D1557.
4. FOR MORE SPECIFIC PROJECT REQUIREMENTS AND CONSTRUCTION QUALITY CONTROL REQUIREMENTS. SEE THE CORRECTIVE ACTION PLAN FOR AREA 9 UXO LANDFILL, TTR.



GRAPHIC SCALE

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SCALE 1:400 METERS

(CONTOUR INTERVAL - 0.25M)

NO	DATE	REVISION DESCRIPTION
0		ISSUED FOR CONSTRUCTION, DATED 7/14/98

PROJECT NUMBER	PROJECT AUTH NO	ACTIVITY CODE	MAP REF NO.
98195.A52	N/A	C4P1BODE	N/A

U.S. DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE LAS VEGAS, NEVADA

Bechtel Nevada

TONOPAH TEST RANGE — AREA 52

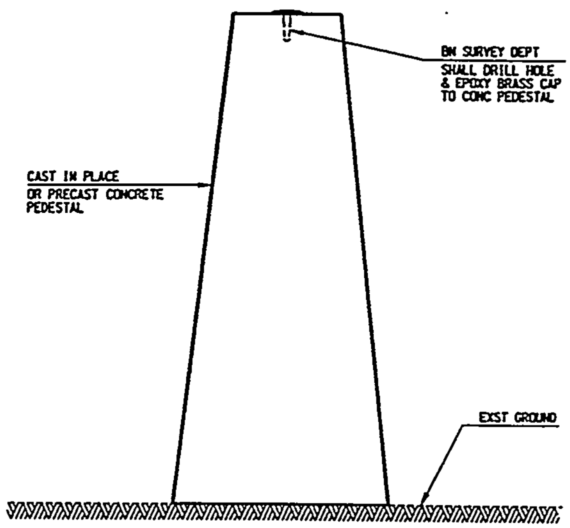
AREA 9 LANDFILL CLOSURES

CAU 453

A9-1,2,3 SITE PLAN

DRAWING NUMBER JS-052-133-C19

REV 0



MONUMENT DETAIL (1) C19

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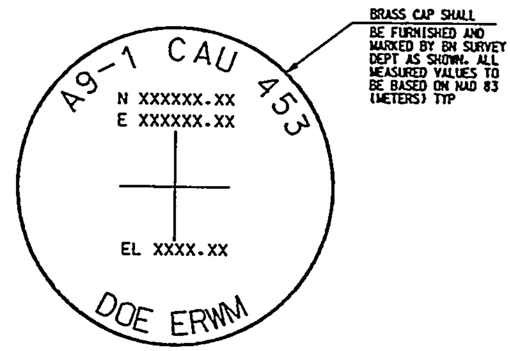

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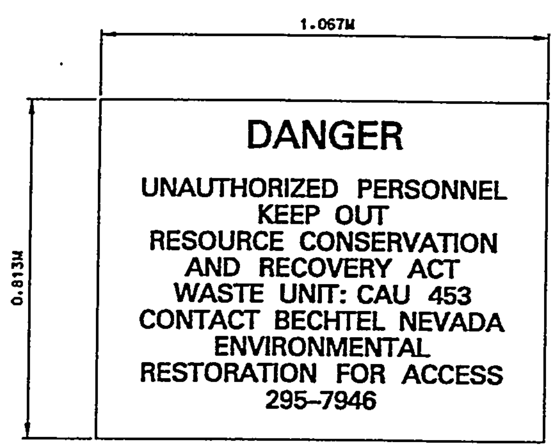
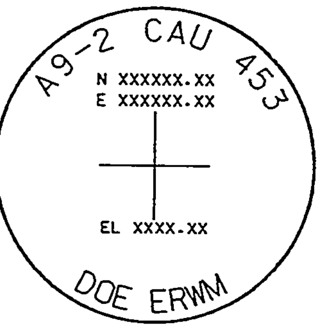


SIGN DETAIL (5) C19

NOT TO SCALE

JUL. 14, 1998 11:38:20



MARKER DETAIL (3) C19

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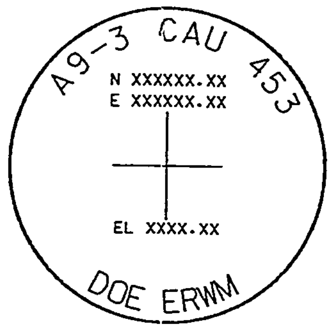


MARKER DETAIL (4) C19

NOT TO SCALE

NO	DATE	REVISION DESCRIPTION
0		ISSUED FOR CONSTRUCTION, DATED 7/14/98

PROJECT NUMBER 98189.A52 | PROJECT AUTH NO N/A | ACTIVITY CODE C4T2BODE

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

Bechtel Nevada

TONOPAH TEST RANGE — AREA 52
AREA 3 LANDFILL CLOSURES
CAU 424

MONUMENT DETAILS

DRAWING NUMBER JS-052-133-C20

REV 0

APPENDIX B

GEOTECHNICAL TEST RESULTS

NUCLEAR DENSITY ASTM D2922–91 CAMPBELL MC–2/MC–3 TROXLER	**BECHTEL NEVADA** MATERIALS TESTING LABORATORY P. O. BOX 98521, M/S NTS188 LAS VEGAS, NV 89193–8521	C4T2CODE 07/31/98 1 OF 1

Requested by D. MADSEN User/Agency BECHTEL Material NATIVE

Project TTR AREA 9 Location of Tests SEE BELOW

Tested by D. HERRINGTON Date Tested 07/15/98 Checked by V. Quinn Lu

Information given to CURTIS OBI By D. HERRINGTON How VERBAL Date 07/15/98

LABORATORY NO	1906	1907	1908		1909	1910	1911	
TEST LOCATION	A9/1A	A9/1B	A9/1C		A9/2A	A9/2B	A9/2C	
DEPTH OF PROBE	BS	BS	BS		BS	BS	BS	
DEPTH OF TESTS Below grade	Grade	Grade	Grade	AVG	Grade	Grade	Grade	AVG
WET DENSITY–PCF	100.0	99.9	100.6	100.2	101.1	100.6	103.9	101.9
DRY DENSITY–PCF	96.9	97.1	98.7	97.6	96.9	96.2	99.8	97.6
MOISTURE %	3.3	2.8	2.0	2.7	4.3	4.6	4.1	4.3
MAX DENSITY–PCF	113.8	113.8	113.8		121.5	121.5	121.5	
OPTIMUM MOISTURE %	6.3	6.3	6.3		8.6	8.6	8.6	
PERCENT COMPACTION	85.1	85.3	86.7	85.7	79.8	79.2	82.1	80.4

LABORATORY NO	1912	1913	1914		1915	1916	1917	
TEST LOCATION	A9/3A	A9/3B	A9/3C		A9/4A	A9/4B	A9/4C	
DEPTH OF PROBE	BS	BS	BS		BS	BS	BS	
DEPTH OF TESTS Below grade	Grade	Grade	Grade	AVG	Grade	Grade	Grade	AVG
WET DENSITY–PCF	108.1	104.2	116.8	109.7	97.5	93.3	94.4	95.1
DRY DENSITY–PCF	103.2	100.3	111.7	105.1	95.9	91.6	92.9	93.5
MOISTURE %	4.7	3.9	4.5	4.4	1.7	1.9	1.6	1.7
MAX DENSITY–PCF	124.0	124.0	124.0		104.0	104.0	104.0	
OPTIMUM MOISTURE %	10.1	10.1	10.1		5.0	5.0	5.0	
PERCENT COMPACTION	83.2	80.9	90.1	84.7	92.2	88.1	89.3	89.9

GAUGE NO 23205 DATE OF STANDARDIZATION 07/15/98 VALUE OF M 633

STANDARDIZATION D 2944

REMARKS: AVERAGE MOISTURE AND DENSITY WILL BE USED FOR PERMEABILITY.

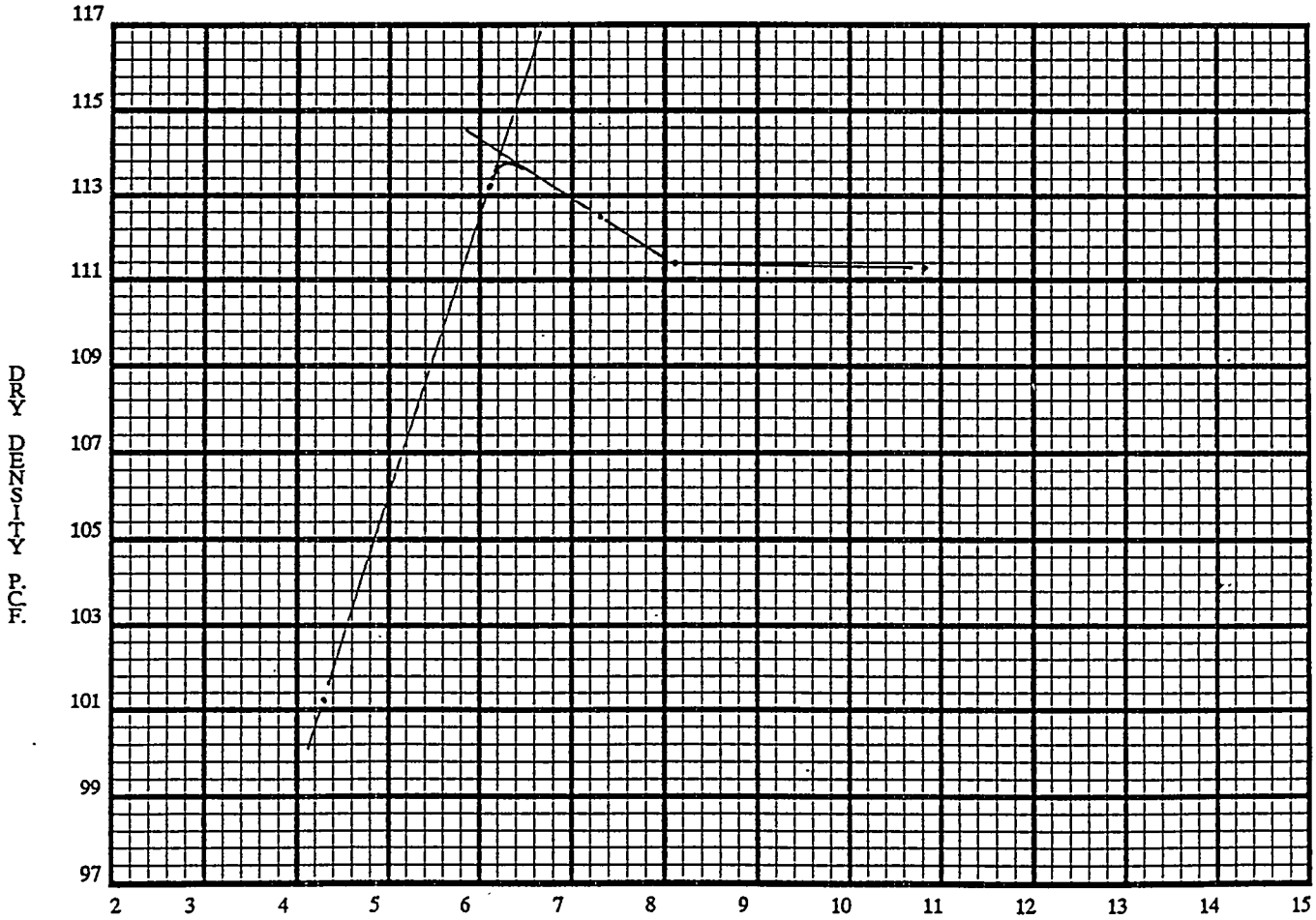
PROCTOR TEST
ASTM D 1557–91
METHOD C

BECHTEL NEVADA
MATERIALS TESTING LABORATORY
P. O. BOX 98521
LAS VEGAS, NV 89193–8521

CHARGE # C4T2CODE
LAB # 1902
DATE 07/25/98

Project: TTR AREA 9 Requested by: D. MADSEN User/Agency: BECHTEL
Sampled by: D. HERRINGTON Date sampled: 07/15/98 Material: A9/1 A,B,C
Tested by: D. HERRINGTON Date tested: 07/24/98 Checked by:

TRIAL		1	2	3	4	5	6
1	Wt.mold + wet soil	6929.0	6941.5	7039.5	6434.0	6946.5	N/A
2	Wt. mold	2843.3	2843.3	2843.3	2843.3	2843.3	N/A
3	Wt. wet soil	4085.7	4098.2	4196.2	3590.7	4103.2	N/A
4	Wet Density, PCF	120.1	120.5	123.3	105.5	120.6	N/A
5	Moisture Tare #	H	A	B	F	115.0	N/A
6	Wt wet soil + tare	1014.3	971.1	1124.9	1005.3	1295.9	N/A
7	Wt dry soil + tare	956.8	899.6	1017.0	964.8	1209.4	N/A
8	Wt moisture	57.5	71.5	107.9	40.5	86.5	N/A
9	Wt tare	16.9	16.8	16.8	17.0	16.9	N/A
10	Wt dry soil	939.9	882.8	1000.2	947.8	1192.5	N/A
11	% Moisture	6.1	8.1	10.8	4.3	7.3	N/A
12	Dry Density, PCF	113.2	111.4	111.3	101.2	112.5	N/A



MAX. DENSITY = 113.8 PCF MOISTURE CONTENT %
OPT. MOISTURE = 6.3 %

NO SPECIFICATIONS: INFORMATION ONLY
Equipment used: PM 16, PTL W1256, Cal. date: 06/02/98, Cal. due: 06/02/99

CC: D. MADSEN BECHTEL
MTL BECHTEL FILES

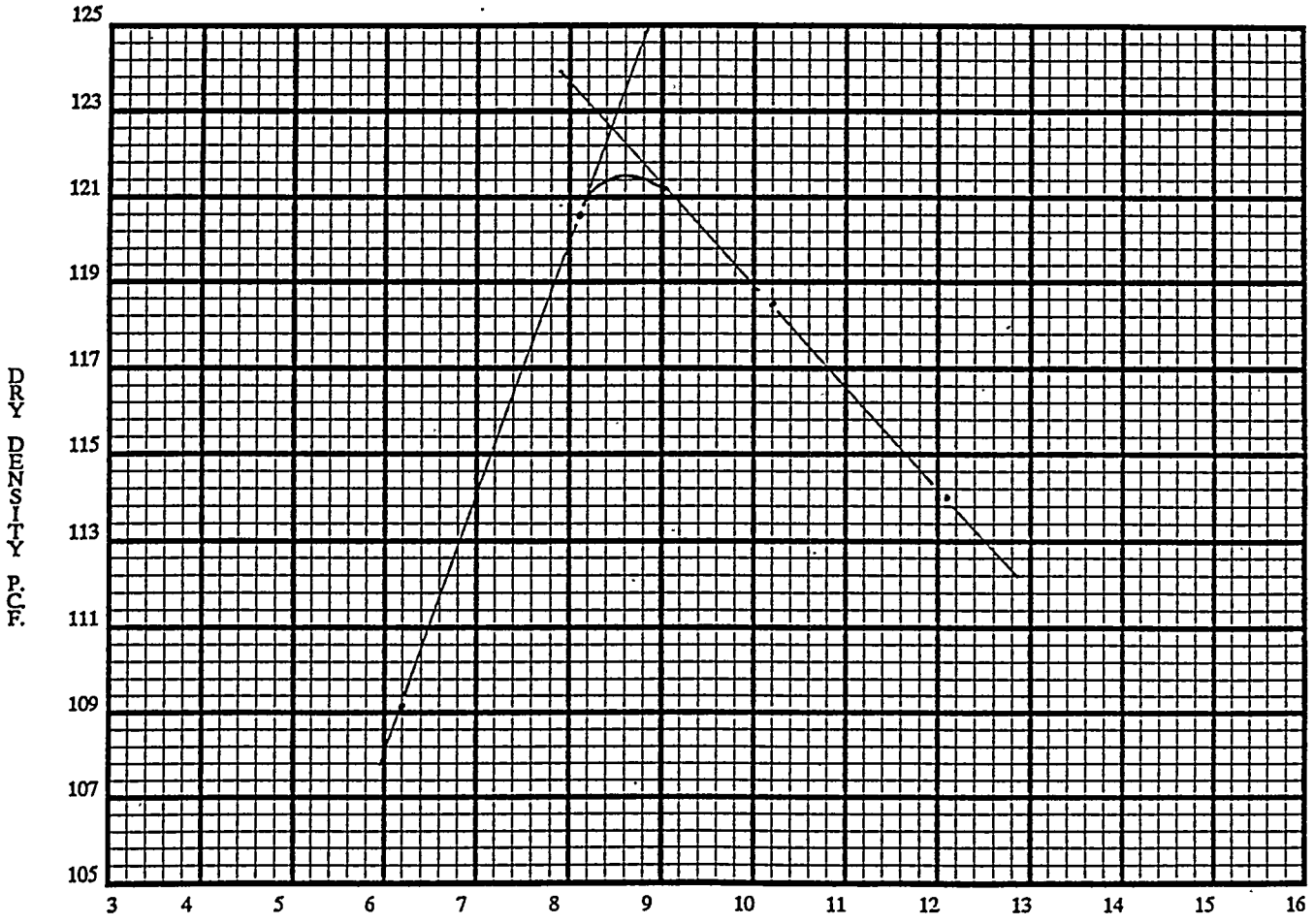
PROCTOR TEST
ASTM D 1557–91
METHOD C

BECHTEL NEVADA
MATERIALS TESTING LABORATORY
P. O. BOX 98521
LAS VEGAS, NV 89193–8521

CHARGE # C4T2CODE
LAB # 1903
DATE 07/25/98

Project: TTR AREA 9 Requested by: D. MADSEN User/Agency: BECHTEL
Sampled by: D. HERRINGTON Date sampled: 07/15/98 Material: A9/2 A,B,C
Tested by: D. HERRINGTON Date tested: 07/24/98 Checked by:

	TRIAL	1	2	3	4	5	6
1	Wt.mold + wet soil	7280.3	7283.3	6783.5	9980.5	N/A	N/A
2	Wt. mold	2843.3	2843.3	2843.3	5634.9	N/A	N/A
3	Wt. wet soil	4437.0	4440.0	3940.2	4345.6	N/A	N/A
4	Wet Density, PCF	130.4	130.5	115.8	127.7	N/A	N/A
5	Moisture Tare #	108.0	C	G	108.0	N/A	N/A
6	Wt wet soil + tare	1249.7	1115.6	966.2	1236.3	N/A	N/A
7	Wt dry soil + tare	1157.2	1014.3	910.9	1104.9	N/A	N/A
8	Wt moisture	92.5	101.3	55.3	131.4	N/A	N/A
9	Wt tare	16.9	17.0	17.0	16.9	N/A	N/A
10	Wt dry soil	1140.3	997.3	893.9	1088.0	N/A	N/A
11	% Moisture	8.1	10.2	6.2	12.1	N/A	N/A
12	Dry Density, PCF	120.6	118.5	109.1	114.0	N/A	N/A



MAX. DENSITY = 121.5 PCF
OPT. MOISTURE = 8.6 %

NO SPECIFICATIONS: INFORMATION ONLY
Equipment used: PM 16, PTL W1256, Cal. date: 06/02/98, Cal. due: 06/02/99

CC: D. MADSEN BECHTEL
MTL BECHTEL FILES

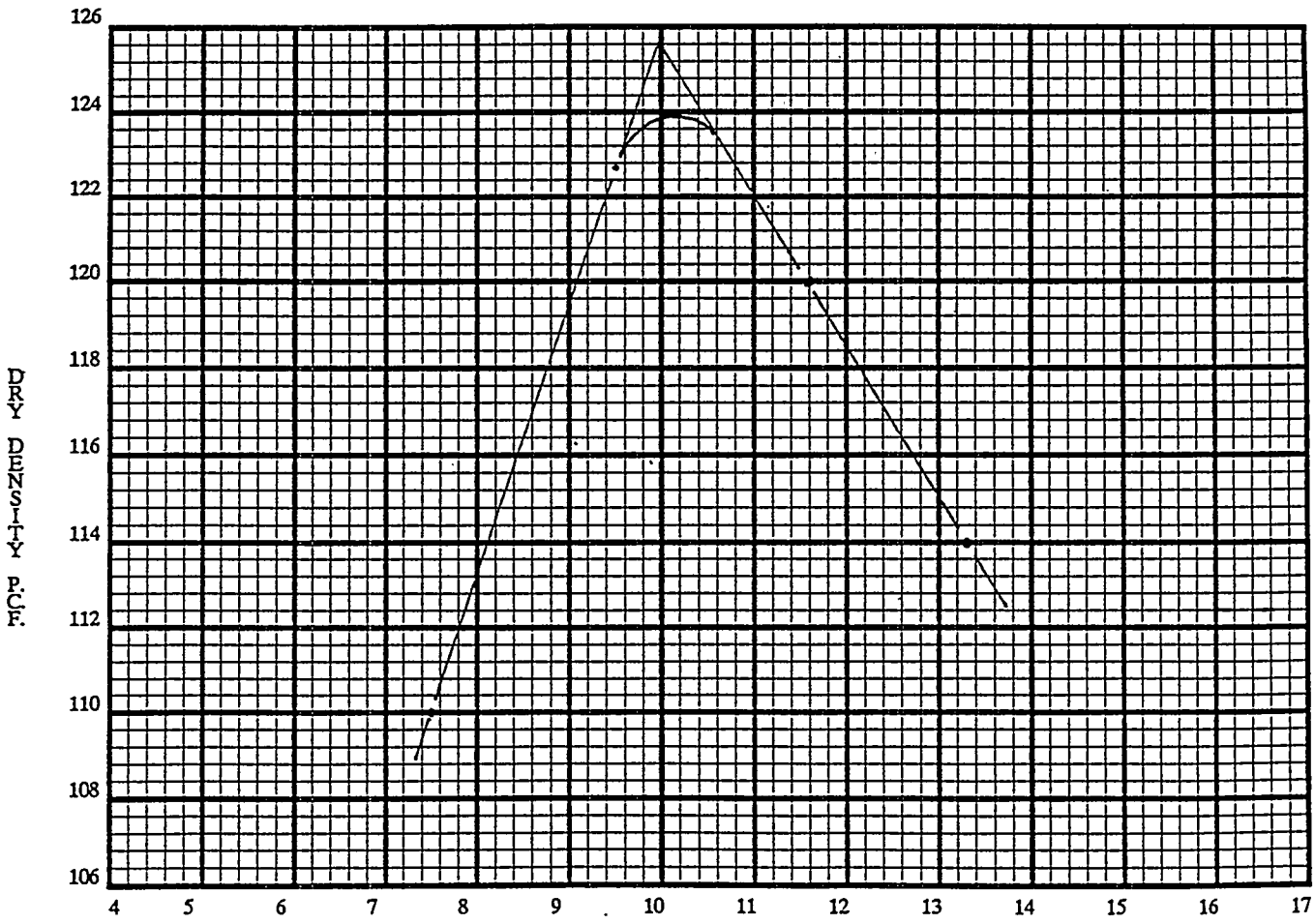
PROCTOR TEST
ASTM D 1557–91
METHOD C

BECHTEL NEVADA
MATERIALS TESTING LABORATORY
P. O. BOX 98521
LAS VEGAS, NV 89193–8521

CHARGE # C4T2CODE
LAB # 1904
DATE 07/25/98

Project: TTR AREA 9 Requested by: D. MADSEN User/Agency: BECHTEL
Sampled by: D. HERRINGTON Date sampled: 07/15/98 Material: A9/3 A,B,C
Tested by: D. HERRINGTON Date tested: 07/24/98 Checked by: V. Quesnel

	TRIAL	1	2	3	4	5	6
1	Wt.mold + wet soil	7414.4	7399.8	6868.9	10030.0	N/A	N/A
2	Wt. mold	2843.3	2843.3	2843.3	5634.9	N/A	N/A
3	Wt. wet soil	4571.1	4556.5	4025.6	4395.1	N/A	N/A
4	Wet Density, PCF	134.4	133.9	118.3	129.2	N/A	N/A
5	Moisture Tare #	110.0	D	H	109.0	N/A	N/A
6	Wt wet soil + tare	1390.5	1087.3	1022.6	1322.7	N/A	N/A
7	Wt dry soil + tare	1271.6	976.0	952.0	1169.5	N/A	N/A
8	Wt moisture	118.9	111.3	70.6	153.2	N/A	N/A
9	Wt tare	17.0	17.0	16.8	16.9	N/A	N/A
10	Wt dry soil	1254.6	959.0	935.2	1152.6	N/A	N/A
11	**% Moisture**	**9.5**	**11.6**	**7.5**	**13.3**	**N/A**	**N/A**
12	**Dry Density, PCF**	**122.7**	**120.0**	**110.0**	**114.0**	**N/A**	**N/A**



MAX. DENSITY = 124.0 PCF
OPT. MOISTURE = 10.1 %

NO SPECIFICATIONS: INFORMATION ONLY
Equipment used: PM 16, PTL W1256, Cal. date: 06/02/98, Cal. due: 06/02/99

CC: D. MADSEN BECHTEL
MTL BECHTEL FILES

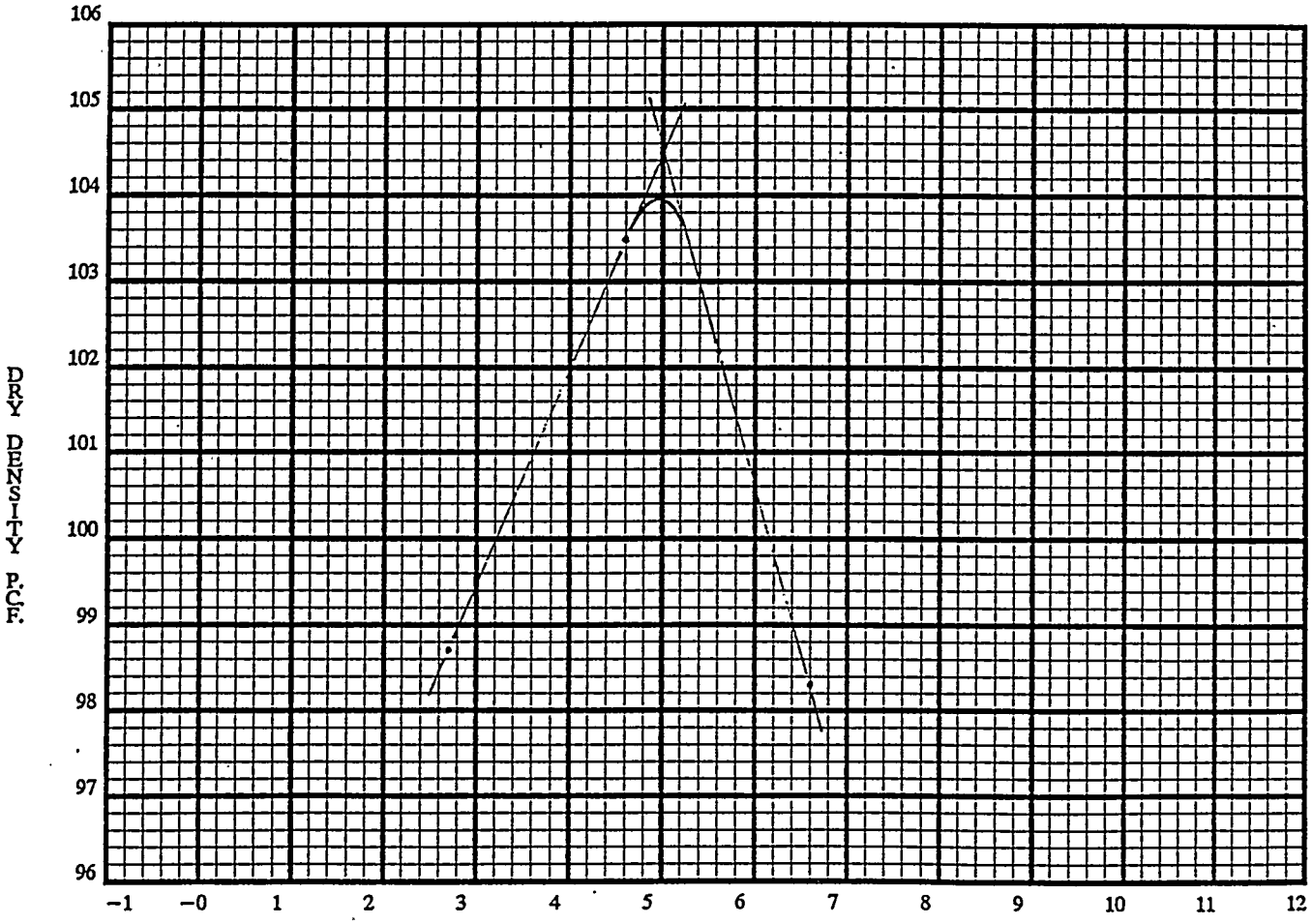
PROCTOR TEST
ASTM D 1557–91
METHOD C

BECHTEL NEVADA
MATERIALS TESTING LABORATORY
P. O. BOX 98521
LAS VEGAS, NV 89193–8521

CHARGE # C4T2CODE
LAB # 1905
DATE 07/25/98

Project: TTR AREA 9 Requested by: D. MADSEN User/Agency: BECHTEL
Sampled by: D. HERRINGTON Date sampled: 07/15/98 Material: A9/4 A,B,C
Tested by: D. HERRINGTON Date tested: 07/24/98 Checked by:

TRIAL		1	2	3	4	5	6
1	Wt.mold + wet soil	6526.1	6410.0	6291.4	6516.4	N/A	N/A
2	Wt. mold	2843.3	2843.3	2843.3	2843.3	N/A	N/A
3	Wt. wet soil	3682.8	3566.7	3448.1	3673.1	N/A	N/A
4	Wet Density, PCF	108.3	104.8	101.4	108.0	N/A	N/A
5	Moisture Tare #	111.0	E	110.0	114.0	N/A	N/A
6	Wt wet soil + tare	1119.5	1002.2	890.6	887.0	N/A	N/A
7	Wt dry soil + tare	1071.1	941.0	867.4	840.5	N/A	N/A
8	Wt moisture	48.4	61.2	23.2	46.5	N/A	N/A
9	Wt tare	17.0	17.0	16.9	16.9	N/A	N/A
10	Wt dry soil	1054.1	924.0	850.5	823.6	N/A	N/A
11	% Moisture	4.6	6.6	2.7	5.6	N/A	N/A
12	Dry Density, PCF	103.5	98.3	98.7	102.2	N/A	N/A



MAX. DENSITY = 104.0 PCF
OPT. MOISTURE = 5.0 %

NO SPECIFICATIONS: INFORMATION ONLY
Equipment used: PM 16, PTL W1256, Cal. date: 06/02/98, Cal. due: 06/02/99

CC: D. MADSEN BECHTEL
MTL BECHTEL FILES

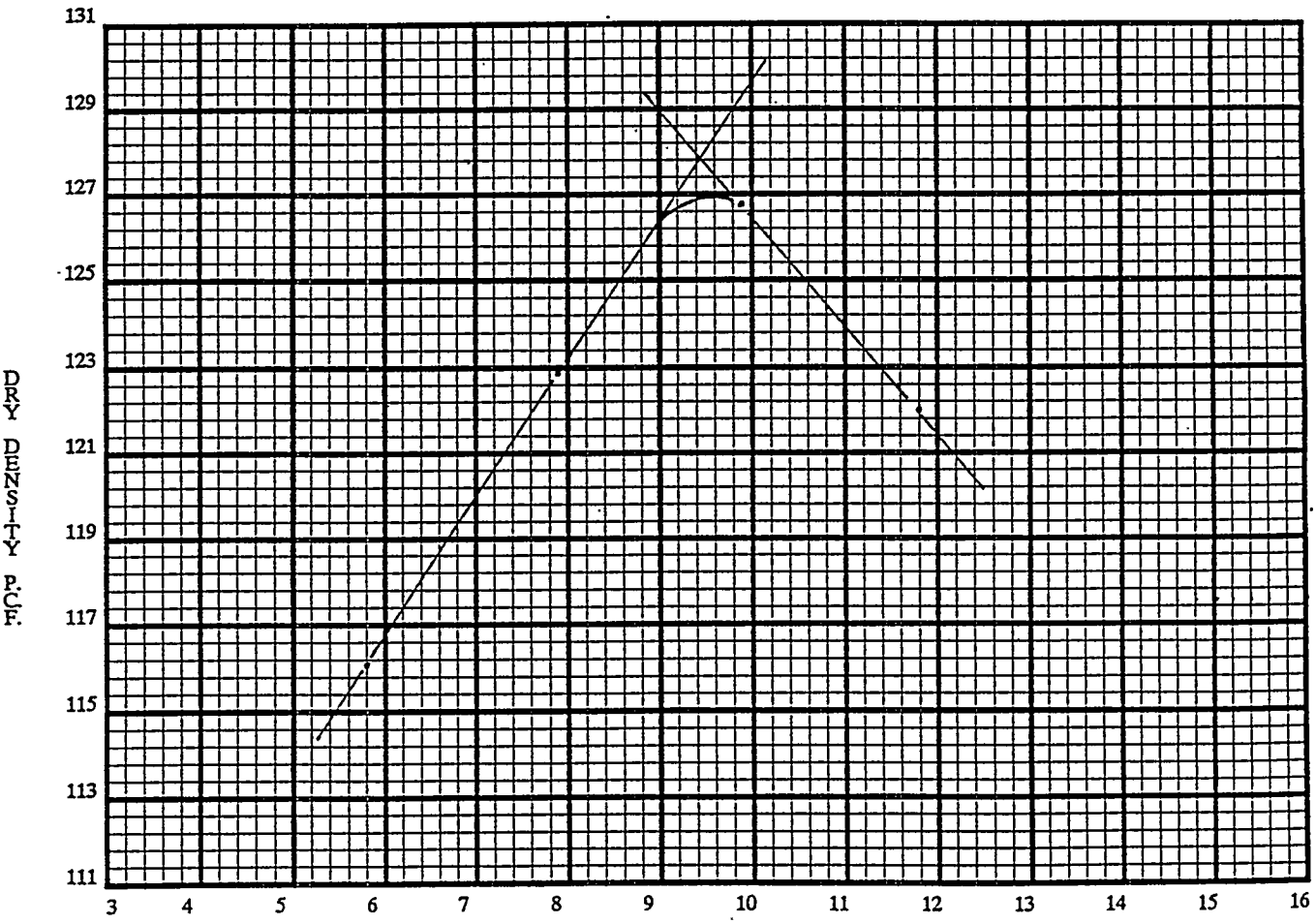
PROCTOR TEST
ASTM D 1557–91
METHOD C

BECHTEL NEVADA
MATERIALS TESTING LABORATORY
P. O. BOX 98521
LAS VEGAS, NV 89193–8521

CHARGE # C4P1CODE
LAB # 1987
DATE 07/31/98

Project: TTR AREA 3 & 9 Requested by: D. MADSEN User/Agency: BECHTEL
Sampled by: D. HERRINGTON Date sampled: 07/28/98 Material: SANDIA BORROW PIT
Tested by: T. HIGH Date tested: 07/30/98 Checked by: V. Dumah

TRIAL		1	2	3	4	5	6
1	Wt.mold + wet soil	7583.4	7485.8	7354.3	7019.3	N/A	N/A
2	Wt. mold	2843.3	2843.3	2843.3	2843.3	N/A	N/A
3	Wt. wet soil	4740.1	4642.5	4511.0	4176.0	N/A	N/A
4	Wet Density, PCF	139.3	136.5	132.6	122.8	N/A	N/A
5	Moisture Tare #	124	127	128	108	N/A	N/A
6	Wt wet soil + tare	1181.2	1332.7	1291.8	1147.9	N/A	N/A
7	Wt dry soil + tare	1076.1	1193.4	1198.3	1086.4	N/A	N/A
8	Wt moisture	105.1	139.3	93.5	61.5	N/A	N/A
9	Wt tare	17.1	17.2	17.2	17.2	N/A	N/A
10	Wt dry soil	1059.0	1176.2	1181.1	1069.2	N/A	N/A
11	**% Moisture**	**9.9**	**11.8**	**7.9**	**5.8**	**N/A**	**N/A**
12	**Dry Density, PCF**	**126.8**	**122.0**	**122.9**	**116.1**	**N/A**	**N/A**



MAX. DENSITY = 127.0 PCF
OPT. MOISTURE = 9.5 %

NO SPECIFICATIONS: INFORMATION ONLY
Equipment used: PM 16, PTL W1256, Cal. date: 06/02/98, Cal. due: 06/02/99

CC: 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 #: C4T2C0DE
User/Agency: BECHTEL | Log # N/A | MTL Lab #: 1902

Project: TTR AREA 9 | Material: NATIVE A9/1
Sampled by: D. HERRINGTON | Date Sampled: 07/15/98
Tested By: T. HIGH & D. JOHNSON | Date tested: 07/20/98
Checked by: D. HERRINGTON D.L.H. | Date checked: 9-2-98

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)
- [ ] Soil Classification
- [ ] Percent Porosity
- [ ] Specific Gravity (ASTM C-127-88/128-93)
- [ ] (ASTM D-584-92)
- [ ] Other (as noted)

Soil Class:

SIEVE ANALYSIS (- 3/8")

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"	0.0	0%	100%	N/A
3/8"	0.0	0%	100%	N/A
4	0.2	0%	100%	N/A
10	8.2	1%	99%	N/A
40	538.0	34%	66%	N/A
100	1165.1	73%	27%	N/A
200	1394.1	87.3%	12.7%	N/A

Sample Wt (g): DRY = 1597.1 WET = N/A

MOISTURE CONTENT

	PAN # 26	N/A	N/A
Wet Weight + Tare	2512.5	N/A	N/A
Dry Weight + Tare	2500.2	N/A	N/A
Water	12.3	N/A	N/A
Tare	903.1	N/A	N/A
Dry Weight	1597.1	N/A	N/A
Moisture %	0.8%	N/A	N/A

UNIT WEIGHT

	Loose	Rodded
Container Size(ft^3)	N/A	N/A
Total Weight (lb)	N/A	N/A
Tare Weight (lb)	N/A	N/A
Material Weight (lb)	N/A	N/A
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: 06/02/98 Calibration Due: 06/02/99

Sieve 1 1/2"	PTL # Y303222	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/4"	PTL # Y303276	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/8	PTL # Y302106	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve # 4	PTL # Y302043	Cal. Date: 03/26/98	Cal. Due: 03/26/99
Sieve # 10	PTL # Y11621	Cal. Date: 10/08/97	Cal. Due: 10/08/99
Sieve # 16	PTL # Y302079	Cal. Date: 03/25/98	Cal. Due: 03/26/99
Sieve # 40	PTL # Y106	Cal. Date: 10/09/97	Cal. Due: 10/09/99
Sieve # 100	PTL # Y10035	Cal. Date: 05/21/98	Cal. Due: 05/21/99
Sieve # 200	PTL # Y11599	Cal. Date: 10/09/97	Cal. Due: 10/09/99

REMARKS: NONE

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

Request / Test Report

Requested by: D. MADSEN | Charge #: C4T2C0DE
User/Agency: BECHTEL | Log #: N/A | MTL Lab #: 1903

Project: TTR AREA 9 | Material: NATIVE A9/2
Sampled by: D. HERRINGTON | Date Sampled: 07/15/98
Tested By: T. HIGH & D. JOHNSON | Date tested: 07/20/98
Checked by: D. HERRINGTON DLH | Date checked: 9-2-98

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)
- [ ] Soil Classification
- [ ] Percent Porosity
- [ ] Specific Gravity (ASTM C-127-88/128-93)
- [ ] (ASTM D-584-92)
- [ ] Other (as noted)

Soil Class:

SIEVE ANALYSIS (- 3/8")

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"	0.0	0%	100%	N/A
3/8"	0.0	0%	100%	N/A
4	0.0	0%	100%	N/A
10	3.6	0%	100%	N/A
40	399.9	30%	70%	N/A
100	897.4	67%	33%	N/A
200	1098.1	82.2%	17.8%	N/A
Sample Wt (g):	DRY =	1336.3	WET =	N/A

MOISTURE CONTENT

	PAN # 27	N/A	N/A
Wet Weight + Tare	2352.6	N/A	N/A
Dry Weight + Tare	2315.2	N/A	N/A
Water	37.4	N/A	N/A
Tare	978.9	N/A	N/A
Dry Weight	1336.3	N/A	N/A
Moisture %	2.8%	N/A	N/A

UNIT WEIGHT

	Loose	Rodded
Container Size(ft^3)	N/A	N/A
Total Weight (lb)	N/A	N/A
Tare Weight (lb)	N/A	N/A
Material Weight (lb)	N/A	N/A
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: 06/02/98 Calibration Due: 06/02/99

Sieve 1 1/2"	PTL # Y303222	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/4"	PTL # Y303276	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/8	PTL # Y302106	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve # 4	PTL # Y302043	Cal. Date: 03/26/98	Cal. Due: 03/26/99
Sieve # 10	PTL # Y11621	Cal. Date: 10/08/97	Cal. Due: 10/08/99
Sieve # 16	PTL # Y302079	Cal. Date: 03/25/98	Cal. Due: 03/26/99
Sieve # 40	PTL # Y106	Cal. Date: 10/09/97	Cal. Due: 10/09/99
Sieve # 100	PTL # Y10035	Cal. Date: 05/21/98	Cal. Due: 05/21/99
Sieve # 200	PTL # Y11599	Cal. Date: 10/09/97	Cal. Due: 10/09/99

REMARKS: NONE

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

Request / Test Report

Requested by: D. MADSEN | Charge #: C4T2C0DE
User/Agency: BECHTEL | Log # N/A | MTL Lab #: 1904

Project: TTR AREA 9 | Material: NATIVE A9/3
Sampled by: D. HERRINGTON | Date Sampled: 07/15/98
Tested By: T. HIGH & D. JOHNSON | Date tested: 07/20/98
Checked by: D. HERRINGTON DLH. | Date checked: 9-2-98

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)
- [ ] Soil Classification
- [ ] Percent Porosity
- [ ] Specific Gravity (ASTM C–127–88/128–93)
- [ ] (ASTM D–584–92)
- [ ] Other (as noted)

Soil Class:

SIEVE ANALYSIS (– 3/8")

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"	0.0	0%	100%	N/A
3/8"	15.2	1%	99%	N/A
4	33.5	2%	98%	N/A
10	73.2	5%	95%	N/A
40	451.1	32%	68%	N/A
100	854.8	61%	39%	N/A
200	1055.8	75.5%	24.5%	N/A

Sample Wt (g): DRY = 1399.0 WET = N/A

MOISTURE CONTENT

	PAN # 28	N/A	N/A
Wet Weight + Tare	2431.1	N/A	N/A
Dry Weight + Tare	2398.6	N/A	N/A
Water	32.5	N/A	N/A
Tare	999.6	N/A	N/A
Dry Weight	1399.0	N/A	N/A
Moisture %	2.3%	N/A	N/A

UNIT WEIGHT

	Loose	Rodded
Container Size(ft^3)	N/A	N/A
Total Weight (lb)	N/A	N/A
Tare Weight (lb)	N/A	N/A
Material Weight (lb)	N/A	N/A
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: 06/02/98 Calibration Due: 06/02/99

Sieve 1 1/2"	PTL # Y303222	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/4"	PTL # Y303276	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/8	PTL # Y302106	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve # 4	PTL # Y302043	Cal. Date: 03/26/98	Cal. Due: 03/26/99
Sieve # 10	PTL # Y11621	Cal. Date: 10/08/97	Cal. Due: 10/08/99
Sieve # 16	PTL # Y302079	Cal. Date: 03/25/98	Cal. Due: 03/26/99
Sieve # 40	PTL # Y106	Cal. Date: 10/09/97	Cal. Due: 10/09/99
Sieve # 100	PTL # Y10035	Cal. Date: 05/21/98	Cal. Due: 05/21/99
Sieve # 200	PTL # Y11599	Cal. Date: 10/09/97	Cal. Due: 10/09/99

REMARKS: NONE

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

Request / Test Report

Requested by: D. MADSEN | Charge #: C4T2C0DE
User/Agency: BECHTEL | Log #: N/A | MTL Lab #: 1905

Project:	TTR AREA 9	Material:	NATIVE A9/4
Sampled by:	D. HERRINGTON	Date Sampled:	07/15/98
Tested By:	T. HIGH & D. JOHNSON	Date tested:	07/20/98
Checked by:	D. HERRINGTON DLH	Date checked:	9-2-98

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)
- [ ] Soil Classification
- [ ] Percent Porosity
- [ ] Specific Gravity (ASTM C-127-88/128-93)
- [ ] (ASTM D-584-92)
- [ ] Other (as noted)

Soil Class:

SIEVE ANALYSIS (- 3/8")

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"	0.0	0%	100%	N/A
3/8"	0.0	0%	100%	N/A
4	0.0	0%	100%	N/A
10	1.1	0%	100%	N/A
40	446.9	40%	60%	N/A
100	880.0	79%	21%	N/A
200	1046.1	93.8%	6.2%	N/A
Sample Wt (g):	DRY =	1115.0	WET =	N/A

MOISTURE CONTENT

	PAN # 29	N/A	N/A
Wet Weight + Tare	2031.2	N/A	N/A
Dry Weight + Tare	2023.4	N/A	N/A
Water	7.8	N/A	N/A
Tare	908.4	N/A	N/A
Dry Weight	1115.0	N/A	N/A
Moisture %	0.7%	N/A	N/A

UNIT WEIGHT

	Loose	Rodded
Container Size(ft^3)	N/A	N/A
Total Weight (lb)	N/A	N/A
Tare Weight (lb)	N/A	N/A
Material Weight (lb)	N/A	N/A
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: 06/02/98 Calibration Due: 06/02/99

Sieve 1 1/2"	PTL # Y303222	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/4"	PTL # Y303276	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/8	PTL # Y302106	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve # 4	PTL # Y302043	Cal. Date: 03/26/98	Cal. Due: 03/26/99
Sieve # 10	PTL # Y11621	Cal. Date: 10/08/97	Cal. Due: 10/08/99
Sieve # 16	PTL # Y302079	Cal. Date: 03/25/98	Cal. Due: 03/26/99
Sieve # 40	PTL # Y106	Cal. Date: 10/09/97	Cal. Due: 10/09/99
Sieve # 100	PTL # Y10035	Cal. Date: 05/21/98	Cal. Due: 05/21/99
Sieve # 200	PTL # Y11599	Cal. Date: 10/09/97	Cal. Due: 10/09/99

REMARKS: NONE

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

Request / Test Report

Requested by: D. MADSEN | Charge #: C4T2C0DE
User/Agency: BECHTEL | Log # N/A | MTL Lab #: 1987

Project:	TTR AREA 9	Material:	SANDIA BORROW PIT
Sampled by:	D. HERRINGTON	Date Sampled:	07/28/98
Tested By:	D. JOHNSON	Date tested:	08/01/98
Checked by:	D. HERRINGTON DLH.	Date checked:	9-2-98

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)
- [ ] Soil Classification
- [ ] Percent Porosity
- Specific Gravity
  - [ ] (ASTM C-127-88/128-93)
  - [ ] (ASTM D-584-92).
- [ ] Other (as noted)

Soil Class:

SIEVE ANALYSIS (- 3/8")

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"	27.8	2%	98%	N/A
3/8"	108.1	9%	91%	N/A
4	257.9	22%	78%	N/A
10	469.1	40%	60%	N/A
40	775.5	66%	34%	N/A
100	921.8	78%	22%	N/A
200	1004.4	85.2%	14.8%	N/A
Sample Wt (g):	DRY =	1179.1	WET =	N/A

MOISTURE CONTENT

	PAN # 4	N/A	N/A
Wet Weight + Tare	1313.8	N/A	N/A
Dry Weight + Tare	1196.1	N/A	N/A
Water	117.7	N/A	N/A
Tare	17.0	N/A	N/A
Dry Weight	1179.1	N/A	N/A
Moisture %	10.0%	N/A	N/A

UNIT WEIGHT

	Loose	Rodded
Container Size(ft^3)	N/A	N/A
Total Weight (lb)	N/A	N/A
Tare Weight (lb)	N/A	N/A
Material Weight (lb)	N/A	N/A
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: 06/02/98 Calibration Due: 06/02/99

Sieve 1 1/2"	PTL # Y303222	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/4"	PTL # Y303276	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve 3/8	PTL # Y302106	Cal. Date: 03/27/98	Cal. Due: 03/27/99
Sieve # 4	PTL # Y302043	Cal. Date: 03/26/98	Cal. Due: 03/26/99
Sieve # 10	PTL # Y11621	Cal. Date: 10/08/97	Cal. Due: 10/08/99
Sieve # 16	PTL # Y302079	Cal. Date: 03/25/98	Cal. Due: 03/26/99
Sieve # 40	PTL # Y106	Cal. Date: 10/09/97	Cal. Due: 10/09/99
Sieve # 100	PTL # Y10035	Cal. Date: 05/21/98	Cal. Due: 05/21/99
Sieve # 200	PTL # Y11599	Cal. Date: 10/09/97	Cal. Due: 10/09/99

REMARKS: NONE

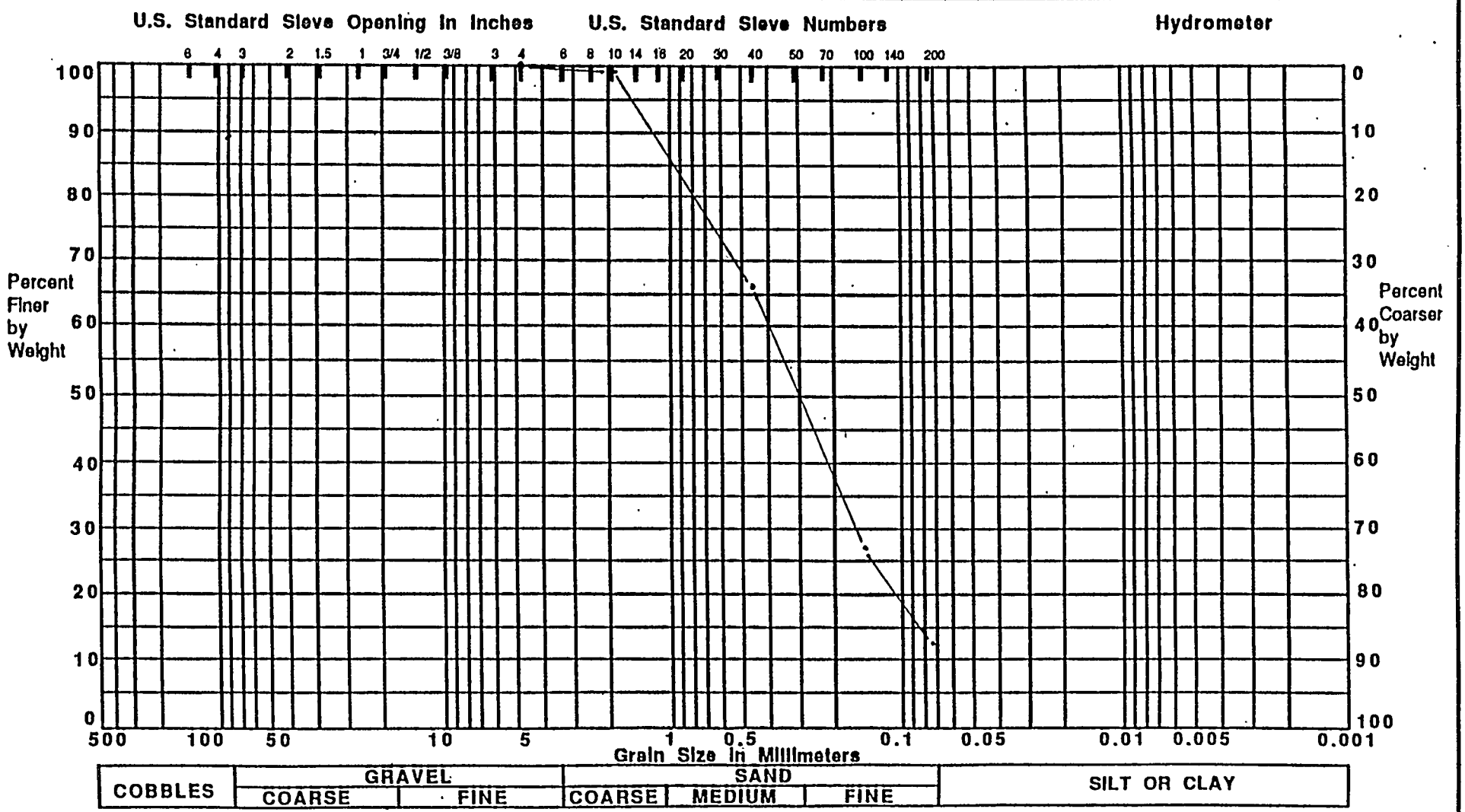
GRADATION CURVES

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

LAB NO. 1902
CHARGE # C472C0DE
DATE 08/02/98

PROJECT: TTR AREA 9 CLASSIFICATION: SM

CHECKED BY: D. HERRINGTON DATE CHECKED: 9-2-98 MATERIAL NATIVE A9/1



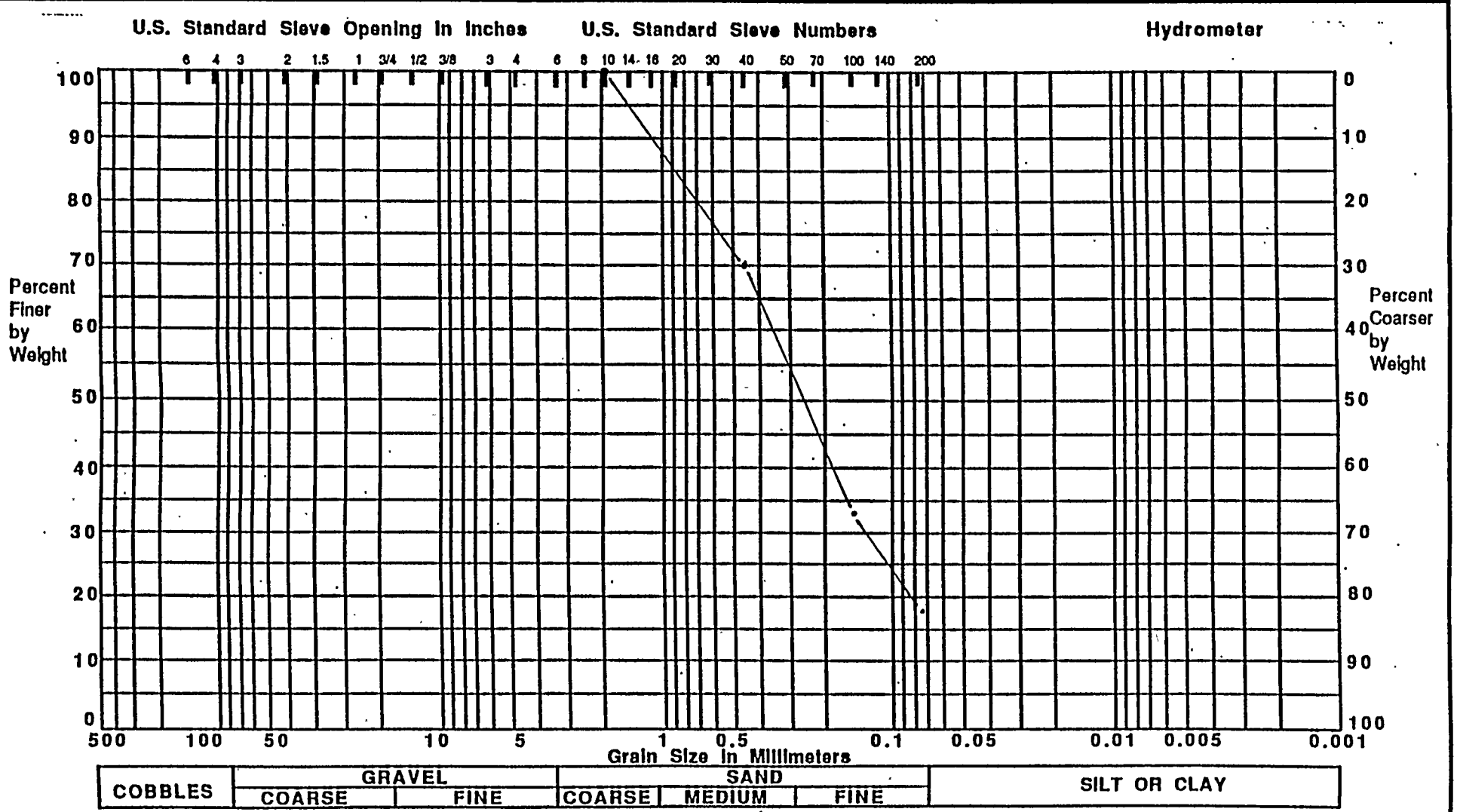
NO EQUIPMENT USED.

GRADATION CURVES

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

LAB NO. 1903
CHARGE # C472C0DE
DATE 08/02/98

PROJECT: TTR AREA 9
CLASSIFICATION: SM
CHECKED BY: D. HERRINGTON Del H.
DATE CHECKED: 9-2-98
MATERIAL NATIVE A9/2



NO EQUIPMENT USED.

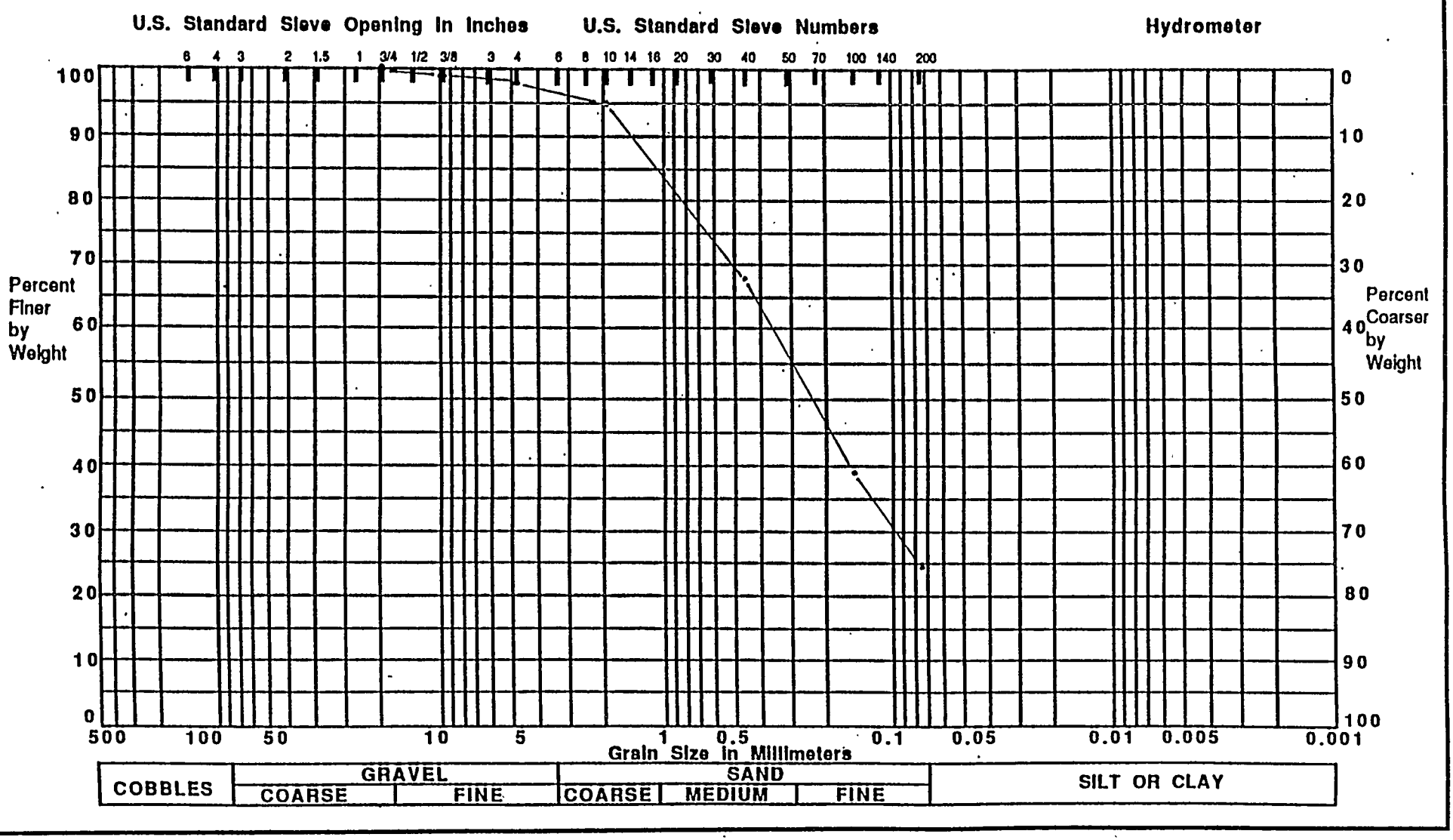
GRADATION CURVES

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

LAB NO. 1904
CHARGE # C472C0DE
DATE 08/02/98

PROJECT: TTR AREA 9 CLASSIFICATION: SM

CHECKED BY: D. HERRINGTON DH DATE CHECKED: 9-2-98 MATERIAL NATIVE A9/3



NO EQUIPMENT USED.

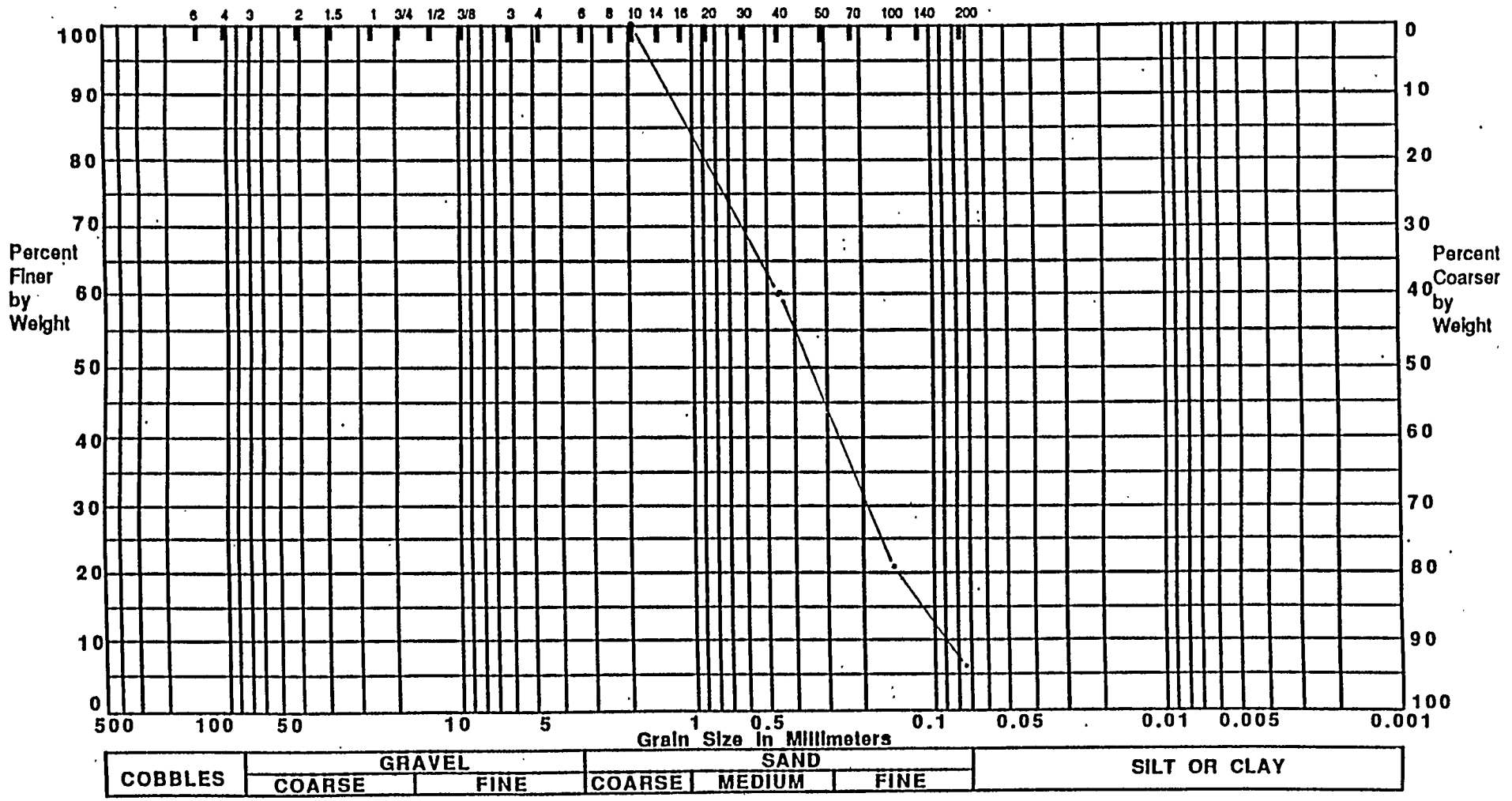
GRADATION CURVES

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

LAB NO:	1905
CHARGE #	C472C0DE
DATE	08/02/98

PROJECT: TTR AREA 9 CLASSIFICATION: SM / SP

CHECKED BY: D. HERRINGTON D.L.H. DATE CHECKED: 9-2-98 MATERIAL NATIVE A9/4



NO EQUIPMENT USED.

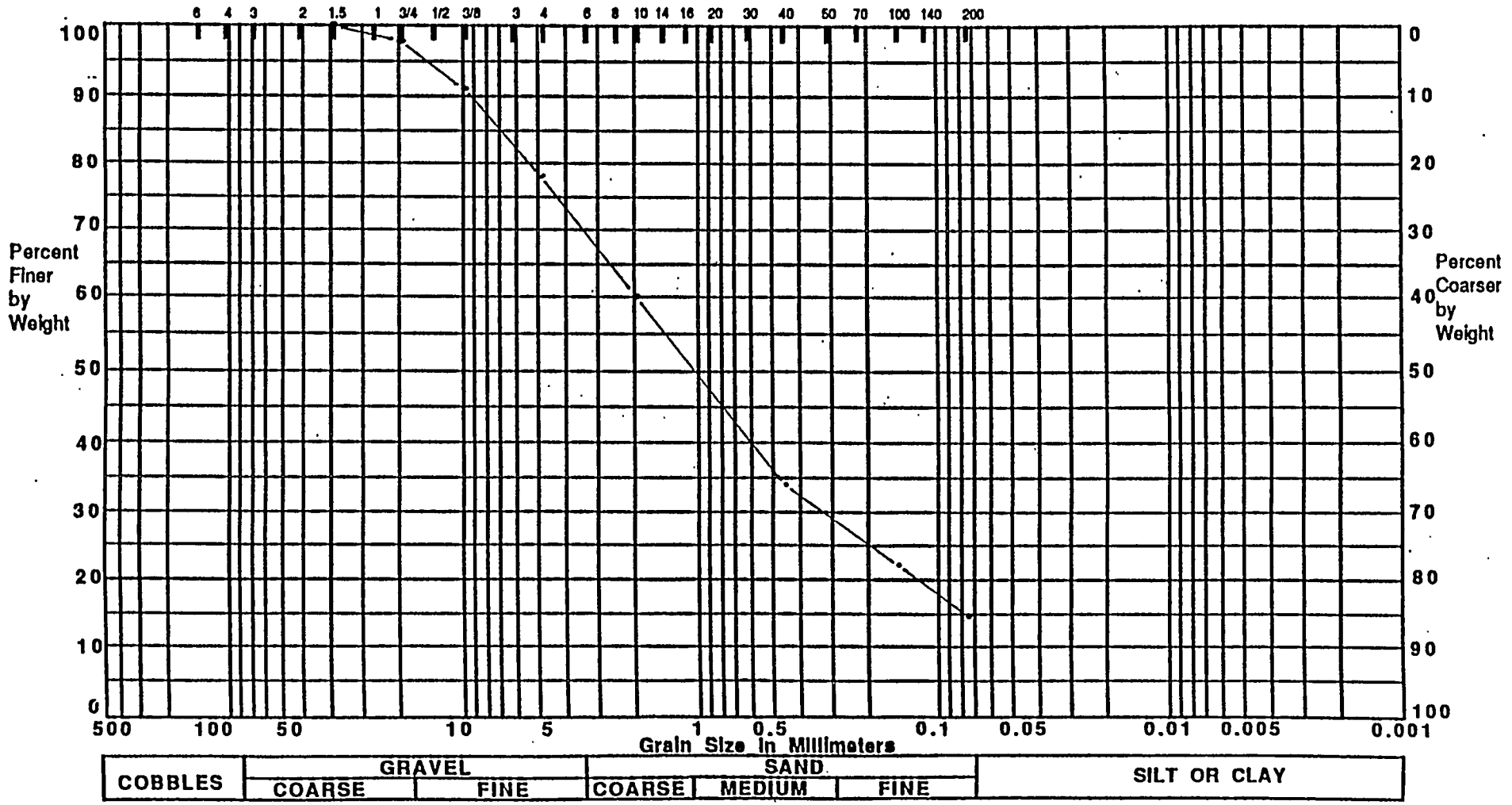
GRADATION CURVES

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

LAB NO.	1987
CHARGE #	C472C0DE
DATE	08/02/98

PROJECT: TTR AREA 9 CLASSIFICATION: SM

CHECKED BY: D. HERRINGTON DATE CHECKED: 9-2-98 MATERIAL SANDIA BORROW PIT



NO EQUIPMENT USED.

Bechtel Nevada
Materials Testing Laboratory
P.O.BOX 98521, M/S NTS 188, LAS VEGAS, NV 89193
(702) 295-6669

Table 1.

SAMPLE TTR PERMEABILITY TO DI WATER
ASTM D 2434-68 (Reapproved 1974)
Standard Test Method for Permeability of Granular Soils (Constant Head)

Project: TTR A/9 | MTL Lab: 1902 | 15.240 = Sample Length (cm)
Requestor: D. MADSEN | Request #: S-170 | 6.033 = Sample Diameter (cm)
Organization: Bechtel | Charge #: C4T2C0DE | 28.68 = X-Sec. Area (sq cm)
Address: NTS306 | Sample Origin: A9/1
Phone: 5-7211 | Sample Type: REMOLDED @ AVERAGE 100.2 WET DENSITY
Tested by: DALE, TOM, DAVE | Water Temperature: 21.4 C
Test start: 08/10/98 | Checked by: V. Thummala

Reading # Days From Start	Manometers H1 mm	Manometers H2 mm	Head cm	Q cm^3	t sec.	Q/At	h/l	k - 20 C cm/sec	Date Tested	Time Tested
7	954	55	89.9	10.00	372.0	0.00094053	5.8990	1.55E-04	08/17/98	AM
7	953	55	89.8	10.00	360.0	0.00097188	5.8924	1.60E-04	08/17/98	AM
7	953	57	89.6	10.00	358.0	0.00097731	5.8793	1.61E-04	08/17/98	AM
7	953	57	89.6	10.00	363.0	0.00096385	5.8793	1.59E-04	08/17/98	AM

EQUIPMENT USED: METTLER PM400, PTL # Y1255, Calibration Date: 05/21/98, Calibration Due: 05/21/99

Bechtel Nevada
Materials Testing Laboratory
P.O.BOX 98521, M/S NTS 188, LAS VEGAS, NV 89193
(702) 295-6669

Table 2.

SAMPLE TTR PERMEABILITY TO DI WATER
ASTM D 2434-68 (Reapproved 1974)
Standard Test Method for Permeability of Granular Soils (Constant Head)

Project: TTR A/9	MTL Lab: 1903	15.240 = Sample Length (cm)
Requestor: D. MADSEN	Request #: S-170	6.033 = Sample Diameter (cm)
Organization: Bechtel	Charge #: C4T2C0DE	28.58 = X-Sec. Area (sq cm)
Address: NTS306	Sample Origin: A9/2	
Phone: 5-7211	Sample Type: REMOLDED @ AVERAGE 101.4 WET DENSITY	
Tested by: DALE, TOM, DAVE	Water Temperature: 21.4 C	
Test start: 08/10/98	Checked by: V. Thummala	

Reading # Days From Start	Manometers H1 mm	Manometers H2 mm	Head cm	Q cm^3	t sec.	Q/At	h/l	k - 20 C cm/sec	Date Tested	Time Tested
7	955	64	89.1	10.00	454.0	0.00077065	5.8465	1.28E-04	08/17/98	AM
7	955	60	89.5	10.00	396.0	0.00088353	5.8727	1.46E-04	08/17/98	AM
7	955	60	89.5	10.00	389.0	0.00089943	5.8727	1.49E-04	08/17/98	AM
7	955	59	89.6	10.00	377.0	0.00092806	5.8793	1.53E-04	08/17/98	AM
7	955	59	89.6	10.00	367.0	0.00095334	5.8793	1.57E-04	08/17/98	AM
EQUIPMENT USED:	METTLER PM400, PTL # Y1255, Calibration Date: 05/21/98, Calibration Due: 05/21/99									

Bechtel Nevada
Materials Testing Laboratory
P.O.BOX 98521, M/S NTS 188, LAS VEGAS, NV 89193
(702) 295-6669

Table 3

SAMPLE TTR PERMEABILITY TO DI WATER
ASTM D 2434-68 (Reapproved 1974)
Standard Test Method for Permeability of Granular Soils (Constant Head)

Project: TTR A/9	MTL Lab: 1904	15.240 = Sample Length (cm)
Requestor: D. MADSEN	Request #: S-170	6.033 = Sample Diameter (cm)
Organization: Bechtel	Charge #: C4T2C0DE	28.58 = X-Sec. Area (sq cm)
Address: NTS306	Sample Origin: A9/3	
Phone: 5-7211	Sample Type: REMOLDED @ AVERAGE 109.7 WET DENSITY	
Tested by: DALE, TOM, DAVE	Water Temperature: 21.4 C	
Test start: 08/10/98	Checked by: V. Thummala	

Reading # Days From Start	Manometers H1 mm	Manometers H2 mm	Head cm	Q cm^3	t sec.	Q/At	h/l	k - 20 C cm/sec	Date Tested	Time Tested
7	953	37	91.6	1.31	2100.0	0.00002183	6.0105	**3.52E-06**	08/17/98	AM
8	940	38	90.2	1.82	3720.0	0.00001712	5.9186	**2.81E-06**	08/18/98	AM
9	955	38	91.7	1.90	4920.0	0.00001351	6.0171	**2.18E-06**	08/19/98	AM

EQUIPMENT USED: METTLER PM400, PTL # Y1255, Calibration Date: 05/21/98, Calibration Due: 05/21/99

Bechtel Nevada
Materials Testing Laboratory
P.O.BOX 98521, M/S NTS 188, LAS VEGAS, NV 89193
(702) 295-6669

Table 4

SAMPLE TTR PERMEABILITY TO DI WATER
ASTM D 2434-68 (Reapproved 1974)
Standard Test Method for Permeability of Granular Soils (Constant Head)

Project: TTR A/9	MTL Lab: 1905	15.240 = Sample Length (cm)
Requestor: D. MADSEN	Request #: S-170	6.033 = Sample Diameter (cm)
Organization: Bechtel	Charge #: C4T2C0DE	28.68 = X-Sec. Area (sq cm)
Address: NTS306	Sample Origin: A9/4	
Phone: 5-7211	Sample Type: REMOLDED @ AVERAGE 98.7 WET DENSITY	
Tested by: DALE, TOM, DAVE	Water Temperature: 21.4 C	
Test start: 08/10/98	Checked by: V. Thummala	

Reading # Days From Start	Manometers H1 mm	Manometers H2 mm	Head cm	Q cm^3	t sec.	Q/At	h/l	k - 20 C cm/sec	Date Tested	Time Tested
2	925	37	88.8	10.00	12.0	0.02915642	5.8268	4.86E-03	08/12/98	AM
2	925	37	88.8	10.00	12.0	0.02915642	5.8268	4.86E-03	08/12/98	AM
2	925	37	88.8	10.00	12.0	0.02915642	5.8268	4.86E-03	08/12/98	AM
2	925	37	88.8	10.00	12.0	0.02915642	5.8268	4.86E-03	08/12/98	AM
2	963	52	91.1	10.00	11.0	0.03180700	5.9777	5.16E-03	08/12/98	AM
2	963	52	91.1	10.00	11.0	0.03180700	5.9777	5.16E-03	08/12/98	AM
EQUIPMENT USED:	METTLER PM400, PTL # Y1255, Calibration Date: 05/21/98, Calibration Due: 05/21/99									

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Table 8.

SAMPLE TTR PERMEABILITY TO DI WATER
ASTM D 2434-68 (Reapproved 1974)
Standard Test Method for Permeability of Granular Soils (Constant Head)

Project: TTR A/3 & A/9	MTL Lab: 1987	15.240 = Sample Length (cm)
Requestor: D. MADSEN	Request #: S-178	6.033 = Sample Diameter (cm)
Organization: Bechtel	Charge #: C4P1C0DE	28.58 = X-Sec. Area (sq cm)
Address: NTS306	Sample Origin: SANDIA BORROW	
Phone: 5-7211	Sample Type: REMOLDED (85%) @ 118.2 WET DENSITY & 9.5% MOISTURE	
Tested by: DALE, TOM, DAVE	Water Temperature: 21.4 C	
Test start: 08/11/98	Checked by: V. Thummala	

Reading # Days From Start	Manometers H1 mm	Manometers H2 mm	Head cm	Q cm^3	t sec.	Q/At	h/l	k - 20 C cm/sec	Date Tested	Time Tested
8	958	49	90.9	10.00	80.0	0.00437346	5.9646	7.11E-04	08/18/98	AM
8	958	42	91.6	10.00	87.0	0.00402158	6.0105	6.49E-04	08/18/98	AM
8	958	39	91.9	10.00	68.0	0.00514525	6.0302	8.28E-04	08/18/98	AM
8	958	39	91.9	10.00	61.0	0.00573569	6.0302	9.23E-04	08/18/98	AM
8	958	40	91.8	10.00	63.0	0.00555360	6.0236	8.95E-04	08/18/98	AM

EQUIPMENT USED: METTLER PM400, PTL # Y1255, Calibration Date: 05/21/98, Calibration Due: 05/21/99

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Table 9.

SAMPLE TTR PERMEABILITY TO DI WATER
ASTM D 2434-68 (Reapproved 1974)
Standard Test Method for Permeability of Granular Soils (Constant Head)

Project: TTR A/3 & A/9	MTL Lab: 1987	16.240 = Sample Length (cm)
Requestor: D. MADSEN	Request #: S-178	6.033 = Sample Diameter (cm)
Organization: Bechtel	Charge #: C4P1C0DE	28.58 = X-Sec. Area (sq cm)
Address: NTS306	Sample Origin: SANDIA BORROW	
Phone: 5-7211	Sample Type: REMOLDED (90%) @ 126.2 WET DENSITY & 9.5% MOISTURE	
Tested by: DALE, TOM, DAVE	Water Temperature: 21.4 C	
Test start: 08/11/98	Checked by: V. Thummala	

Reading # Days From Start	Manometers H1 mm	Manometers H2 mm	Head cm	Q cm^3	t sec.	Q/At	h/l	k - 20 C cm/sec	Date Tested	Time Tested
8	957	38	91.9	0.30	107.0	0.00009810	6.0302	1.58E-05	08/18/98	AM
8	957	38	91.9	0.73	100.0	0.00025541	6.0302	4.11E-05	08/18/98	AM
8	957	40	91.7	0.65	105.0	0.00021659	6.0171	3.49E-05	08/18/98	AM
8	957	40	91.7	0.90	127.0	0.00024794	6.0171	4.00E-05	08/18/98	AM
8	957	42	91.5	0.85	128.0	0.00023234	6.0039	3.75E-05	08/18/98	AM
8	957	40	91.7	0.78	121.0	0.00022554	6.0171	3.64E-05	08/18/98	AM

EQUIPMENT USED: METTLER PM400, PTL # Y1255, Calibration Date: 05/21/98, Calibration Due: 05/21/99

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Table 10.

SAMPLE TTR PERMEABILITY TO DI WATER
ASTM D 2434-68 (Reapproved 1974)
Standard Test Method for Permeability of Granular Soils (Constant Head)

Project: TTR A/3 & A/9	MTL Lab: 1987	16.240 = Sample Length (cm)
Requestor: D. MADSEN	Request #: S-178	6.033 = Sample Diameter (cm)
Organization: Bechtel	Charge #: C4P1C0DE	28.58 = X-Sec. Area (sq cm)
Address: NTS306	Sample Origin: SANDIA BORROW	
Phone: 5-7211	Sample Type: REMOLDED (95%) @ 132.1 WET DENSITY & 9.5% MOISTURE	
Tested by: DALE, TOM, DAVE	Water Temperature: 21.4 C	
Test start: 08/11/98	Checked by: V. Thummala	

Reading # Days From Start	Manometers H1 mm	Manometers H2 mm	Head cm	Q cm^3	t sec.	Q/At	h/l	k - 20 C cm/sec	Date Tested	Time Tested
8	957	36	92.1	0.72	370.0	0.00006808	6.0433	1.09E-05	08/18/98	AM
8	957	40	91.7	0.40	68.0	0.00020581	6.0171	3.32E-05	08/18/98	AM
8	957	40	91.7	1.11	199.0	0.00019516	6.0171	3.15E-05	08/18/98	AM
8	955	38	91.7	0.70	473.0	0.00005178	6.0171	8.35E-06	08/18/98	AM
8	955	36	91.9	0.95	678.0	0.00004902	6.0302	7.89E-06	08/18/98	AM
8	955	40	91.5	0.70	373.0	0.00006566	6.0039	1.06E-05	08/18/98	AM
8	954	37	91.7	0.74	330.0	0.00007846	6.0171	1.27E-05	08/18/98	AM
8	954	37	91.7	0.50	357.0	0.00004900	6.0171	7.90E-06	08/18/98	AM
8	953	38	91.5	0.67	484.0	0.00004843	6.0039	7.83E-06	08/18/98	AM
8	953	38	91.5	0.48	196.0	0.00008568	6.0039	1.38E-05	08/18/98	AM
8	953	38	91.5	0.63	243.0	0.00009071	6.0039	1.47E-05	08/18/98	AM
8	953	38	91.5	1.00	428.0	0.00008175	6.0039	1.32E-05	08/18/98	AM

EQUIPMENT USED: METTLER PM400, PTL # Y1255, Calibration Date: 05/21/98, Calibration Due: 05/21/99

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