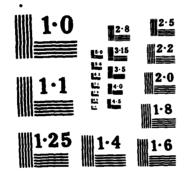
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FINAL REPORT

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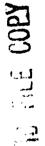
NELLIS AIR FORCE BASE, NEVADA

TACTICAL AIR COMMAND

PREPARED FOR

UNITED STATES AIR FORCE OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (OEHL) BROOKS AIR FORCE BASE, TEXAS 78235-5501



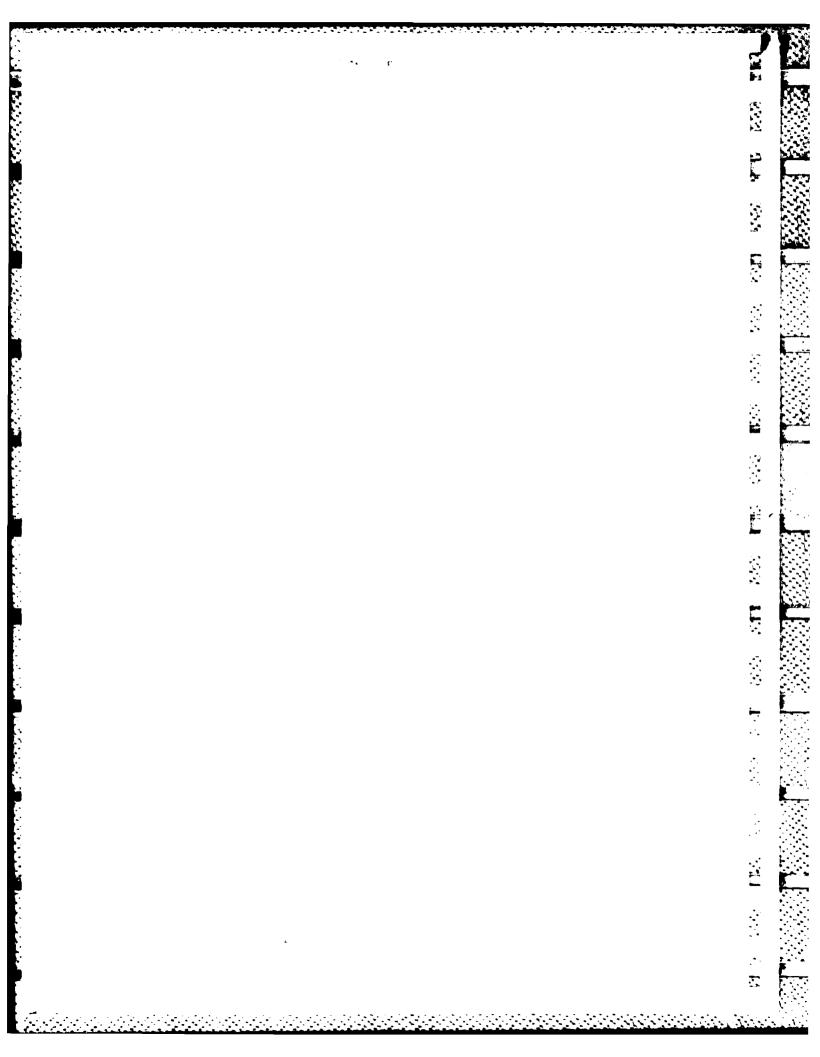


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FINAL REPORT

FOR

NELLIS AIR FORCE BASE, NEVADA

TACTICAL AIR COMMAND

AUGUST 9, 1985

PREPARED BY

DAMES & MOORE 1550 NORTHWEST HIGHWAY PARK RIDGE, ILLINOIS 60068

CONTRACT NO. F 33615-83-D-4002, Order 003

OEHL TECHNICAL MONITOR: Maj. Dennis Brownley

TECHNICAL SERVICES DIVISION (TS)

PREPARED FOR

UNITED STATES AIR FORCE OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (OEHL) BROOKS AIR FORCE BASE, TEXAS 78235-5501

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NOTICE

This report has been prepared for the United States Air Force by Dames & Moore, for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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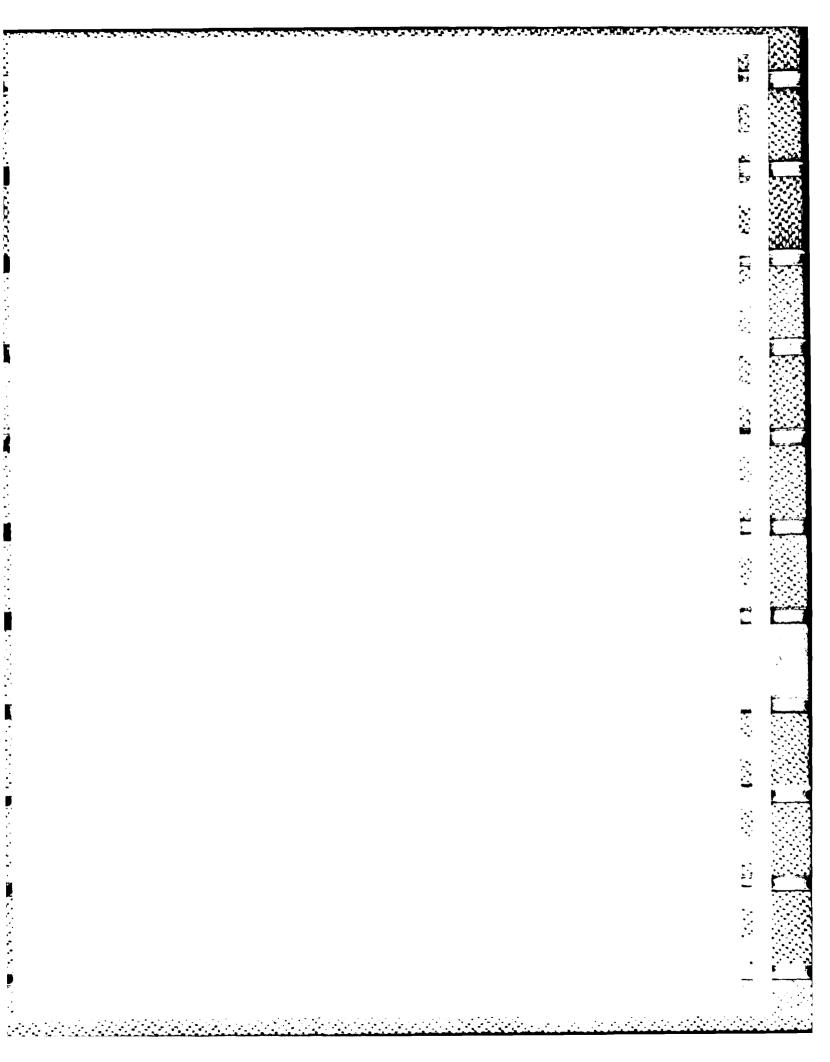
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PREFACE

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As part of the U.S. Air Force Installation Restoration Program (IRP), investigations were undertaken at five sites on Nellis Air Force Base, Nevada, to determine whether hazardous material contamination is present. This report, prepared by Dames & Moore under Contract No. F 33615-830D-4002, Order 0003, presents the results of the Phase II, Stage 1 IRP investigations. The period of work reported on herein was September 1983 through August 1985. The field investigations were directed by Dr. Kenneth J. Stimpfl. Mr. John Dudley, Hydrogeologist, supervised installation of monitoring wells, and Mr. Thomas Lee, Geotechnical Engineer, supervised the soil sampling activities. Maj. Dennis D. Brownley, Technical Services Division, USAF Occupational and Environmental Health Laboratory (OEHL), was the Technical Monitor.

TABLE OF CONTENTS

		PAGE
SUM	IMARY	1
I.	INTRODUCTION	3
	A. BACKGROUND	3
	B. PURPOSE AND SCOPE	3
	C. BRIEF HISTORY OF NELLIS AFB AND WASTE DISPOSAL OPERATIONS	4
	D. DESCRIPTION OF SITES	
	E. IDENTIFICATION OF POLLUTANTS SAME	
	F. IDENTIFICATION OF THE FIELD TEAM	9
п.	ENVIRONMENTAL SETTING	11
	A. PHYSICAL GEOGRAPHY	
	B. REGIONAL GEOLOGY AND HYDROGEOL	LOGY 11
	C. GENERAL HYDROGEOLOGY	14
	D. SITE-SPECIFIC GEOLOGY AND HYDROG	EOLOGY 20
	E. HISTORIC GROUND WATER PROBLEMS	24
	F. LOCATIONS OF WELLS ON AND OFF BA	ASE 25
III.	FIELD PROGRAM	27
	A. FIELD PROGRAM DEVELOPMENT	27
	B. IMPLEMENTATION	27
IV.	DISCUSSION OF RESULTS AND SIGNIFICANCE	OF FINDINGS 34
	A. DISCUSSION OF RESULTS	34
	B. SIGNIFICANCE OF FINDINGS	38
۷.	ALTERNATIVE MEASURES	43
	CONCLUSIONS	49
VII.	RECOMMENDATIONS	51
ΑΡΡ	PENDICES	

A - LOGS OF BORINGS, MONITOR WELLS, BASE WELLS AND DOMESTIC WELLS

- **B LABORATORY AND FIELD QUALITY CONTROL PROGRAMS**
- C CHAIN-OF-CUSTODY FORMS
- D ANALYTICAL DATA
- E REFERENCES

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K

L

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L

- F BIOGRAPHIES OF KEY PERSONNEL
- G SAFETY PLAN
- H ~ SCOPE OF WORK
- I WELL LOCATION AND ELEVATION SURVEY
- J GLOSSARY OF TERMS, ACRONYMS, ABBREVIATIONS, AND SYMBOLS
- K COST ESTIMATES (under separate cover)

LIST OF TABLES

Ê.			
		LIST OF TABLES	
İ	Table No.	Title	Pag
	1	Parameters, Limits of Detection for Soil and Ground Water Analyses, and Water Quality Criteria	10
F	2	Base Well Construction, Yield, and Water Level Data	15
	3	Summary of Domestic Wells in Section 21	19
.N	4	Monitor Well Construction Details	29
-	5	Sample Preservation and Analytical Methods	30
	6	Summary of Constituents Above Detection Limits in Ground Water Analyses	35
1	7	Summary of Constituents Above Detection Limits in Soil Samples	39
	8	Recommended Parameters for Future Ground Water Analyses	45

LIST OF PLATES

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1.

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Plate No.	Title	Page
1	Vicinity Map	5
2	Locations of Waste Disposal Sites, Production Wells, and Monitor Wells	7
3	Generalized Geology	12
4	Comparison of Shallow and Deep Ground Water Elevations	16
5	Water Level Contour Maps for Wells that Penetrate the Principal Aguifers, February 1973 and March 1975	17
6	Shallow and Deep Ground Water Elevations Contour Map	21
7	Location of Soil Borings at Sites 15 and 20	23

SUMMARY

Nellis Air Force Base (AFB) is located approximately 8 miles northeast of Las Vegas, Nevada. It is situated near the eastern edge of the Las Vegas Basin, which is an intermountain valley and typical of basin and range physiography. Nellis AFB has been in operation since 1940 as a gunnery school for fighter pilots and is currently the largest base in the Tactical Air Command.

The Phase II, Stage 1 field evaluation of the Installation Restoration Program (IRP) consisted of investigations at the following five sites:

Site 1 - Main Base Landfill;

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Site 17 - Location of Former Sewage Treatment Plant (STP) Percolation Ponds; Site 4 - Fuel Tank Sludge Disposal Area; Site 15 - Storm Drain Gully; and

Site 20 - Existing Fire Training Area.

The field investigation consisted of the following activities:

- o Installation and sampling of three monitor wells along the southernmost boundary of the base, which is immediately south of Sites 1, 17, and 24.
- o Sampling of base wells 6, 11, 12, 13, and 14.
- o Drilling and sampling five borings at Site 15.
- o Drilling and sampling four borings at Site 20.

The ground water and soil samples were analyzed for up to 44 constituents, including purgeable halocarbons and aromatics, pesticides, lead, nitrate, oil and grease, and phenol.

Two ground water systems exist beneath Nellis AFB. The shallow ground water system comprises approximately the upper 200 feet of valley sediments and is maintained by upward leakage from the deeper artesian aquifer and recharged by septic tank effluent, irrigation waters, and wastewater treatment plant effluent. Precipitation is an insignificant source of recharge. The artesian ground water system consists of the more permeable sediments at depths greater than about 200 feet and is the principal source of ground water for the base and the rest of the Las Vegas Valley. The influence of pumping from base wells completed in the artesian aquifer can be seen by the parallel decline of shallow and artesian ground water levels with time. Data collected from this study indicate that the downgradient direction of the shallow aquifer system is not in the direction anticipated by previous studies. Therefore, the monitoring wells that have been constructed may not present maximum contaminant concentrations.

Of the 44 parameters in the ground water analyses, only 6 were present in one or more samples above detection limits. The detected parameters included 2 halocarbons (1,1,1-trichloroethane and toluene), 2 pesticides (aldrin and DDT isomers), nitrate, and phenol. The nitrate concentration in one of the monitor well samples exceeded primary drinking water standards. There is some uncertainty in the aldrin analysis because the level indicated is near the threshold of detection and for various geochemical reasons as discussed in the main text. The elevated nitrate concentrations posed no risk to human health to the base because shallow ground water is not used for drinking water at the base. However, it is possible that Site 17 is the source of excessive nitrate concentrations south of the base, where shallow ground water is a source of drinking water for many domestic wells.

No significant evidence of contamination was found at either Site 15 or Site 20.

The Phase II, Stage 1 conclusions are as follows:

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- 1. Aldrin was tentatively identified in samples from base wells 11 and 13. However, because the analyses are at the threshold of detection, there is some uncertainty in the analysis for aldrin.
- 2. The concentrations of nitrate in monitor well samples pose no health risks to the base, but may indicate that migration of contaminants from wastes disposed at the base create a health risk for residents south of the base. This is also true regarding DDT isomers.
- 3. More information regarding the shallow ground water regime needs to be collected in order to assess the true direction of contaminant movement and the source, extent, and magnitude of contamination in the shallow ground water system.

Recommendations for the next phase of investigation at Nellis AFB are given in Section VII.

I. INTRODUCTION

A. BACKGROUND

The Department of Defense (DOD) initiated the Installation Restoration Program (IRP) in 1976 to investigate and mitigate any environmental contamination that may be present at DOD facilities as a result of handling or disposing hazardous wastes. IRP was revised in 1981 and reissued as the Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5. The Air Force implemented DEQPPM 81-5 in 1982 as a four-phase program.

Phase IProblem Identification/Records SearchPhase IIProblem Confirmation and QuantificationPhase IIITechnology Base DevelopmentPhase IVCorrective Action

For Nellis AFB, Las Vegas, Nevada, Phase I was completed by CH2M Hill (1982). Dames & Moore has been retained by the Air Force under Contract Number F33615-83-D-4002 to conduct the Phase II, Stage 1 field evaluation.

This report presents the results of Dames & Moore's field and laboratory investigations in the vicinity of hazardous waste disposal and handling areas at Nellis AFB. Chemical analyses were undertaken by UBTL, Inc. of Salt Lake City, Utah.

B. PURPOSE AND SCOPE

The purposes of the field evaluation portion of Phase II of the IRP were to:

- 1. Determine if environmental contamination has resulted from waste disposal practices at Nellis AFB;
- 2. If contamination is found, provide estimates of the magnitude and extent of contamination; and
- 3. Identify any additional investigations and their attendant costs necessary to identify the magnitude, extent, and direction of movement of discovered contaminants.

The scope of work as outlined for Phase II, Stage 1 of the IRP consisted of the following activities:

1. Drilling, sampling, and geologically logging three borings to a depth of 120 feet at locations south of the base landfill (Site 1);

2. Installing and developing a monitor well in each boring;

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- 3. Sampling the three monitor wells and base wells 6, 11, 12, 13, and 14;
- 4. Analyzing the ground water samples for 44 parameters including halocarbons, aromatics, pesticides, and others;
- 5. Drilling, soil sampling, and geologically logging 5 borings to a depth of 20 feet at Site 15 (storm drain gully) and 4 borings to a depth of 20 feet at Site 20 (existing fire training area);
- 6. Analyzing selected soil samples from both sites for the organic parameters and oil and grease; and
- 7. Preparing this report, which presents our findings.

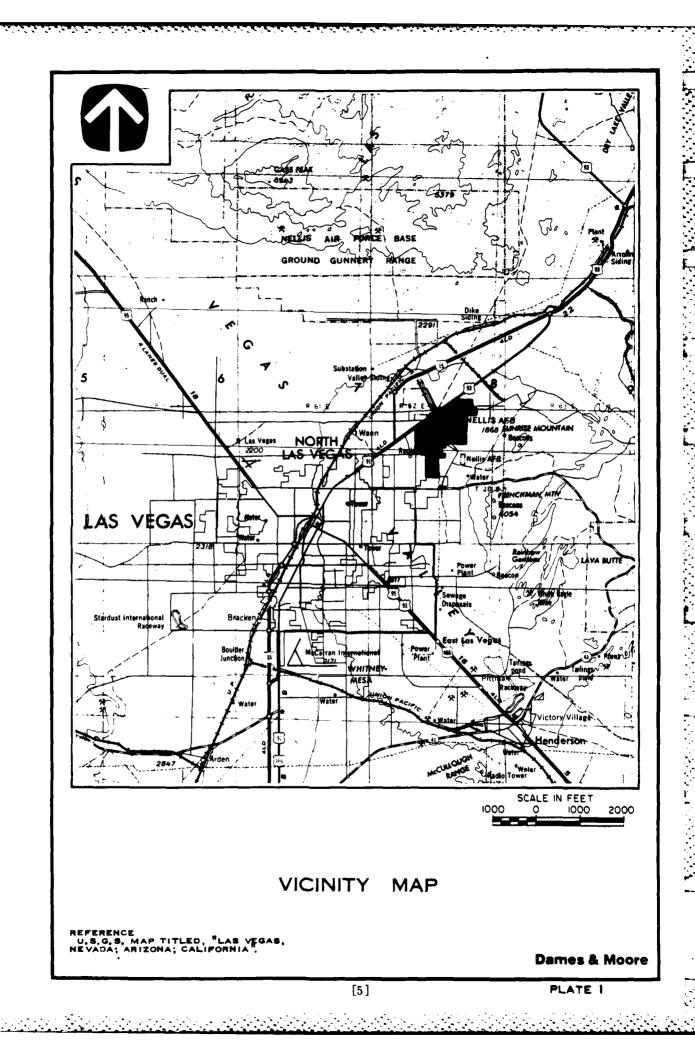
Field work began on 28 Oct 83 and was completed on 9 Nov 83.

C. BRIEF HISTORY OF NELLIS AFB AND WASTE DISPOSAL OPERATIONS

The site on which Nellis AFB is located (see Plate 1) was used for flight operations beginning in 1929, when it consisted of dirt runways and a few buildings. In 1940, the City of Las Vegas purchased and improved the site for training civilian pilots and offered it to the Army Air Corps later that year for gunnery training. Since 1940, the base has functioned as a gunnery school, training pilots in all phases of fighter gunnery. Nellis AFB is currently the largest base in the Tactical Air Command.

Potentially hazardous wastes have been generated at Nellis AFB from activities involving vehicle and aircraft maintenance, ground support equipment maintenance, and aircraft corrosion control. Pest control laboratory operations, fuel analyses, nuclear weapon assembly, and a small plating operation have also created potentially hazardous wastes (CH2M Hill, 1982). The wastes have included solvents and paint strippers such as trichloroethane, trichloroethene, methyl ethyl ketone, toluene, PD-680 (safety solvent), and carbon tetrachloride. Pesticides and herbicides that have been applied and disposed of at the base include diazinon, malathion, chlordane, krovar, paraquat, princep, DDT, and lindane. Other wastes include waste oils, hydraulic fluid, waste battery acid, fuels, and grease.

Prior to about 1970, wastes generated at Nellis AFB were disposed of in the sanitary sewer, base landfills, or were burned in fire training exercises. Essentially all the maintenance shops discharged their wastes, including solvents and oil and





grease, into the sanitary sewer system, and the wastes underwent secondary treatment at one of the two base sewage treatment plants. The original wastewater treatment plant was located just west of the midpoint of the runway and was operated between 1940 and 1952. The plant used trickling filters and discharged the effluent into the storm drain gully, which carried the effluent to the landfill south of the golf course (see Plate 2). The second sewage treatment plant was operated between 1952 and 1971 and utilized a primary clarifier and trickling filter system for secondary treatment. The effluent was placed in percolation ponds for oxidation and evaporation or used to irrigate the golf course. Digester sludge was used as a soil conditioner in various parts of the base. Solid wastes from the maintenance shops and waste pesticides and herbicides were dumped in the base landfills prior to the early 1970s. Fire training activities consumed most of the waste petroleum oil and lubricants between the early 1950s and the mid-1970s.

Since about 1970, potentially hazardous wastes such as solvents and pesticides have been reclaimed and containerized, and oil/water separators have been installed on shop drains. Sanitary wastes have been discharged to a Clark County regional wastewater treatment plant since 1972. Only clean fuels have been used recently for fire training, and the soil in the fire training pit is periodically scraped up and spread on the surrounding area to allow for biological degradation.

D. DESCRIPTION OF SITES

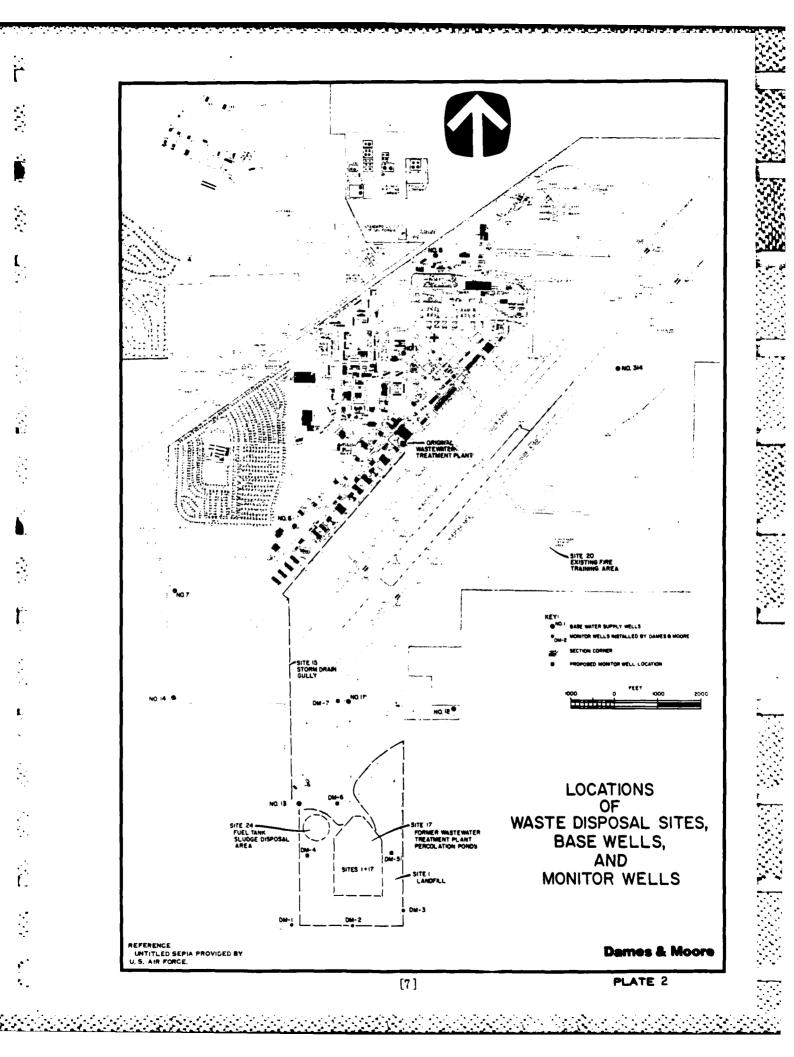
CH2M Hill (1982) identified 33 sites within Nellis AFB at which potentially hazardous wastes were generated, disposed of, or used in some activity. Each site was rated on the basis of potential contamination and/or surface or subsurface migration of the wastes. Sixteen of the 33 sites received priority ranking, and the remaining sites were judged not to warrant further investigation. A scope of work was issued under Contract F33615-83-D-4002 for Phase II, Stage 1 investigations at the following five sites:

Site 1 - Main Base Landfill Site 17 - Former STP Percolation Ponds Site 24 - Fuel Tank Sludge Disposal Area Site 15 - Storm Drain Gully Site 20 - Existing Fire Training Area

These sites are shown on Plate 2 and are described below:

1. Site 1 - Base Landfill

Site 1 occupies about 150 acres in the southernmost part of Nellis AFB, along with Sites 17 and 24. It has been the base landfill since 1942



except for the period from 1968 to 1974. All types of solid wastes generated by the base have been dumped here, along with potentially hazardous wastes including solvents, paint thinner, pesticides, waste oil and grease, and fuels. Both trench and area fill techniques have been used at the site, and the fill was burned regularly until the mid-1960s (CH2M Hill, 1982). The storm drain gully, part of which comprises Site 15, also runs through the landfill. Site 1 currently serves as the main base landfill.

2. Site 17 - Former STP Percolation Ponds

The base wastewater treatment plant was operated at Site 17 from 1952 until 1972, when the base sanitary sewer system was connected to the county wastewater treatment plant. The base plant provided secondary treatment and discharged the effluent to percolation ponds and to the golf course irrigation system. This site is being investigated because of the potential for contaminant migration. The principal contaminants are expected to be trace organic chemicals and heavy metals due to the disposal of shop wastes to the sanitary sewer system, and nitrate contamination from seepage of secondary effluent from the ponds.

3. Site 24 - Fuel Tank Sludge Disposal Area

Site 24 is located south of the golf course and north of the landfill at Site 1. This area may have received wastewater treatment plant sludge and leaded fuel storage tank cleaning sludge at any time between 1942 and 1972. Since 1951, as many as 25,000 gallons of jet fuel and leaded gasoline sludge have been landfilled (CH2M Hill, 1982).

4. Site 15 - Storm Drain Gully

The storm drain gully runs south from the site of the original wastewater treatment plant past the west side of the golf course and into the landfill (Site 1). No shop drains have ever been connected to the gully, but it does receive potentially hazardous wastes in runoff from the flight line. CH2M Hill (1982) also observed waste fuel and hydraulic fluid in the gully. An effluent containing solvents and other maintenance shop wastes was discharged into a gully prior to 1952 from the original wastewater treatment plant.

5. Site 20 - Existing Fire Training Area

Fire training has been conducted at Site 20 since the early 1950s, although only clean fuels have been burned since the late 1970s. As many as 10,000 gallons of waste petroleum, oil, and lubricants were burned per month prior to 1972. This volume decreased to 300 gallons per month after 1972 because most of the wastes were disposed of off site. The surficial soils of Site 20 are periodically scraped off and mixed with surrounding soils to allow biological decomposition of the petroleumbased waste.

E. IDENTIFICATION OF POLLUTANTS SAMPLED

Based on the wastes present in the above sites, potential contaminants would include the chlorinated and brominated hydrocarbons (halocarbons), aromatic hydrocarbons, pesticides, and other parameters listed in Table 1. Ground water samples from the monitor wells and all the base wells except 6 and 14 were analyzed for all the parameters in Table 1. Nitrate, phenol, and DDT isomers have been deleted from the analyses for wells 6 and 14. Soil samples have been analyzed for halocarbons, aromatics, and oil and grease.

F. IDENTIFICATION OF THE FIELD TEAM

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The field work required for Phase II, Stage 1 was accomplished by Mr. John Dudley, Hydrogeologist, who supervised the monitor wells. Mr. Thomas Lee, Geotechnical Engineer, supervised the soil sampling activities. Appendix F contains a description of the qualifications of these personnel.

TABLE 1

PARAMETERS, LIMITS OF DETECTION FOR SOIL AND GROUND WATER ANALYSES, AND WATER QUALITY CRITERIA

CONSTITUENT	LIMIT OF DETECTION, SOIL (µq/q)	LIMIT OF DETECTION, WATER (µg/L)	WATER QUALITY CRITERIA
Purgeable Halocarbons and Aromatics			
Chloromethane	0.01	0.5	
Bromomethane	0.01	0.5	
Dichlorodifluoromethane	0.01	0.5	
Vinyl Chloride	0.01	0.5	
Chloroethane	0.01	0.5	
Methylene Chloride	0.01	0.5	
Trichlorofluoromethane	0.01	0.5	
1,1-Dichloroethene	0.01	0.1	
1,1-Dichloroethane	0.01	0.1	
Irans-1,2-dichloroethene	0.01	0.1	
Chloroform	0.01	0.1	
1,2-Dichloroethane	0.01	0.1	
1,1,1-Trichloroethane	0.01	0.1	
Carbon Tetrachloride	0.01	0.1	
Bromodichloromethane	0.01	0.1	
1,2-Dichloropropane	0.01 0.01	0.1 0.5	
Trans-1,3-dichloropropene Trichloroethene	0.01	0.1	
Dibromochloromethane	0.01	0.5	
1,1,2-Trichloroethane	0.01	0.1	
Cis-1,3-dichloropropene	0.01	0.5	
2-Chloroethylvinylether	0.01	1.0	
Bromoform	0.01	0.1	
1,1,2,2-Tetrachloroethane	0.01	0.5	
1,1,2,2-Tetrachloroethene	0.01	0.5	
Chlorobenzene	0.01	0.1	
1,2-Dichlorobenzene	0.01	0.5	
1,3-Dichlorobenzene	0.01	0.5	
1,4-Dichlorobenzene	0.01	0.5	
Ethyl Benzene	0.01	0.5	
Benzene	0.01	0.5	
Toluene	0.01	0.5	
<u>Pesticides (µq/L)</u>			
Aldrin	NA	0.01	
Dieldrin	NA	0.01	
Chlordane	NA	0.1	
DDT isomers	NA	0.01	
Endrin	NA	0.01	1 μg/L*
Endrin Aldehyde	NA	0.01	1 μg/c
Heptachlor	NA	0.01	
Lindane	NA	0.01	4 μg/L*
Others (mg/L)			
Lead	NA	0.01	0.05 mg/L+
Nitrate (as N)	NA	0.02	
Dil and grease	0.05 mg/g	0.5	10.0 mg/L*
Phenol	NA NA	0,005	
• • • • • •		4.007	

Source: Federal Register, November 28, 1980.

*Primary drinking water standard.

NA = Not analyzed mg/L = milligrams per liter $\mu g/L$ = micrograms per liter mg/g = milligrams per gram $\mu g/g$ = micrograms per gram

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II. ENVIRONMENTAL SETTING

A. PHYSICAL GEOGRAPHY

Nellis AFB is located in Clark County, Nevada, 8 miles northeast of the City of Las Vegas and approximately 10 miles northwest of Lake Mead. Land surface elevations range from about 1,900 feet above mean sea level at the northern boundary of the base to approximately 1,800 feet at the southern boundary.

Nellis AFB is situated in the northeastern portion of the Las Vegas Valley, which is bordered by the Las Vegas Range and the Sheep Range to the north, the River Mountains to the east, the Spring Mountains to the west, and the McCullough Range to the south. This area typifies the physiography of the Basin and Range Province, in which mountain ranges are separated by desert valleys.

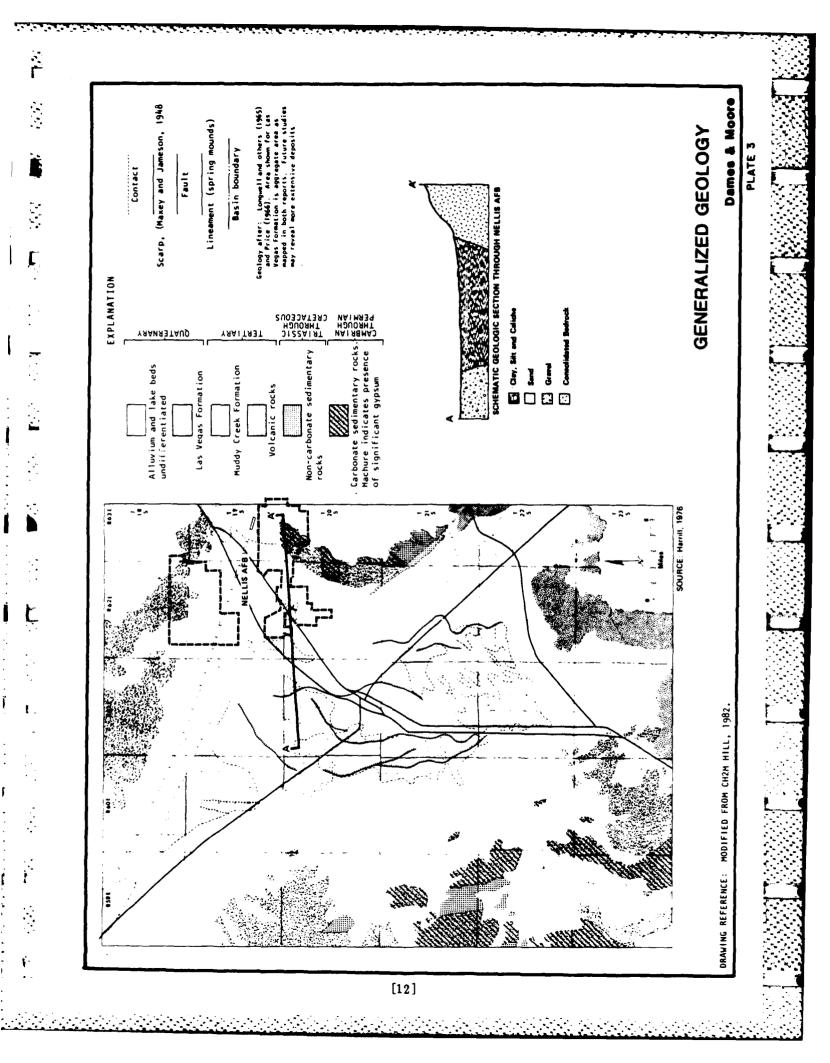
The low-relief surface of the Las Vegas Valley was formed by stream erosion of the surrounding mountains and deposition of the sediments in coalescing alluvial fans in the basin. The topography of the Nellis AFB area generally slopes to the southwest. Numerous small gullies and washes drain the area in a southerly direction. Surface runoff in the immediate vicinity of the base drains to the south, where it subsequently joins the Las Vegas Wash draining to the southeast.

The average annual precipitation at the base is 3.8 inches, and it is evenly distributed throughout the year. Mean monthly temperatures range from a low of 45° F in January to a high of 91° F in July. Annual average lake evaporation in the vicinity of the base is 72 inches (CH2M Hill, 1982).

B. REGIONAL GEOLOGY AND HYDROGEOLOGY

The Las Vegas Valley is a structural basin containing both consolidated and unconsolidated rock. The division of the principal lithologic units in this report follows that of Harrill (1976), in which there are two major lithologic groups based on hydrologic properties. One group consists of unconsolidated and semiconsolidated sediments that were eroded from the surrounding mountains and deposited in the valley as it subsided due to faulting. The second group is composed of the consolidated rocks that underlie the valley fill and occur in the mountains.

The consolidated rocks consist of sedimentary, metamorphic, and igneous rocks of Precambrian to Tertiary age. These units generally have low porosity and permeability and probably do not transmit water except where fractures occur. There is no evidence of significant hydrologic connections between the consolidated rocks and the principal aquifers in the valley fill. Plate 3 shows the general geology of the region.



The valley fill is composed of the Tertiary Muddy Creek Formation and Quaternary alluvium. The Muddy Creek Formation, approximately 4,000 feet thick, overlies the consolidated rock units and consists of silt, clay, fine sand, and some lenses of pebble conglomerate. Quaternary alluvium is composed of gravel, silt, sand, and clay deposited in alluvial fans and lake beds. The valley fill sediments are the primary source of ground water in the Las Vegas Valley.

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As reported by Harrill (1976) and Kaufmann (1976), the valley fill can be divided into two hydrologic units: the near-surface aquifer or shallow ground water system, and the deeper artesian aquifer system. The shallow ground water system is maintained by upward leakage through semiconfining deposits above the artesian aquifers and is also recharged by precipitation, irrigation return flows, and septic tank and sewage treatment plant effluents. Precipitation is only a negligible source of recharge because of the high evaporation rate. The near-surface aquifer ranges up to about 200 feet thick and consists of clay and silt with discontinuous layers of sand, gravel, and caliche. Depths to shallow ground water range from a few feet to approximately 100 feet below ground. The shallow ground water surface generally slopes toward the east and discharges into the Las Vegas Wash along the east side of the valley.

The principal artesian aquifers are generally between 450 and 700 feet in depth, especially in the western part of the valley (Kaufmann, 1976). A deeper aquifer, between 700 and about 1,100 feet deep, is tapped to a lesser extent by the valley wells. The quantities of sand and gravel decrease from west to east, and wells in the eastern part of the valley yield correspondingly less water than wells in the western part of the valley. Transmissivities in wells of the Las Vegas Valley Water District in the western part of the valley range from 240,000 to 310,000 gallons per day per foot (gpd/ft), while wells 5 miles west of Nellis AFB at the Craig Road Well Field showed aquifer transmissivities of 30,000 to 40,000 gpd/ft (Malmberg, 1965). wells installed at Nellis AFB in the eastern part of the valley indicate transmissivities of approximately 4,300 to 14,000 gpd/ft based upon specific capacities of the wells. Depth to potentiometric surface in the artesian aquifers is highly variable, ranging up to 100 feet below ground. In other words, deep wells drilled into the deep aquifer will strike major aquifer zones between 450 and 700 feet deep. This pressurized aguifer water will rise in the well to approximately 100 feet below surface. The potentiometric surface of the artesian aquifer generally slopes toward the southeast, except for local variations due to pumping.

C. GENERAL HYDROGEOLOGY

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Nellis AFB is located in the eastern part of the valley, where the basin sediments contain higher fractions of clay and silt than western and central valley locations. Two hydraulically connected aquifer zones similar to the rest of the valley are recognized beneath the base. The base production wells are completed up to 1,000 feet below ground, where artesian conditions prevail. Shallow ground water within about 100 feet of ground surface also exists beneath the base.

1. Artesian Ground Water System at Nellis AFB

Logs of the base production wells show that the sediments beneath the base consist of clay with occasional layers of sand or gravel up to about 20 feet thick. Ground water in the permeable layers is under artesian pressure and is the source of water for the base water supply wells. Typically, the well casing is perforated over most of its length in order to intercept water from as many permeable layers as possible. Transmissivities estimated from specific capacities measured in base wells of the water-producing layers range from 4,300 to 14,000 gpd/ft. This range is about 1/10 of the transmissivities measured in western and central portions of the valley. Drillers' well logs and completion reports are provided in Appendix A and summarized in Table 2.

Water level records are available for several base wells. Water levels were at about 50 feet below ground in base wells installed in the early 1950s and were at 60 to 70 feet below ground in base wells installed in the 1960s. Since installation, water levels have declined 30 to 60 feet in the base wells, as shown on Plate 4. The decline reversed during the late 1970s, when the base reduced its ground water pumpage by purchasing Lake Mead water from the Southern Water Supply System of the Southern Nevada Water Supply Project (Phase I) (Patt, 1976). The water levels rose as much as 20 feet between 1977 and 1982, although water levels measured during Phase II, Stage 1 were at 1977 levels. Plate 5 shows regional water level contour maps for the principal aquifers for 1973 and 1975.

The local potentiometric surface of the deep aquifer on 8 Nov 83 is shown on Plate 4. Pumping from wells 11, 12, and 13 has apparently created a cone of depression centered near well 13, as shown by the nearly 30-foot difference between the water level elevations measured in wells 13 and 14. These ground water levels represent a gradient of about 40 feet per mile, which is slightly steeper than the 30-foot-per-mile gradient shown on Plate 5 for the regional potentiometric surface. Well 7 had been out of service for 6 months prior to measuring, and it appears that well 14 is also out of service or is not pumped often. The transmissivity indicated by well 14 is relatively low (4,300 gpd/ft), and pumping would create a noticeable TABLE 2

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BASE WELL CONSTRUCTION, YIELD, AND WATER LEVEL DATA

RECENT WATER LEVEL ^{3,C}	112	92	NA	112	109	113	26	NA	
WATER LEVEL AT INSTALLATION ^a W	58.1	54	NA	NA	59	72	70	17	
APPROXIMATE TRANSMISSIVITY ^b (gpd/ft)	7,300	14,000	NA	NA	6,600	6,000	4,300	NA	
INITIAL YIELD (gpm)	650	320	010	0017	600	0111	350	NA	
O J	826	760	006	778	980	674	630	300	
PERFORATED INTERVAL	144 to	150 to	150 to	302 to	320 to	274 to	290 to	120 to	
CASING DIAMETER (in)	12 ಕೆ	123	12	14	14	14	14	12	
DEPTHa	1,000	760	913	802	1,000	ti 69	650	300	
YEAR INSTALLED	1951	1951	1959	1962	1963	1962	1963	1951	
WELL NUMBER	9	7	80	11	12	13	14	314	

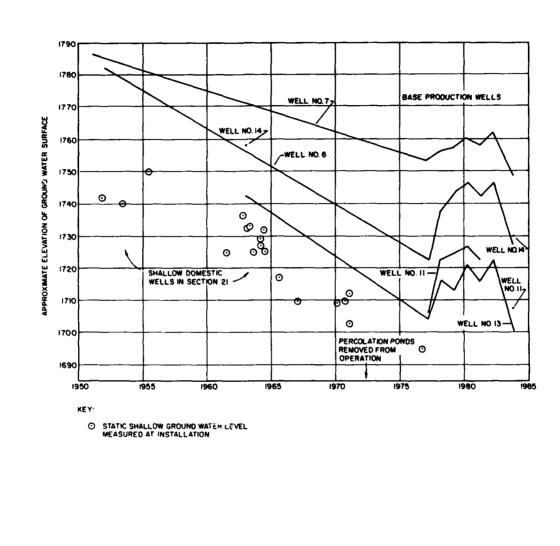
Source: Well logs filed with Nevada State Engineer and miscellaneous Nellis AFB records (see Appendix A). aFeet below ground.

^bEstimated from specific capacity using method of Theis and others (1963) in gallons per day per foot. ^cMeasurement taken 8 Nov 83.

NA = not available

Well locations are shown on Plate 2.

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COMPARISON OF SHALLOW AND DEEP GROUND WATER ELEVATIONS

Dames & Moore

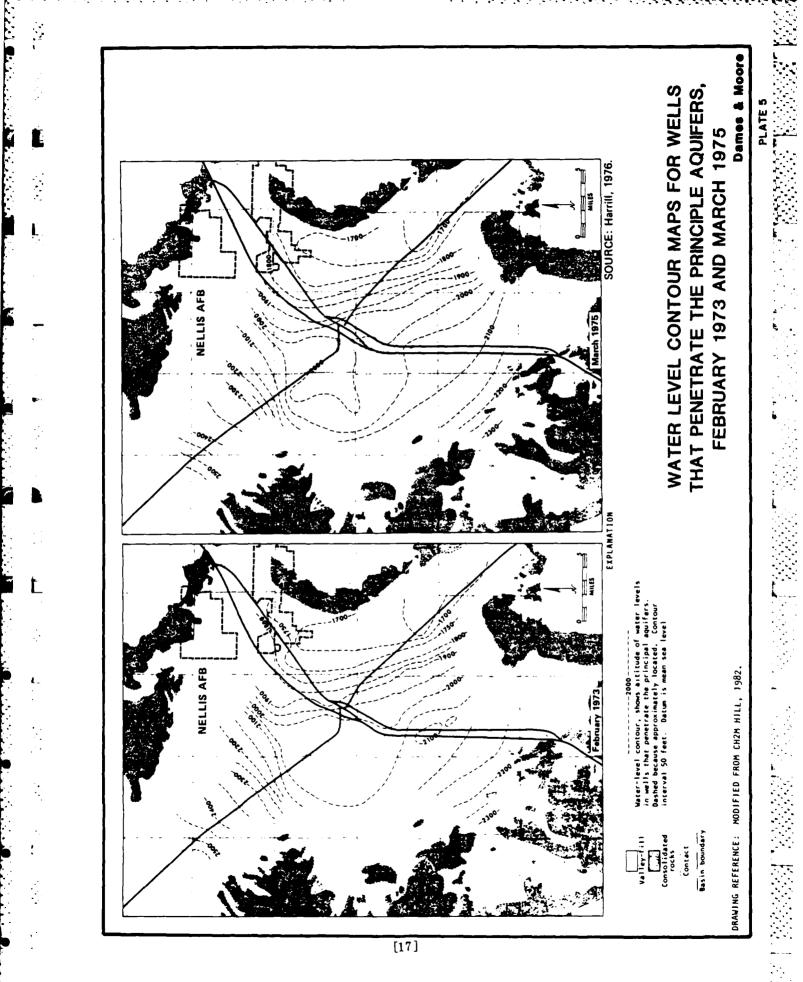
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cone of depression. The highest water levels were in wells 7 and 14 and create a gradient to the southeast, which conforms with the regional artesian ground water system gradient.

Based on analyses of ground water samples from base wells 1, 2, 4, 6, and 7, covering the years between 1954 and 1981, ground water used by the base has always been of relatively good quality (Kaufmann, 1976; CH2M Hill, 1982). The ground water is very hard, although concentrations of total dissolved solids and major anions and cations are low. Only one analysis included trace metals, and all the concentrations except arsenic were below primary drinking water standards (well 4, on 17 Sep 81). None of the analyses included any organic constituents.

2. Shallow Ground Water System at Nellis AFB

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Logs of 19 domestic wells located in the northern half of Section 21 (T20S, R62E) immediately south of the base were obtained from the Nevada Department of Water Resources to provide information about the shallow ground water system in the vicinity of the base. The logs (see Appendix A) show that the upper 200 feet of sediments consist primarily of clay with varying fractions of sand, gravel, and caliche. Depth to shallow ground water shown on the logs ranges from 35 to 90 feet below ground, and well yields given on the logs range from 40 to 200 gallons per minute (gpm). The logs are summarized in Section G and Table 3.

Despite the low permeability of the sediments, there is some degree hydraulic communication between the deep artesian aquifer and shallow ground water. Shallow ground water is recharged by upward flow from deeper artesian ground water, along with infiltration of surface water such as golf course irrigation and seepage from the former base sewage treatment plant percolation ponds when they were in operation. To investigate the relationship between the shallow ground water system and the artesian ground water below, static water levels measured at the time of installation of the 19 domestic wells were plotted on Plate 4. The water levels declined from 30 to 50 feet below ground in the 1950s to 90 feet below ground in 1976, paralleling the decline in base well water levels. The trend shows that as artesian water levels declined, recharge to the shallow ground water system also decreased and lowered shallow ground water levels. It is possible that lowering of the artesian water levels below shallow ground water levels by pumping induced the shallow ground water to drain downward into the deep aquifer. The cone of depression produced in the potentiometric surface of the artesian aquifer by pumping would locally reverse the hydraulic gradient between the deep and the shallow aquifer, causing ground water to move downward in response to the downward gradient instead of upward, which is the natural condition.

TABLE 3

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SUMMARY OF DOMESTIC WELLS IN SECTION 21

		LOCATION	NOL	YEAR	CASING	PERFORATED	WATER LEVEL AT	LENGTH OF	YIELD
OWNER	DEPTH#	QUARTER	QUARTER	INSTALLED	DIAMETER	INTERVAL*	INSTALLATION*	SURFACE SEAL*	(<u>md8</u>)
Brown	100	MN	NE	1952	80	None	43	55	50
Conner	100	NA	NE	1953	80	NA	5	01	AN
Ayers	100	SE	NE	1955	8	t C	35	50	50
Rice	200	SW	NE	1961	8 5/8	t t	60	NA	NA
Mugleston	205	SW	NE	1962	6	85 to 200	611	NA	NA
llack	200	MS	NE	1963	8	to	60	50	NA
iroft	160	SW	NE	1963	6 5/8	t 0	52	NA	NA
emp	190	SW	NE	1963	6 5/8	to	52	NA	NA
lushone	125	SW	NE	1964	8 5/8	to	53	50	01
Carbell	200	SW	NE	1964	9	to	58	NA	NA
Pader	200	NM	NE	1964	9	to	56	NA	NA
ruter	150	MN	NE	1964	æ	to	60	50	100
Wells	200	NN	NE	1965	8	to	68	50	NA
Azvedo	200	SW	NE	1967	8 5/8	to	75	50	60
ennett	200	SW	NE	1970	8 5/8	ţ	77	50	NA
Vewman	200	SW	NE	1970	6 5/8	to	75	NA	NA
inn.	235	MN	NE	1971	6 5/8	to	82	NA	NA
Shannon	200	NS	NE	1971	8 5/8	to	73	50	NA
Dodge	200	SE	NE	1976	6 5/8	to to	90	NA	NA

Source: Well logs filed with Nevada State Engineer (see Appendix A).

*Feet below ground surface.

NA = Not available.

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The water levels shown on Plate 4 also suggest that infiltration from the former percolation ponds (Site 17) had little effect on shallow ground water levels south of the base. The effect of the infiltration would have been to maintain uniform shallow ground water levels after 1952, followed by a sharp decline after 1972 when the ponds were abandoned. No such decline is noted on Plate 4. It is conceivable that pumping the base wells created northerly gradients in the shallow ground water system, and seepage from the ponds migrated north toward the base wells. This would explain why no effect from the infiltration was observed in shallow ground water levels south of the base.

No historic information is available on shallow ground water quality beneath the central part of the base; however, elevated nitrate concentrations in shallow ground water south of the base are described in Section E.

D. SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

This section presents the results of surface and subsurface investigations conducted during Phase II, Stage 1 at Sites 1, 17, 24, 15, and 20 at Nellis AFB. The field program is described in Section III, and the results of chemical analyses are presented in Section IV.

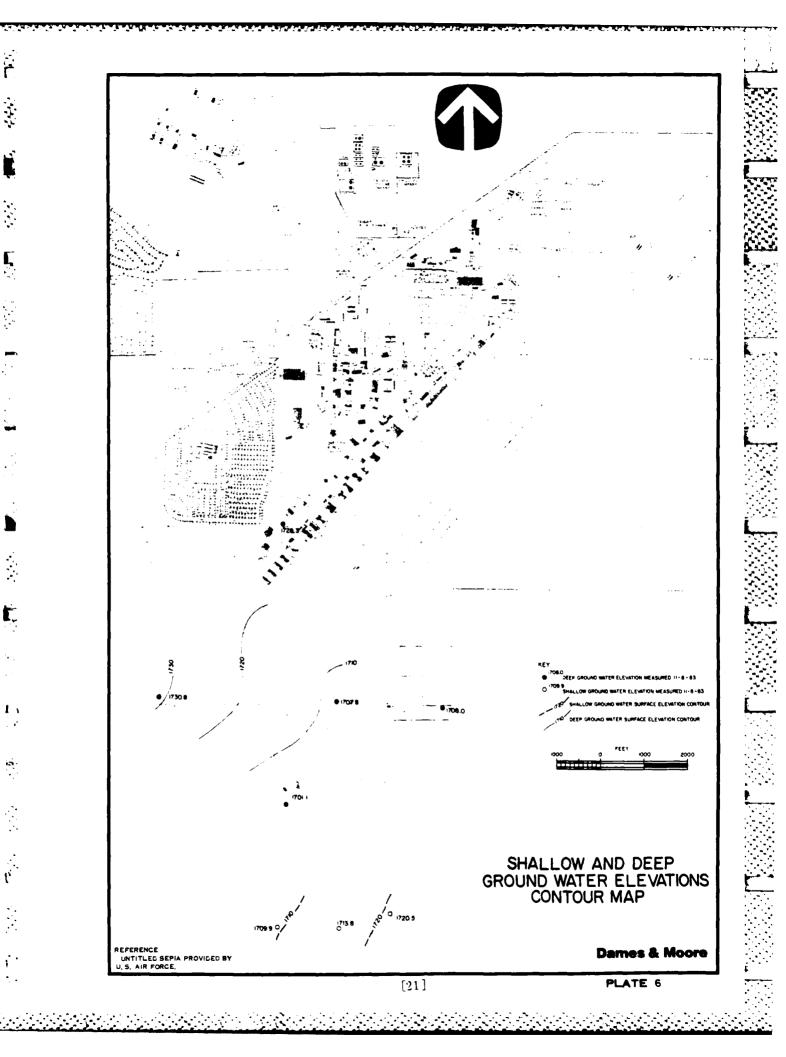
1. Sites 1, 17, and 24

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These sites comprise the base landfill, former STP percolation ponds, and fuel tank sludge disposal area, respectively, and are considered as a single area because of their close proximity to each other (see Plate 2). Three monitor wells were installed to a depth of 120 feet along the southern end of the landfill, as shown on Plate 2. Based on the results of the IRP Records Search, it was believed that the monitor wells would be downgradient from Sites 1, 17, and 24. Samples collected while drilling the wells consisted of gray and brown clay with varying fractions of sand and silt (see monitor well logs in Appendix A). Ground water levels ranged from 79.3 to 92.2 feet below ground in November 1983. Water level recovery tests conducted in the monitor wells yielded a transmissivity of about 200 gpd/ft (Appendix L), which is low but typical for clayey sediments.

The configuration of the three monitor wells, in a virtual straight line, makes it very difficult to define the attitude of the shallow ground water surface. A strict, geometric interpretation of the shallow ground water level measurements in the three monitor wells results in a west to southwest gradient, unlike the regional shallow ground water surface, which slopes toward the southeast (Plate 6). However, it is more likely that the shallow ground water gradient slopes north or northwest. As previously discussed, shallow ground water levels appear to be affected by

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pumpage from the artesian aquifer by base wells. If so, a cone of depression created by pumping the base wells would form a northeast-trending, trough-like depression in the shallow ground water surface that encompasses the area between DM-1, DM-2, and DM-3 are located in a line base wells 11, 12, and 13. perpendicular to the southeastern flank of the depression, which is reflected by the increasing depth to water from east to west (DM-3 to DM-1). Net shallow ground water movement would be toward the center of the depression near well 13. Therefore, it is likely that shallow ground water levels are deeper north of the landfill than south of the landfill where the monitor wells have been installed. However, a shallow monitor well would have to be installed in that area to confirm if a northward hydraulic gradient in the shallow ground water system exists. Another consequence of the effects of pumping the base wells is that shallow ground water elevations are probably higher than the artesian water level elevations in the vicinity of base wells 11, 12, and 13 and create a downward hydraulic gradient from the shallow ground water system to the artesian ground water system. This is significant because a downward gradient would provide impetus for contaminants to migrate to the aquifer.

Ground water samples were collected from the three monitor wells and base wells 6, 11, 12, 13, and 14, and the analyses are discussed in Section IV. HNU and explosimeter readings were always less than 1 unit.

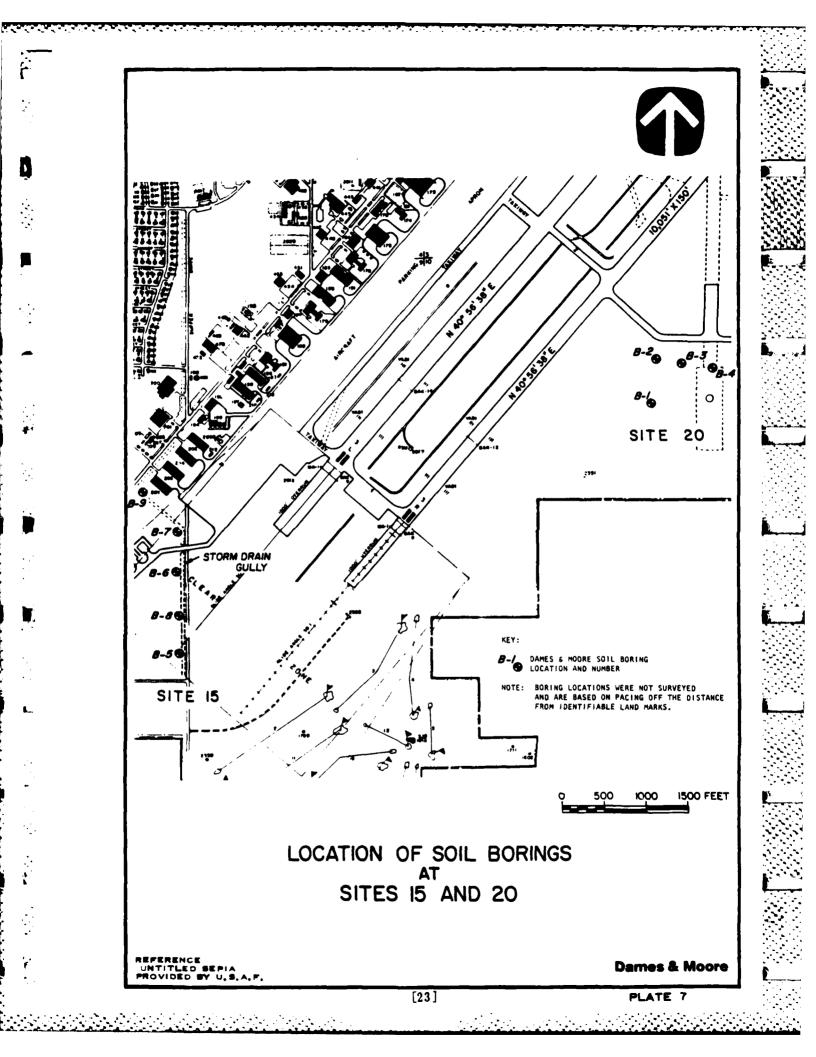
2. Site 15

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The storm drain gully, designated as Site 15, is located near the southwest end of the runway, as shown on Plates 2 and 7. The ditch is approximately 5 feet deep and approximately 8 feet wide at the bottom. The side slopes of the ditch range from 3:1 to 5:1, horizontal:vertical. In general, the ditch drains toward the south and ultimately terminates in the landfill south of the golf course. The surface of the ditch is covered with grass and small scrubs, and water ponds in spot locations.

The subsurface soil conditions at the storm drain gully were investigated by drilling a total of five borings to depths of 20 feet below the existing ground surface along the bottom of the ditch at locations shown on Plate 7. The logs of borings are presented in Appendix A.

In general, the subsurface soils in the storm drain gully consist of clayey to fine sandy soil with varying amounts of silt and occasional pockets of caliche. Moisture contents ranged from moderately moist (11 to 19 percent) near the surface to very moist (21 to 28 percent) at depth. No ground water was encountered in any of the borings. HNU and explosimeter readings were always less than 1 unit.



3. Site 20

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The existing fire training area, designated as Site 20, is located at the east side of the runway, as shown on Plates 2 and 7. In general, the s^{**}e consists of clayey sandy soil covered with occasional grass and scrub. A two-story brick house and several steel cylindrical storage tanks are structures set on fire during training sessions. Surface runoff from the site is collected by a small ditch located along the eastern boundary of the fire training area that continues south past the boundary of the base.

The subsurface soil conditions at the fire training area were investigated by drilling a total of four borings to 20 feet below the existing ground surface at locations shown on Plate 7. The logs of borings are presented in Appendix A.

The soils underlying the fire training area are predominantly clayey silt and fine sandy clay. Moisture contents range from moderately to slightly moist (6.6 to 14 percent) near the surface to very slightly moist (\leq percent) at depth. No ground water was encountered in any of the borings. HNU and explosimeter readings were always less than 1 unit.

E. HISTORIC GROUND WATER PROBLEMS

This section describes two historic ground water problems that have occurred in the vicinity of the base: elevated nitrate levels south of the base, and land subsidence due to ground water depletion.

Kaufmann (1976) investigated elevated nitrate concentrations in private wells south of the landfill (see Plate 2). Nitrate concentrations ranged as high as 22 milligrams per liter as nitrogen (mg/L as N) in wells within 1 mile of the southern boundary of the base. The primary drinking water standard for nitrate is 10 mg/L as N. CH2M Hill (1982) showed one analysis from a USGS well located in a trailer park immediately south of the base. The sample, collected 21 Oct 81, contained 18 mg/L as N, 290 mg/L chloride, 1,200 mg/L sulfate, and 2,430 mg/L total dissolved solids (CH2M Hill, 1982). These concentrations are on the order of 10 times higher than those in ground water from base wells. According to Kaufmann (1976), the degradation of the shallow ground water has been caused by southward (downgradient) migration of contaminants from the landfill and from the former wastewater treatment plant. Percolation ponds (Site 17) were located in the middle of the landfill area. Although there are also septic tanks in the vicinity of the well, Kaufmann (1976) believed the percolation ponds were the source because the nitrate levels in domestic wells were higher than the range observed in domestic wells near other areas of septic tanks in the Las Vegas metropolitan region.

Kaufmann (1976) reported analyses from 12 domestic wells within a mile of the southern boundary of the base, and four of the analyses showed nitrate concentrations in excess of 10 mg/L as N.

The Las Vegas Valley has experienced rapid development since 1954, along with increasing ground water demands. A general decline of ground water levels in the principal artesian aquifers has occurred throughout the valley, especially in the vicinity of the pumping centers located in the western and central portions of the basin. Land subsidence in the Las Vegas Valley is due to the declining hydraulic head and resulting dewatering and compaction of fine-grained aquifer materials. Subsidence of almost 2 feet was recorded near major pumping centers in the Las Vegas Valley from 1963 to 1972. Nellis AFB has experienced approximately $\frac{1}{2}$ foot of total subsidence (CH2M Hill, 1982). Subsidence cracks and fissures have also developed in the alluvium in some parts of the valley. Such cracks may provide conduits for rapid movement of contaminants to the water table; however, no such cracks are known to exist near any of the disposal sites at Nellis AFB (CH2M Hill, 1982).

F. LOCATIONS OF WELLS ON AND OFF BASE

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Drilling logs and well construction information were collected for several of the base production wells and for 19 domestic wells located in the northeastern quarter of Section 21 immediately south of the base. Plate 2 shows the locations of the base wells, and they are summarized in Table 2. The domestic wells are summarized in Table 3.

A well inventory of domestic wells located in areas adjacent to Sites 1, 15, 17, and 24 was conducted at the Las Vegas office of the Nevada State Engineer. The inventory included wells located in Township 20 south, Range 62 east, Sections 15, 21, and 22. Section 15 is located east of the disposal sites, Section 21 is to the south and southwest of the sites, and Section 22 is located southeast of the sites.

No records of private wells were found in Section 15, and approximately 350 well records were found in Section 21. Records of six private wells were on file in Section 22, all of which were in the southern half of the section and greater than $\frac{1}{2}$ mile from the base. Therefore, the wells located in Section 21 provide the most information for the purposes of this report. Nineteen representative well records, including well logs, were selected from the northeast quarter of Section 21 and are included in Appendix A and summarized on Table 3. These wells are directly south and within $\frac{1}{2}$ mile of the southern base boundary south of the golf course. Most of these wells were drilled as private domestic supply wells and were completed in the shallow ground water system less than 250 feet below ground. The wells were

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drilled between 1950 and 1976, and it is not known how many of the wells are active today.

III. FIELD PROGRAM

A. FIELD PROGRAM DEVELOPMENT

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The field portion of this study consisted of:

- 1. Drilling, constructing, and developing three new monitor wells at Site 1, the base landfill;
- 2. Preparing descriptive geologic logs for each new monitor well;
- Measuring static water levels and collecting samples for water quality analyses from each new monitor well, and from five base water supply wells;
- 4. A field survey to establish vertical and horizontal control of all sampled wells was performed by the Air Force; and
- 5. Drilling and sampling 5 borings to a depth of 20 feet at Site 15 and 4 borings to a depth of 20 feet at Site 20.

B. IMPLEMENTATION

1. Monitor Well Installation

Three monitor wells were constructed at three locations adjacent to and generally southwest, south, and southeast of the base landfill (see Plate 2). The wells were drilled by Thompson Well Drilling of Las Vegas, Nevada using the conventional rotary method with air and foam circulation. A 12-inch borehole was drilled for each well, and cutting samples were collected at regular 10-foot intervals. Descriptions of the cuttings were made in the field by an experienced Dames & Moore hydrologist. These descriptions were used to prepare geologic logs for each drill hole.

The drill holes were also monitored for organic vapors during drilling using an HNU photoionization meter and an explosimeter. Readings were taken with both meters at the top of the borehole at the same time cuttings were collected and described. Readings thus obtained were recorded directly on the boring logs.

The casing installed in the monitor wells is 6-5/8-inch OD, 5-5/8-inch ID Schedule 80 PVC pipe and well screen. The screen used is 40 slot (0.04-inch slots), consisting of horizontal slots factory-sawed in parallel rows. All casing and screen sections were coupled with threaded joints; no PVC solvent or metal screws were used at connections. The three wells were constructed with 30-foot screen sections at the bottoms of the drill holes. The bottoms of the screen sections were fitted with threaded PVC plugs. Screens were set so that the upper 3 to 5 feet of screen extended above the water table. Above the screen, blank casing was installed to 1 to 2 feet above ground surface. Table 4 contains a summary of monitor well construction details.

A prepared, well-sorted silica sand was poured into the annular space adjacent to the screen and blank casing to a depth of about 50 feet below ground surface. The remainder of this annular space was grouted with concrete to the surface. The installations were completed with a 3-foot length of steel pipe equipped with a locking steel cap embedded in a concrete pad surrounding each well.

2. Monitor Well Sampling

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After the three monitor wells were constructed and developed, samples for water quality analysis were collected from each well and shipped to the laboratory on the same day. Sampling was conducted in accordance with strict sampling protocol and established chain-of-custody procedures, as described below.

Continuous bailing was conducted at each hole for periods ranging between 50 and 90 minutes, and approximately 10 to 20 casing volumes of water were removed prior to sample collection. Temperature, conductivity, and pH measurements of the well discharge were made periodically during bailings (see Appendix B). Once these parameters had stabilized, samples were collected from the wells using a Teflon sampling bailer. The sampling bailer was suspended in the well by a stainless steel cable and was lowered and retrieved using a hand reel. Prepared sampling containers were completely filled and immediately packed on ice in shipping coolers. One sample for lead analysis was collected from each well, filtered in the field through a 0.45-micron membrane filter, and placed in a sampling container pretreated with nitric acid as a preservative. Table 5 lists the parameters for which laboratory analyses were performed, and the sample size, type of sample container, and preservatives used.

The filtering apparatus, Teflon bailer, the various probes and beakers used during operation of the pH, and conductivity meters were thoroughly rinsed with distilled water after each use to avoid any cross-contamination of samples between wells. All field instruments functioned well and were carefully calibrated after each use, using prepared buffer solutions and conductivity standards. The samples were shipped by air in ice chests and were received at UBTL in Salt Lake City the day following sample collectior È ĥ 1 . ń **A**... • · t

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TABLE 4

MONITOR WELL CONSTRUCTION DETAILS

		SCREENED	ENED				STATE	PLANE	
		INTEL	NTERVAL	TOP OF	ELEVATI	(TSW) NO.	COORDI	COORDINATES	STATIC
WELL	WELL DEPTH ^a	FROM	TO	GRAVEL PACK ^a	MARKER POINT	MARKER POINT GROUND SURFACE	NORTH	EAST	WATER LEVEL ^D
DM-1	120	88	118	50	1804.00	1801.7	529,621	656,743	94.56
DM-2	120	78	108	50	1799.98	1797.9	529,608	658,261	86.18
DM-3	120	1th	104	50	1801.85	1799.7	529,975	659,442	81.39
aroot	areat helow annund sunfane		e la ne						

afeet below ground surface.

 bFeet below marker point, measured 5 Nov 83.

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SAMPLE PRESERVATION AND ANALYTICAL METHODS

DADAMFTER	PRESERVATIVE ^a	CONTAINER ^a	MAXIMUM HOLDING TIME ^a	VOLUME ^a (m1)	ANALYTICAL METHOD ^D
Oil and grease	Cool, 4°C, H ₂ SO4 to pH<2	glass	28 days	1,000	USEPA 413.2
Lead	HNO ₃ or HCl to pH<2	plastic, glass	6 months	250	USEPA 239.2
Phenol	H ₃ PO ₄ to pH<4 1.0 g CuSO ₄ /1	glass	28 days	1,000	USEPA 420.2
Pesticides	Cool, 4°C	glass, Teflon cap	7 days	1,000	USEPA 608
Nitrates	Cool, 4°C	plastic, glass	48 hours	100	USEPA 353.2
Volatile Aromatics	Cool, 4°C	glass, Teflon cap	14 days	011	USEPA 601
Volatile Halocarbons	Cool, 4°C	glass, Teflon cap	14 days	017	USEPA 602

busePA, 1978.

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Chain-of-custody forms were prepared and accompanied the samples from the field to the laboratory. These records document the integrity of the samples at each point of transfer, from field personnel to shippers and couriers to laboratory staff. The signatures of the individuals relinquishing and accepting custody of the samples, and the date and time, appear on the records at each point of transfer (see Appendix C).

Water level measurements were made at various times during well construction, after well development, and after sampling. Static water levels were measured after sampling and after sufficient time for equilibration. A battery-powered electric tape was used to measure all water levels. Depth-to-water measurements were made and recorded to the nearest 0.01 foot, using either the top of the PVC casing or a marked measuring point on the top of the steel standpipe as the point of reference.

3. Base Well Sampling

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Water samples were also collected from five base wells located in the general vicinity of the base landfill. Base wells 6, 11, 12, 13, and 14 were sampled (see Plate 2). All wells sampled were equipped with electric motor-driven turbine pumps, which were turned on prior to sample collection. Wells were pumped continuously for 2 to 3 hours, during which time periodic measurements of pH, conductance, and temperature were made on the discharge water. Flow meters installed on the discharge line were monitored during pumping, and 9 to 17 casing volumes were removed from the wells prior to sampling. After pH, conductivity, and temperature had stabilized in the discharges, sample bottles were filled directly from a spigot on All sample bottles were filled completely to eliminate head the discharge line. space and were immediately packed with ice in ice chests for shipping to UBTL. Overnight shipping and delivery services were used to insure that all samples were received at UBTL the day after the samples were collected. Chain-of-custody records were maintained as previously described. Table 5 summarizes the sampling parameters, sample size, container type, and preservatives used for each well sampled.

Water level measurements were also made in the five base wells sampled, and in base well 7 located at the west entrance to the base (see Plate 2). Water level measurements were made using an electric tape. Considerable difficulty was encountered in getting reliable water level measurements from the base supply wells because of interference caused by several inches of oil (with low electrical conductivity) present on the water surface within the casing of these wells. As explained by civilian employees responsible for well maintenance on the base, the source of this oil is an automatic oil dripping device installed in each well to lubricate the pump drive shaft. The presence of this oil has never presented any

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noticeable problems, since water levels during pumping are well above the pump intakes (Reese, 1983). Special care and patience were required to obtain reliable water level measurements, and they are believed to be accurate to the nearest 0.1 foot. The water level measurements were made prior to turning the pumps on for water sampling; however, it should be noted that all the base wells (except well 7, which was out of service for repairs) are pumped varying amounts daily, depending on water demands throughout the base. Consequently, the water levels measured in the base wells may not represent true static water levels. These oils could potentially affect water quality results from these wells; however, since the wells are highly pumped and the pump intakes are far below the floating oil, we believe that the effect of the oil is below detection limits.

4. Well Location and Elevation Survey

The location and elevation of each of the three new monitoring wells and the five base supply wells sampled during the study were surveyed after completion of the field work. The survey work was performed by the Air Force's 820th Civil Engineering Squadron RH (RED HORSE), stationed at Nellis AFB. Vertical control on all wells is reported to be accurate to the nearest 0.1 foot (the limits of a standard second-order survey). Vertical control for the monitoring wells was established at ground level and at the measuring point labeled at the top of the steel surface casing. Vertical control for the base supply wells was established at ground level and on the lower lip of the water level access port from which water levels were measured in the field. Horizontal control on all wells was established using the transverse Mercator projection, State of Nevada, East Zone, Central Meridian 115°35'00.000", N.A. Datum (1927). The results of the survey work are presented in Appendix I.

5. Soil Sampling

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The soil sampling program completed during this study consisted of drilling, sampling and logging nine borings to 20 feet below existing ground surface. The borings were drilled using a Mayhew-600 truck-mounted drill rig and were advanced by air rotary using 4-3/4-inch tricone and drag bits. The locations of the borings are presented on Plate 5. The logs of the borings are presented in Appendix A. The field investigation was continuously supervised by a Dames & Moore soils engineer who collected soil samples, classified the soil encountered, and maintained a complete log of each boring. The samples were placed in sterile glass jars and packaged in ice chests until received by the analytical laboratory.

The subsurface soil was sampled using both the Dames & Moore Type U sampler and the California ring sampler, which is a split-barrel sampler similar to the Type U sampler (see Appendix D). The samplers were driven using a 360-pound downhole hammer falling a free distance of 30 inches for each blow. During our investigation, vapors from the potentially contaminated soil were monitored by the HNU photoionization device and/or the explosimeter. The soil samplers were cleaned with acetone and hexane between each sample to prevent cross-contamination of samples.

Upon completion of the drilling, the borings were grouted to the ground surface with mortar mixture consisting of sand, cement, and bentonite.

6. Analytical Methods

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The ground water and soil samples were analyzed according to USEPA (1978) methods. Table 5 lists each parameter and its analytical method. More details are given in Appendix D.

IV. DISCUSSION OF RESULTS AND SIGNIFICANCE OF FINDINGS

A. DISCUSSION OF RESULTS

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This section presents a discussion of the chemical analyses of ground water and soil samples collected during field investigations at Sites 1, 17, 24, 15, and 20. The second part of this section discusses the significance of the results. Primary drinking water standards, along with detection limits for the parameters analyzed, are given in Table 1.

1. Sites 1, 17, and 24

Sites 1, 17, and 24 will be considered together because of their close proximity to each other (see Plate 2). Field investigations included installing and sampling three monitor wells immediately south of the landfill, and sampling base production wells 6, 11, 12, 13, and 14. The field investigation is described in Section III, and the complete analyses are in Appendices B and D.

a. Detectable Parameters

Of the 44 parameters in the ground water analyses (Table 1), only 6 were present in one or more samples above detection limits, as shown in Table 6. The detected parameters included 2 halocarbons (1,1,1-trichloroethane and toluene), 2 pesticides (aldrin and DDT isomers), nitrate, and phenol. The nitrate concentration in the DM-3 sample exceeded the primary drinking water standard (PDWS) of 10 mg/L for nitrate (as N) established by the U.S. Environmental Protection Agency (USEPA).

1,1,1-trichloroethane was detected in four samples (DM-1, DM-2, DM-3, and base well 12) at a maximum concentration of $3.5 \ \mu g/L$. Toluene was detected in samples from DM-2 and base wells 6 and 13 at a maximum concentration of 12.77 $\mu g/L$. Of the pesticides, aldrin was detected in samples from DM-1 and base wells 11 and 13, while DDT isomers were detected in the DM-1 sample. The aldrin concentrations in all the above samples were $0.01 \ \mu g/L$ [or 10 nanograms/liter (ng/L)], which is the level of detection for aldrin. Concentration of DDT isomers in the DM-1 sample was $0.06 \ \mu g/L$. Phenol was detected only in the well 13 sample at 0.0080 mg/L.

Nitrate was not included in the analyses for the samples from base wells 6 and 14. Nitrate was detected in all the samples in which it was analyzed, and ranged from 9.2 to 16 mg/L in monitor wells DM-1 through DM-3 and from 0.39 to 0.67 mg/L in the base wells. Only the concentration of nitrate in the DM-3 sample exceeded the water quality criterion (PDWS) of 10 mg/L as N. The PDWS was

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TABLE 6

SUMMARY OF CONSTITUENTS ABOVE DETECTION LIMITS IN GROUND WATER ANALYSES

					WELL NUMBER	JER		
CONSTITUENT	DM-1	DM-2	DM-3	WELL 6	WELL 11	HELL 12	WELL 13	WELL 14
Purgeable Halocarbons and Aromatics (mg/L)								
1,1,1-trichloroethane	0.34	3.5	0.95	QN	QN	2.5	DN	QN
Toluene	ND	12.77	QN	0.7	QN	QN	۲.۱	QN
Pesticides (µg/L)								
Aldrin	0.01	QN	QN	QN	0.01	QN	0.01	QN
DDT isomers	0.06	QN	QN	NA	QN	QN	QN	NA
Others (mg/L)								
Nitrate (as N)	9.8	9.2	<u>16</u>	NA	0.45	0.67	0.39	NA
Phenol	QN	QN	ND	NA	QN	QN	0.80	NA
Notes: (1) Those constituents not listed above were present at concentrations less than	tituents	not li	sted ab	ove were	present ¿	it concentra	tions less	than

(1) Those constituents not listed above were present at concentrations less than detection limits.

Table 1 lists all the constituents analyzed and their detection limits. Q @ ₹

Concentrations that exceed water quality criteria are underlined.

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not analyzed. none detected; NA = = UN

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established at 10 mg/L as N because infant methemoglobinemia does not occur when nitrate is below that level. The levels found in the base wells are considered to be at or below background.

b. Reliability of the Analyses

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There is some doubt whether the monitor wells are actually downgradient from the waste disposal sites. The shallow ground water gradient appears to slope toward the north or west, based on monitor well water levels and effects of pumping in the artesian aquifer. This suggests that the monitor wells may be upgradient from Sites 1, 17, and 24 and, therefore, may not be intercepting contaminants from the sites.

The monitor wells were screened above and below the water table, where contaminants would be concentrated. After the monitor wells were installed, they were thoroughly developed by bailing to remove all traces of drilling fluid from the wells and to improve the flow of ground water into the wells. Bailing was continued until the specific conductivity of the well water stabilized. At least three casing volumes of water were removed from the monitor wells and base wells prior to sampling. The monitor well samples were collected with a Teflon bailer to minimize agitation and consequent aeration of the sample, which could volatilize organic chemicals. The Teflon bailer does not absorb any chemicals from the sample, thereby preventing any effects on sample chemistry and cross-contamination of subsequent samples.

The laboratory quality control (QC) program is described in detail in Appendix B. In general, analyses of duplicate samples were satisfactory. Recovery of spikes was always greater than 100 percent and ranged as high as 133 percent for the halocarbons and aromatics. Therefore, the reported concentrations of 1,1,1-trichloroethane are probably overestimated. This is not significant because the reported concentrations of 1,1,1-trichlorethane do not represent a health risk. Recovery of pesticide spikes ranged from 86 to 113 percent, slightly beyond the generally acceptable limits of 90 to 110 percent. Because the average is about 100 percent, the reported concentrations of aldrin and DDT isomers are considered reliable. However, at these very low concentrations of aldrin detected (at $0.01 \mu g/L$, the detection limit), ambiguities in the analytical results may erroneously indicate the presence or absence of this constituent. Although the results were rechecked, the analyst said that it is possible that the results may have been caused by a constituent other than aldrin. There are also physical reasons why aldrin would not be expected to be present. Aldrin is a relatively unstable compound and readily converts to dieldrin, which is one of the more persistent chlorinated pesticides (USEPA, 1979). It would be more likely that both aldrin and dieldrin, or dieldrin alone, would be detected rather than only aldrin.

c. Background Concentrations

Background concentrations of the detectable parameters are only available for nitrate and are very limited. No previous analyses included volatile organics, pesticides, or phenol. Kaufmann (1976) considered concentrations of nitrate up to 2.2 mg/L as N as background levels in shallow ground water. This concentration was based on nitrate concentrations observed in samples from wells completed in deeper levels of the artesian aquifer. Ground water from the deeper aquifer would not be contaminated by urban nitrate sources such as septic tanks and sewage treatment plant effluent.

2. <u>Site 15</u>

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Site 15 is located several hundred feet southwest of the runway and flight line, as shown on Plate 2. The field investigation consisted of five borings drilled to a depth of 20 feet at locations shown on Plate 7. Soil samples were collected at 1-foot intervals, and 16 samples were analyzed for oil and grease and the purgeable halocarbons and aromatics listed in Table 1. None of the parameters was present above detection limits in soil samples from Site 15.

These results are considered reliable because of efforts taken in the field to avoid contamination of the samples, although the analytical results may have underestimated the actual concentrations based on results from the QC program in the laboratory. The soil sampler was rinsed between samples with acetone and hexane, and the soils engineer wore disposable gloves when it was necessary to handle the samples. The samples were placed in sterile glass jars and kept on ice until delivered to the laboratory.

Appendix B contains a complete description of the laboratory QC program. In general, the duplicate samples were analyzed satisfactorily, but spike recovery was variable. Recovery of spikes ranged from 18 to 130 percent and averaged about 71 percent for 0.01 μ g/g spikes, which is the detection limit for the halocarbons and aromatics. Recovery of the 0.025 μ g/L spikes improved but was frequently beyond the acceptable limits of 90 to 110 percent. Reported concentrations near the detection limits are probably less than the actual concentrations.

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Despite the low spike recoveries, it is likely that the soil contains insignificant amounts of contaminants. Readings from the photoionization meter (HNU) were usually low, and no explosive vapors were detected. The contaminants are volatile, and vaporization is accelerated by the relatively high soil temperatures.

3. <u>Site 20</u>

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Site 20 is located east of the runway, as shown on Plate 2. The field investigation consisted of drilling four borings to depths of 20 feet at locations shown on Plate 5 and collecting soil samples at 1-foot intervals. Twelve samples were analyzed for oil and grease and volatile halocarbons and aromatics listed in Table 1. Only benzene was detected above detection limits in any of the Site 20 samples. Sample 6 from Boring 2 contained 0.016 μ g/g on a dry weight basis, as shown in Table 7. These analyses are considered reliable for the reasons described above for Site 15.

B. SIGNIFICANCE OF FINDINGS

Based on the results described in the previous section, this section will estimate, to the degree possible, the extent of contamination at each site.

1. Extent of Contamination at Sites 1, 17, and 24

Contamination of the ground water beneath Sites 1, 17, and 24 was shown by the presence of six inorganic or organic chemicals in one or more of the monitor well and/or base well samples. The absence of the other 37 parameters suggests that the contamination is relatively limited.

Nitrate was detected in all the samples in which it was analyzed. The concentrations were highest in the monitor wells south of the landfill and lowest in the base wells north of the golf course (see Plate 2). Because the concentrations in the base wells were below levels considered to be background, the deep artesian aquifer system appears to be currently unaffected by nitrates.

The extent of nitrate contamination in the shallow ground water encompasses the area in the vicinity of the monitor wells and, as reported by Kaufmann (1976), includes areas south of the base. No wells have been sampled east, west, or north of Site 17, so it is impossible to trace the extent in those directions.

According to Kaufmann (1976), excessive nitrate concentrations in shallow ground waters south of the landfill are due primarily to leakage from the former sewage treatment plant percolation ponds operated at Site 17 by Nellis AFB from 1940 until 1971. About 0.55 million gallons of wastewater per day were treated

SUMMARY OF CONSTITUENTS ABOVE DETECTION LIMITS IN SOIL SAMPLES

CONSTITUENT	SITE	BORING NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (ft)	CONCENTRATION
Benzene	20	B-2	6	6	0.016

*Micrograms per gram on a dry weight basis.

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2 2 Note: Oil and grease and the purgeable halocarbons and aromatics listed in Table 1 comprised the soil sample analyses. Detection limits are also listed in Table 1.

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between 1958 and 1971. Other potential sources of nitrate include infiltration from the base golf course, which was partially irrigated with secondary effluent until 1971, or septic tank leachate from septic tanks west of the landfill area or near the contaminated private wells. The hydrologic information collected for the shallow ground water system was inadequate to distinguish between these several possible sources.

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There is some doubt that Site 17 is the source of nitrate contamination because of the lack of information regarding the shallow ground water gradients south of the landfill. As discussed previously, the regional shallow ground water gradient was anticipated to be toward the south and east, based on the findings of It is likely, however, that the shallow ground water surface is locally Phase I. affected by pumping of the base production wells, and it appears that the shallow ground water gradient may slope toward the north. It is possible that the northerly gradient also prevailed while the percolation ponds were in operation, and infiltration from the ponds would have migrated north away from the private wells. A second cause of uncertainty regarding the former percolation ponds as a current source of off-base nitrate contamination is the lack of a driving force. When the percolation ponds were in operation, there were substantial amounts of infiltration from the ponds to carry nitrate to the shallow ground water system. Currently, precipitation and golf course irrigation are the only driving forces to carry nitrates into the shallow ground water system. Precipitation is an insignificant source of recharge because only about 2 percent of the annual precipitation of 3.7 inches infiltrates to the shallow ground water system (Patt, 1976). Therefore, there currently is no driving force to carry nitrate directly from Site 17. Irrigation of the golf course required an estimated 485 acre-feet per year in 1973, of which about 200 acre-feet, or 0.18 million gallons per day, recharged the shallow ground water system (Patt, 1976). The absence of a monitor well completed in the shallow ground water system between the golf course and Site 17 makes it impossible to estimate the amount of nitrate that is being carried from the golf course to the water table.

1,1,1-trichloroethane was detected in one of the base wells (well 12) and in all three monitor wells. The source of 1,1,1-trichloroethane in the monitor wells may have been waste solvents disposed of in the landfill or discharged in the percolation ponds from the former wastewater treatment plant. The source of the 1,1,1-trichloroethane in well 12 is unknown, although solvents were disposed of at Sites 17, 15, and 24, and leachate from any of those sites could be captured by the hydraulic gradient created when well 12 is pumping. However, some of the area of influence in well 12 is beneath off-base areas. 1,1,1-trichloroethane does not readily sorb onto soil particles, so it can be carried by downward percolating ground water with minimal attenuation (USEPA, 1979).

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The extent of contamination due to 1,1,1-trichloroethane includes shallow ground water beneath the landfill and areas south of the landfill and the deep aquifer in the vicinity of well 12. The presence of elevated nitrate concentrations in shallow ground water south of the base indicates that there is also potential for migration of 1,1,1-trichloroethane south of the base.

The four remaining contaminants, aldrin, DDT isomers, phenol, and toluene, were each detected in three or fewer samples and show no patterns that define the extent of contamination in the area north of the golf course. Contaminants detected in the monitor well samples show that the extent of contamination includes the shallow aquifer in the area south of and probably including Sites 1, 17, and 24. There are no analyses of samples from off-base wells that included organic chemicals from which to estimate off-base contamination. The extent shown by nitrate may serve as a rough approximation, but organic constituents behave differently in the subsurface environment, and the extent of organic contamination should also be different. As discussed above for well 12, the hydraulic gradients in the artesian aquifer created by pumping wells 11, 12, and 13 can intercept leachate from any of several disposal sites. This makes it very difficult to estimate the extent of contamination due to any single disposal site or contaminant. Further, the contaminant may have entered the well below or through fractures in the borehole seal.

In general, the extent of contamination shown by the six detected parameters in shallow ground water samples include Sites 1, 17, and 24; areas to the south of those sites; and, according to Kaufmann (1976), nitrate contamination extends almost a mile south of the base. The extent of contamination in the artesian aquifer north of Sites 1, 17, and 24 is difficult to assess because there was no pattern in the contaminants detected in the base wells. The hydraulic gradients created by pumping the base wells and the downward gradient from the shallow aquifer to the deep aquifer could induce contaminants from any of several disposal sites to migrate to the base wells.

2. Extent of Contamination at Sites 15 and 20

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Soil analyses yielded no evidence of contamination at Site 15, and only one sample from 6 feet below ground at Site 20 contained any contamination. Based on these results, there is apparently no significant contamination at these sites.

3. Evaluation of Contamination at Sites 1, 17, and 24

Six constituents were detected at one or more of the base or monitor well samples. Nitrate exceeded PDWS. As discussed previously, nitrate contamination is limited to shallow ground water in the vicinity of the monitor wells. Therefore, the base water supply is not threatened at this time, and the principal concern is the elevated nitrate concentrations in shallow ground water that were found in the monitor wells and reported for private wells south of the base.

Nitrate in shallow ground water in the vicinity of the monitor wells does not pose a health risk for the base because the base does not utilize shallow ground water for any purpose. However, it is possible that nitrate from Site 17 has contaminated the shallow ground water that is used for drinking water south of the base, thereby creating a moderate health risk. The health risk is deemed moderate because shallow ground water south of the base is not severely contaminated. The maximum nitrate concentrations reported by Kaufmann (1976) are only about a factor of two above the drinking water standards, and only one of the concentrations in the monitor well samples exceeded the PDWS of 10 mg/L as N (16 mg/L as N in DM-3). Further, the percolation ponds at Site 17 were taken out of operation in 1972, thereby terminating both the suspected principal source of the nitrate and the infiltration that may have been carrying nitrate to the water table. Since then, only a negligible amount of infiltration is created by the fraction of precipitation that is not evaporated or transpired. Currently, only golf course irrigation has the potential of generating enough infiltration to carry nitrate through the water table, but it is unknown if the infiltration is creating any contamination. There does not appear to be a substantial plume of ground water highly contaminated with nitrate originating from Sites 1, 17, and 24.

4. Evaluation of Contamination at Sites 15 and 20

Based on the fact that no significant evidence of contamination was found at Sites 15 and 20 during this study, there does not appear to be a health risk associated with these sites.

V. ALTERNATIVE MEASURES

This section describes several alternatives for further defining the extent and magnitude of ground water contamination that has been identified at Nellis AFB. The alternatives include installation of four additional shallow monitor wells, resampling the base wells and monitor wells that were sampled once during Phase II, Stage 1, addition of major cations and anions to subsequent ground water analyses, monitoring of selected wells in which contaminants are found, and inventorying and possibly sampling private wells and septic tanks south of the base where nitrate contamination in shallow ground water has been reported. Each alternative is discussed below.

The results of Phase II, Stage 1 did not provide enough information to adequately define the shallow ground water regime. In fact, the results were somewhat contradictory to what was expected. For example, CH2M Hill (1982) and Kaufmann (1976) anticipated that shallow ground water would flow southeast or east on a regional basis; however, water level measurements from the monitor wells installed by Dames & Moore indicated that the shallow ground water gradient apparently slopes to the west or north. Based on our analyses, it is questionable whether the monitor wells are actually downgradient, and it appears that the monitor wells may, in fact, be upgradient from Sites 1, 17, and 24. Further, more information needs to be collected about the shallow ground water system before reliable estimates can be made of the extent and magnitude of shallow ground water contamination.

It is recommended that four additional monitor wells be installed at locations shown on Plate 2. For ease of reference, these have been numbered DM-4 to DM-7. The basis for each well is as follows:

 $\underline{DM-4}$ and $\underline{DM-5}$ — Water levels from these proposed wells and the existing monitor wells would define the attitude of the shallow ground water surface and would indicate the direction contaminants are migrating from Sites 1, 17, and 24.

 $\underline{DM-6}$ — This well should be located north of Sites 1, 17, and 24 and would provide needed information on the shallow ground water gradient. However, DM-6 may intercept infiltrating irrigation water from the golf course and would indicate whether the golf course is a significant source of nitrate contamination. Located near base well 13, DM-6 may also provide information on the degree of hydraulic communication between the shallow and artesian ground water systems through a comparison of water level fluctuations and water quality in the two wells. $\underline{DM-7}$ — This well, located north of the golf course and next to base well 11, would yield water samples that should be minimally affected by infiltration of irrigation water from the golf course. Information gained would include better background water quality data for the shallow aquifer system, better definition of the elevation of the ground water table surface, and data on vertical hydraulic gradient.

The four additional wells would be completed at a depth of about 120 feet and would be constructed from PVC casing and well screen similar to the monitor wells installed for Phase II, Stage 1 (see Section III).

The base wells and monitor wells should be resampled to confirm the presence or absence of the parameters in the first analyses. Most of the organic constituents were at or below detection limits in the ground water samples. At these very low concentrations, ambiguities in the analytical results may erroneously indicate the presence or absence of a constituent. Resampling would confirm the existence of aldrin and other organic constituents that may have been falsely identified or overlooked. Extraction of large volume samples and double column confirmation would provide lower detection limits and positive confirmation of components detected. This second round of sampling should include the additional monitor wells described above.

The major anions, cations, and drinking water parameters listed in Table 8 should comprise the analyses of all subsequent ground water samples to more accurately assess ground water quality in both aquifers beneath the base. The additional parameters will provide a detailed characterization of the ground water composition in both ground water systems. Tracing the changes in composition of ground water from different areas beneath the base will show the effects of mixing of various waters, and would indicate the impacts of the various base facilities and disposal areas on ground water quality. One or more of the anions such as chloride or sulfate may serve as an accurate contamination indicator. The cations, along with the anions, generally define a "fingerprint" of a particular ground water type that can be recognized among different samples. Comparison of the ground water types can show the occurrence of mixing of shallow and artesian ground water or the addition of contaminants to the ground water systems.

The wells in which contaminants are confirmed should be sampled three more times at quarterly intervals to define the temporal variation of the concentrations. The analyses should show the relationship of contaminant concentrations and seasonal pumpage and would help to prioritize the contaminants that may warrant remedial action. The quarterly monitoring, where necessary, would include measurement of the water level and analysis of the confirmed contaminants plus pH, specific

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RECOMMENDED PARAMETERS FOR FUTURE GROUND WATER ANALYSES

Cations

Calcium Magnesium Potassium Sodium

Organic Constituents

EPA 601 and 602 Purgeable Halocarbons and Aromatics

Anions

Pesticides

Sulfate Chloride Fluoride Bicarbonate Carbonate Nitrate Aldrin Dieldrin Chlordane DDT isomers Endrin Endrin Aldehyde Heptachlor Lindane

Others

pH Specific Conductivity Total Dissolved Solids Lead Oil and Grease Phenol Total Organic Carbon Total Organic Halogen conductivity, TDS measurements and the major cations and anions in Table 8 to indicate general water quality. Sample collection and analytical methods would be the same as those employed for Phase II, Stage 1 and are described in Section III. After samples have been collected for the three quarters following the resampling, the results should be examined, and the need for either continued monitoring or other actions should be evaluated at that time.

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If information about the shallow ground water system collected during the next phase indicates that hazardous levels of contaminants may be migrating from the base to private wells used for drinking water, then an inventory should be conducted of private wells completed in shallow ground water downgradient of the base. The purpose of the inventory would be to identify the number of private wells in use in areas that may be affected by contamination from the base. The extent and magnitude of contamination caused by the base would be directly proportional to the number of private wells adversely affected by the contaminants. The results of the inventory may also reveal other potential sources of contamination in the vicinity of The inventory should include the following information: the private wells. well depth, completion date, casing size, screened interval, lithologic log, yield, use, daily extraction, static and pumping water levels and elevations, appearance of water, condition of surface seal and evidence of nearby contamination sources (i.e., heavily fertilized lawns or gardens, livestock, garbage dumps, waste petroleum products, or septic tanks). Some of this information may be available from the Department of Water Resources or State Engineer, but the remainder should be obtained in the field for accuracy. Because the inventory might create considerable public concern, it should be done only if hydrologic information shows little doubt that the base is a potential source of contaminants in the shallow private wells.

Prior to 1972, water infiltrating from the percolation ponds at Site 17 and golf course irrigation were significant sources of recharge to shallow ground water and maintained a driving force carrying contaminants to the water table. Currently, golf course irrigation is probably the principal source of recharge of the shallow ground Although sewage effluent is no longer used to irrigate the golf course, water. excess irrigation may be a significant driving force to leach contaminants from the soil and carry them to the shallow water table. According to Patt (1976), golf courses in the Las Vegas area in 1973 were irrigated with volumes of water ranging from 2.7 to 11.5 acre-feet per year, while the Nellis golf course was irrigated with 7.82 acre-feet per year. Overwatering may create net downward infiltration of water which could leach contaminants from the soil, especially the part of the golf course built over the former landfill. The permeability of the unsaturated zone between ground surface and the water table increases with the soil moisture content, and by minimizing soil moisture content, contaminant migration can be slowed or Excessive fertilization adds more nutrients such as nitrate to the soil attenuated.

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than can be utilized by vegetation. The excess may migrate downward increasing the already high nitrate concentrations in shallow ground water. A study should be conducted to evaluate current irrigation and fertilization practices of the golf course. If excessive watering or fertilization is indicated, optimization studies and procedures can be recommended.

Contaminant plumes may often be defined using surficial resistivity surveys. Ground water carrying contaminants generally contains a higher concentration of dissolved solids and is consequently more conductive than ground water upgradient from the contaminant source. The contaminated ground water might then be identified by its relatively low resistivity. The advantages of resistivity surveys include the capability to cover large areas in less time and at relatively less cost than could be done by installing wells. A combination of resistivity surveys calibrated with a small number of wells may provide a very cost-effective and informative subsurface investigation. However, the disadvantages of the technique preclude its use at Nellis AFB. The large depth to shallow ground water severely diminishes the resolution of the survey. The technique requires a significant resistivity contrast between the contaminated and uncontaminated ground water. As discussed previously for nitrate in the shallow ground water system, there does not appear to be a contaminant plume composed of contrasting water quality originating from the base. There are significant differences between the nitrate concentrations in the shallow and artesian ground water systems, but the resistivity survey would only detect the shallow ground water system. Concentrations of the other constituents are too close to detection limits to create the necessary water quality contrast.

Borehole geophysical methods such as resistivity, self potential, density, and gamma radiation are often used to characterize and correlate geologic and hydrologic conditions. However, they would not yield significantly more subsurface information than that collected during the drilling and sampling carried out for Phase II, Stage 1. Like surficial geophysical methods, borehole methods yield the most information from sediments with contrasting properties such as composition, grain size, moisture content, density, or degree of consolidation. The shallow sediments beneath the base consist primarily of clay and silt without sufficiently contrasting characteristics, which would make the borehole measurements at Nellis AFB relatively useless.

Unsaturated zone monitoring is a method of investigation that is used to characterize the quality of water in the soil pores above the water table. The sample is collected in a lysimeter that is buried at some depth beneath the area of investigation. A lysimeter is a porous ceramic container with separate sampling vacuum hoses attached to it. Soil water is collected by evacuating the lysimeter and then pressuring it to retrieve the sample. If the soil moisture content is low, up to several days may be required for soil water to seep into the lysimeter. Lysimeters are useful because they provide samples of downward infiltrating water before it reaches the water table. They can be used to isolate sources of ground water contamination.

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The main disadvantages of lysimeters are that the porous ceramic filter plugs with soil or the hoses break or collapse. Their usefulness at Nellis AFB would be limited by the lack of infiltrating water because of the high evaporation rate. Lysimeters might be useful beneath the golf course to collect samples of irrigation water as part of a program to optimize irrigation procedures.

Nitrogen isotopes have been used to distinguish between nitrogen generated by fertilizers and human or animal wastes. The technique is based on the relative enrichment of nitrogen-14 and nitrogen-15. At Nellis AFB, this technique could be used to determine whether nitrate in the shallow ground water samples originated from human wastes at Site 17 and septic tanks, or from fertilizers at the golf course. The disadvantage of isotopes is that there is enough uncertainty in the isotope analyses that supporting hydrologic evidence is needed to corroborate the results. Therefore, the use of isotopes at Nellis AFB is premature until the shallow ground water flow regime is better known.

VI. CONCLUSIONS

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The following section contains a summary of the conclusions reached after completion of Phase II, Stage 1. Recommendations for the next phase of IRP are given in Section VII. Attendant costs are given under separate cover in Appendix K.

The results of Phase II, Stage 1 showed that two ground water systems exist at Nellis AFB. The shallow ground water system occurs in approximately the upper 200 feet of sediments and is maintained by upward leakage from the deeper artesian ground water system and surface infiltration from precipitation, septic tank leachate, and irrigation waters. Current shallow ground water levels are approximately 90 to 100 feet below ground surface. Many domestic wells in the vicinity of Nellis AFB are completed in the shallow ground water system. Although the regional shallow ground water gradient is reportedly toward the south and east, shallow ground water levels in monitor wells installed during this investigation appear to be affected by base well pumping and indicate that shallow ground water gradient in the vicinity of the base may be toward the northwest.

Beneath the shallow ground water system are several artesian aquifers that comprise the principal ground water supply for not only the base but also the major ground water users in the Las Vegas Valley. Artesian water levels range between 90 and 110 feet below ground and appear to form a depression in the vicinity of base wells 11, 12 and 13. The deep artesian aquifer is recharged primarily by precipitation in the mountains surrounding the Las Vegas Valley.

Although the shallow ground water system has a low transmissivity, there is a small degree of hydraulic communication between the two aquifers. A comparison of the artesian water levels measured in base wells and shallow ground water levels measured in domestic wells since 1950 showed that the shallow water levels declined at the same rate as the artesian water levels. This indicates that, as the artesian water levels decline, recharge to the shallow aquifer decreases and causes shallow ground water levels also to decline. Therefore, it is possible that shallow ground water levels in the vicinity of the monitor wells installed south of those sites. If this is true, then the monitor wells may be upgradient rather than downgradient from the disposal sites.

It is also possible that shallow ground water levels in the vicinity of the base production wells are higher than the artesian water levels, thereby creating a downward hydraulic gradient. This is significant because a downward hydraulic gradient may induce contaminants from the shallow aquifer to migrate to the artesian aquifer. However, more information regarding the shallow ground water

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Contaminants that may have originated from past waste activities at the base were present in samples from the base wells and monitor wells. Nitrate, phenol, 1,1,1-trichloroethane, toluene, aldrin, and DDT isomers were present in one or more ground water samples. Nitrate in the DM-3 sample exceeded PDWS. Aldrin determinations are suspect, as discussed previously.

Nitrate was detected in all the ground water samples. The concentrations were low in the base well samples and near or above drinking water standards in the monitor well samples. Although the nitrate concentrations pose no health risk for the base, there is a possibility that Sites 1, 17, and 24 may be the source of elevated nitrate concentrations in domestic wells immediately south of the base. Reported nitrate concentrations from this area are high enough to create a moderate health risk. However, the shallow ground water system in that area must be better defined to determine the source of the nitrate and to determine whether other contaminants are migrating from the base.

VII. RECOMMENDATIONS

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The recommendations presented in this section have two primary purposes: (1) to collect information to further define the ground water regime in the vicinity of Sites 1, 17, and 24; and (2) to confirm the presence and determine the temporal variation of contaminants in the shallow and artesian ground water systems beneath the base.

Further definition of the ground water regime is necessary to establish the true downgradient direction from the disposal sites and, hence, the direction of contaminant movement. This is necessary in order to determine whether ground water contamination has resulted due to past disposal practices on the base, and to estimate the magnitude and extent of contamination.

Various alternative measures for achieving these purposes, along with detailed discussion of the information that would be obtained, are given in Section V of the main text. The following gives our recommendations for additional study at this time.

The first recommendation is to install three additional monitor wells surrounding Sites 1, 17, and 24 at locations shown on Plate 2. The new wells would be located immediately east, west, and north of the three sites and are designated DM-4, DM-5, and DM-6 for the sake of reference. Information from the three new wells, along with the three existing monitor wells, will better define the shallow ground water surface and the degree of hydraulic communication between the shallow and artesian ground water systems, as discussed previously. Completion and sampling of proposed well DM-7 is not recommended at this time, since serious ground water contamination has not been confirmed.

The second recommendation is to resample all the base wells and the new and existing monitor wells for the parameters in the first sampling round plus the major cations and anions listed in Table 8. This round of analyses will confirm the presence of contaminants in the two ground water systems, and the additional parameters will characterize the chemical nature of ground water beneath the base. We recommend that larger volume samples be collected and extracted for organic analyses, and that double column confirmations be run.

The third recommendation is to monitor ground water quality with time by collecting three additional quarterly samples after the resampling from wells in which contaminants were confirmed, and analyze them for the parameters listed in Table 8. The results will show whether contamination is increasing or decreasing, and the water level information will indicate temporal changes in the direction of

[51]

contaminant movement. After a year of monitoring, the results should be reviewed and a decision made to continue monitoring or to pursue other courses.

A domestic well inventory is not recommended until there is adequate hydrogeologic basis for suspecting that the base is the source of contamination south of the base. Because of the public concern created by the inventory, it should be done only when deemed necessary.

The fourth recommendation is to evaluate the rates of irrigation and fertilization of the golf course to determine if this is presently a contributor to the problem.

Other alternatives discussed previously are not justified at present, in our opinion, and are not recommended at this time.

The following summarizes our recommendations and rationale:

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Sites	Recommended Action	Rationale
1, 17, 24	Installation of 3 additional monitor wells encircling Sites 1, 17, and 24	To define the shallow ground water table surface and the relationship between shallow and artesian ground water systems
1, 17, 24	Resampling base wells 6, 11, 12, 13, and 14, and existing and new monitor wells for halocarbons, aromatics, pesti- cides, nitrate, and other major cations and anions	To confirm the presence of contaminants and characterize shallow and artesian ground water quality
1, 17, 24	Collect 3 additional quarterly samples from above wells for confirmed contaminants and major cations and anions	To determine temporal varia- tions of ground water quality and trend of contaminant concentration
15, 20	No further action	No significant evidence of contamination

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APPENDIX A

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LOGS OF BORINGS, MONITOR WELLS, BASE WELLS, AND SELECTED OFF-SITE WELLS

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Logs of Borings and Monitor Wells Drilled by Dames & Moore

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BORING 1 LABORATORY TEST BATA REPORTED ELSEWHERE UNU NEADING IPPAN ESPLOSIMET BEADING IS. L.F.L.I VOLATILE HALOCADORS DEPTH IN FEET VOLATILE Anomatics STATES SYMBOLS OIL AND Enerse DESCRIPTION BROWN CLAYEY SILTY FINE SAND TO SANDY SILT WITH TRACE OF GRAVEL, DAMP 5H/ ML 23 🛛 0 0.6 29 🛙 0 2.0 GRADING TO DARK BROWN 42 🕅 l'i 4.0 X X X 0 INCREASING CLAY, DAMP 47 🚦 0 3.6 75 🛿 r i 8.1 GRADING TO LIGHT BROWN, DAMP 82 **B** 0 3.6 82 🛙 0 4.6 79 🛛 0 3.8 INCREASING CLAY 0 29 1.2 18 🛙 Q 1.6 INCREASING SAND 10 41 🛛 0 1.6 52 🛿 0 2.6 X X X 29 🛙 0.8 0 40 🛙 0 1.8 TRACE OF GRAVEL 36 🛙 0 2.0 15 87/ 🛛 0 2.2 80/ 8 11 WHITE CLAYEY/SILTY SAND 0 1.8 97/ 10.5 2.4 X 0 X X 95 🖥 0 1.8 CALICHE 29 🛛 Ш DAMP 2.2 đ 28 BORING TERMINATED AT 20.0 FEET ON 11/8/83. NO GROUNDWATER ENCOUNTERED. 25 38 35 LOG OF BORINGS BY Dames & Moore Plate A-1

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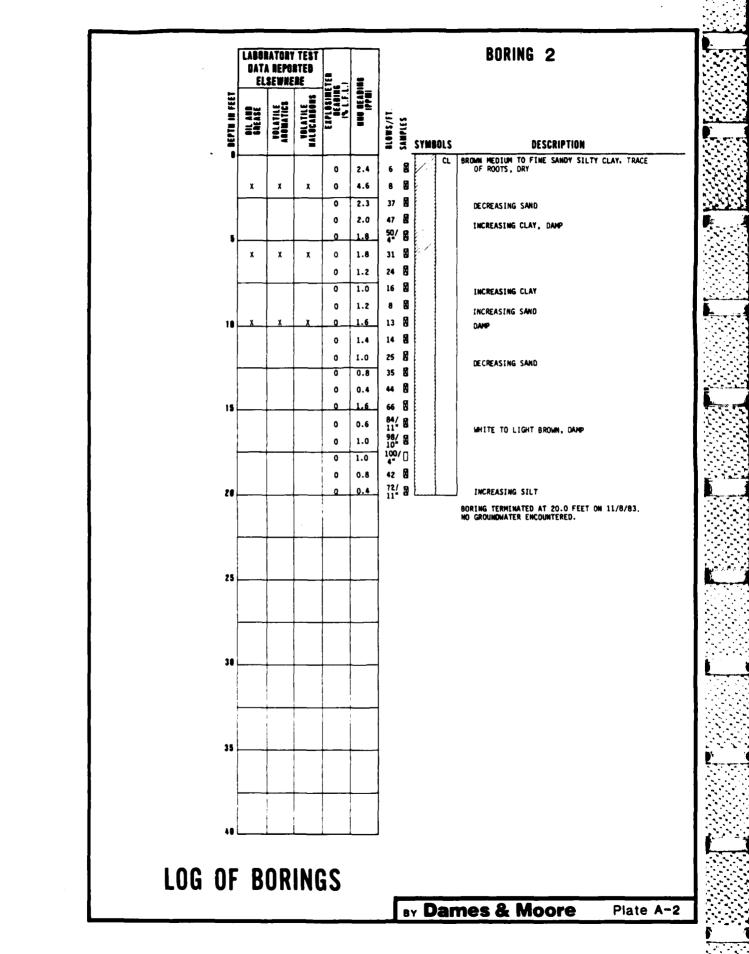
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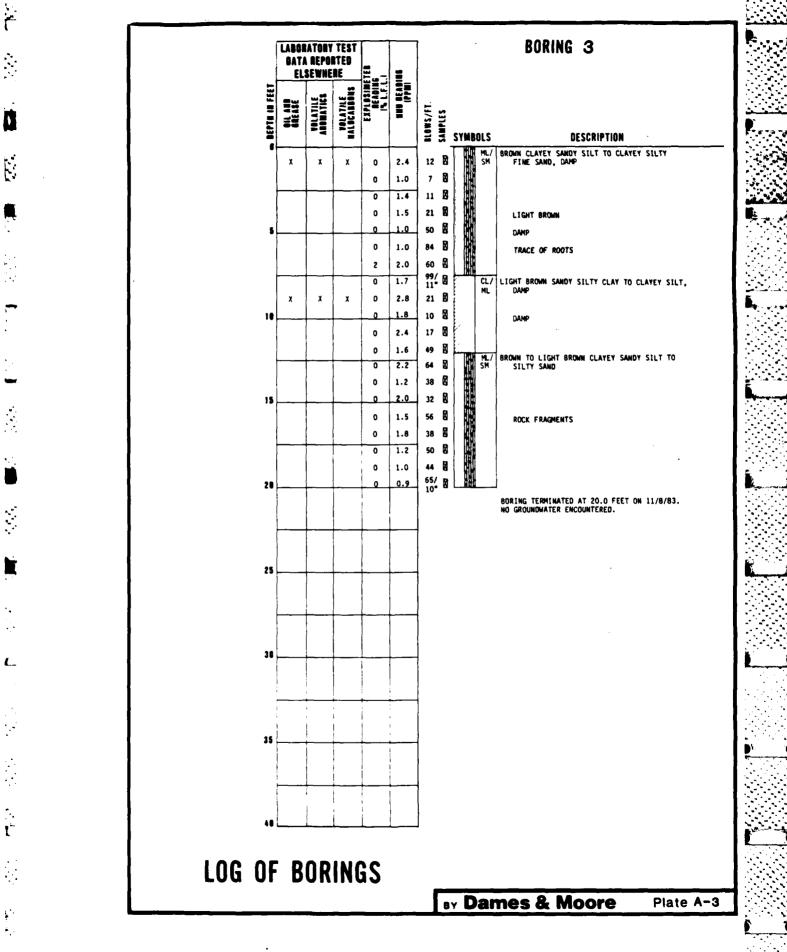
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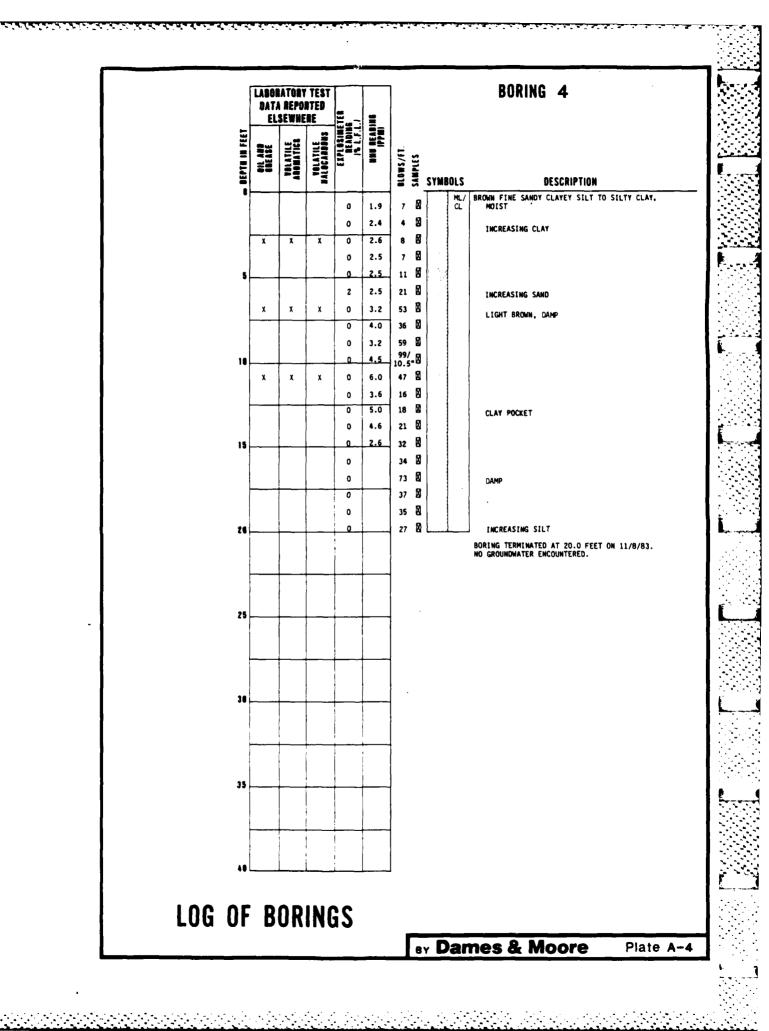
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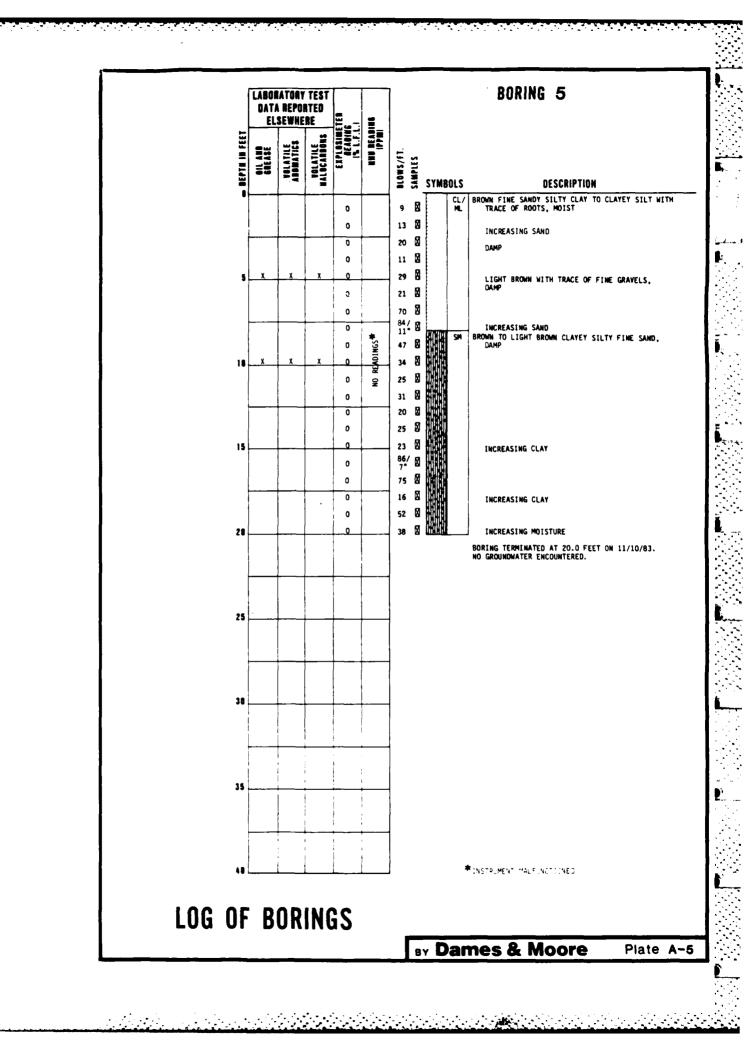
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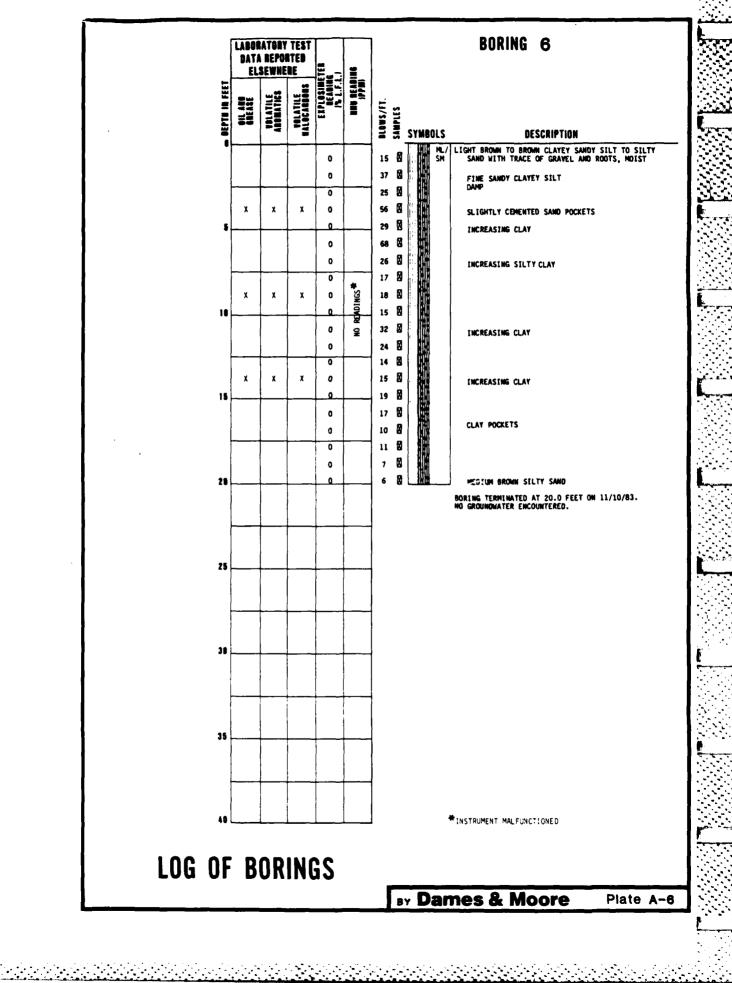
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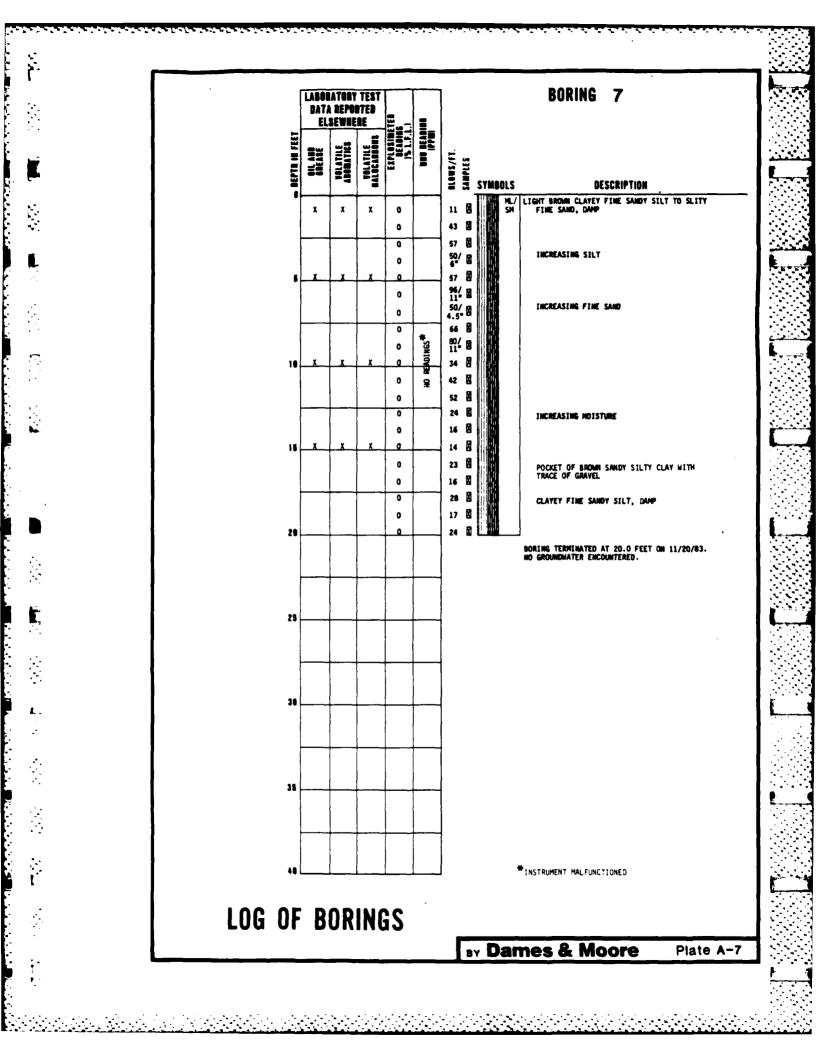
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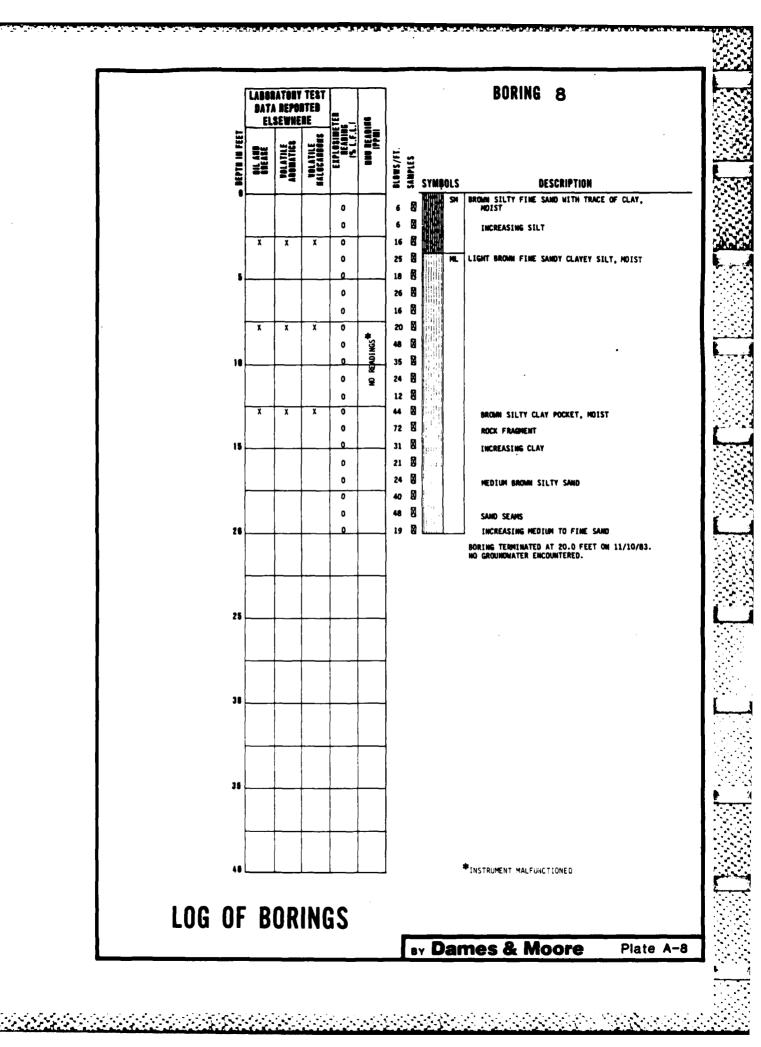
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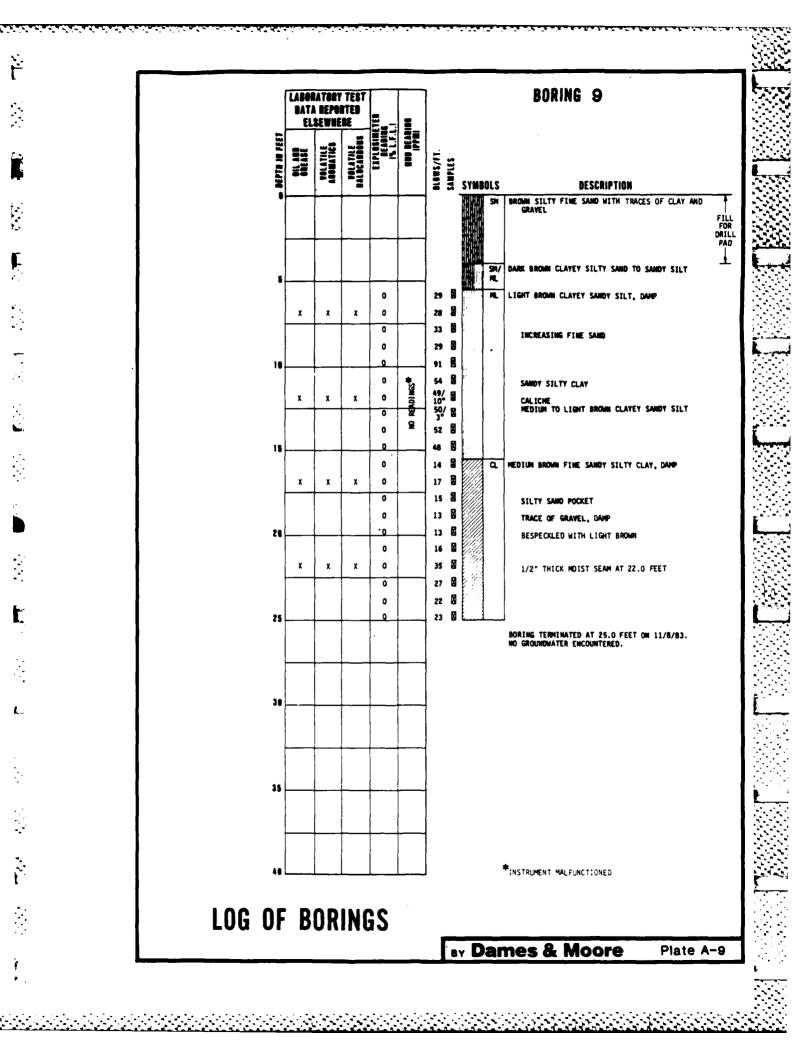
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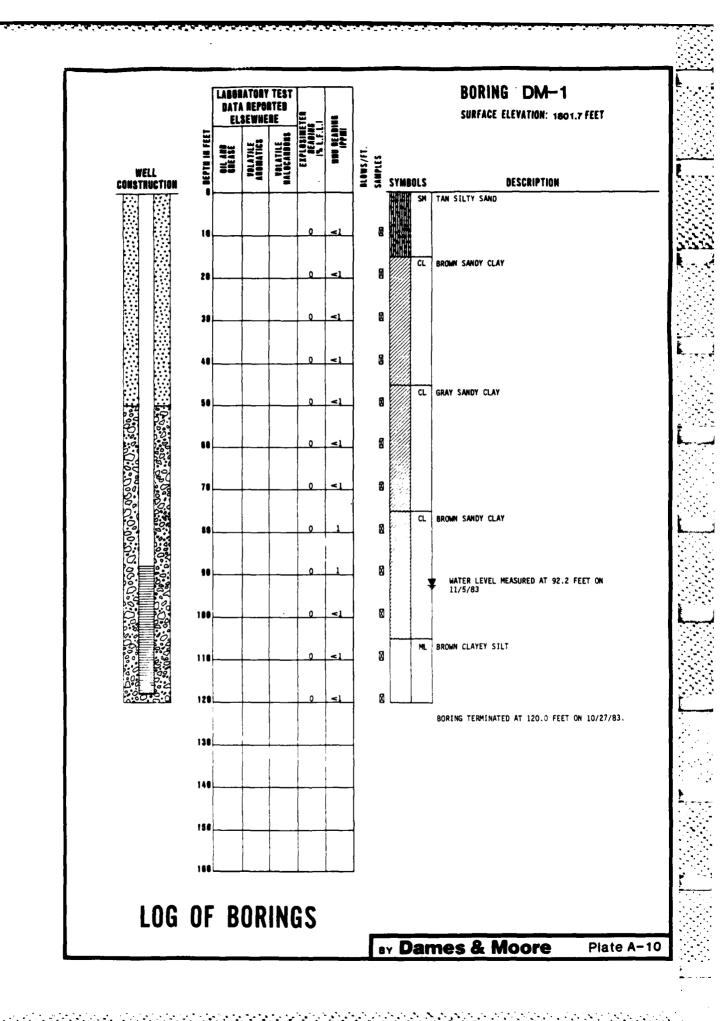
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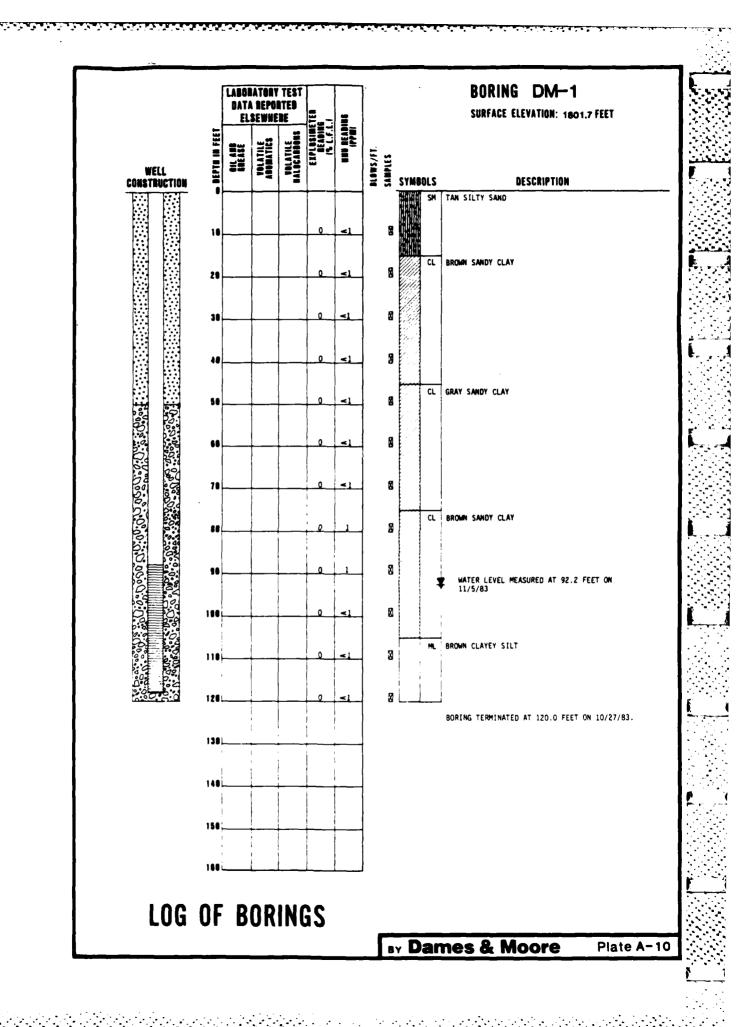
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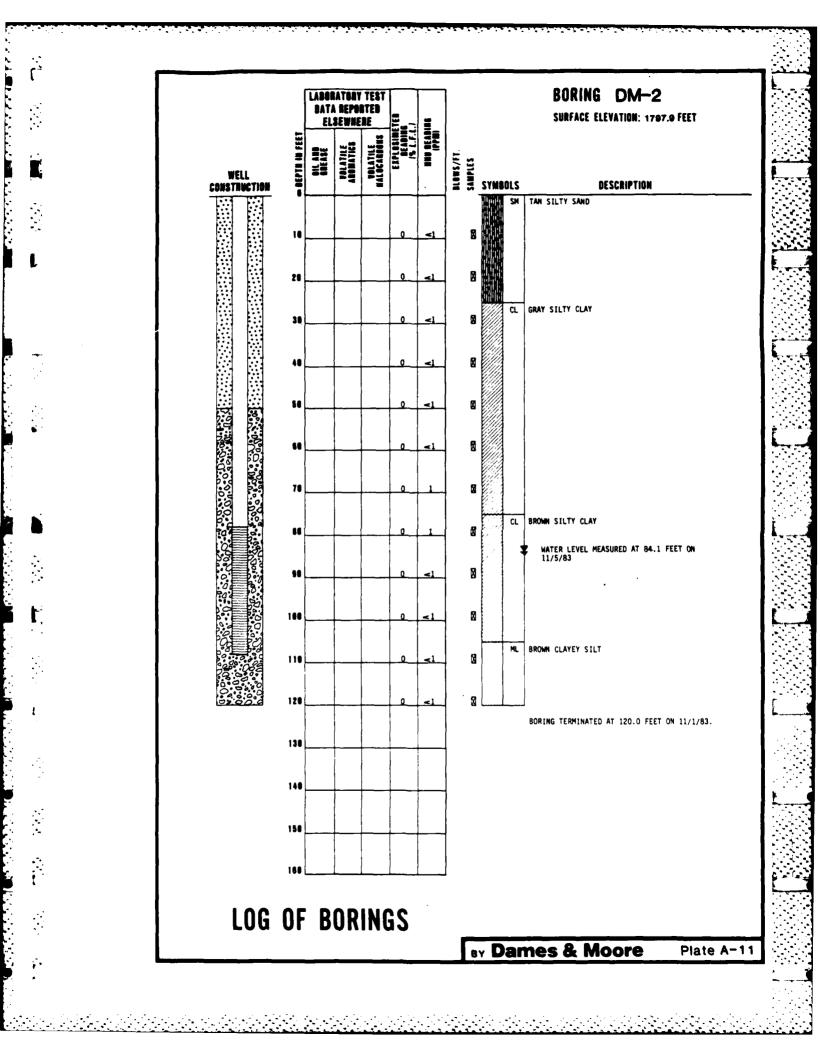


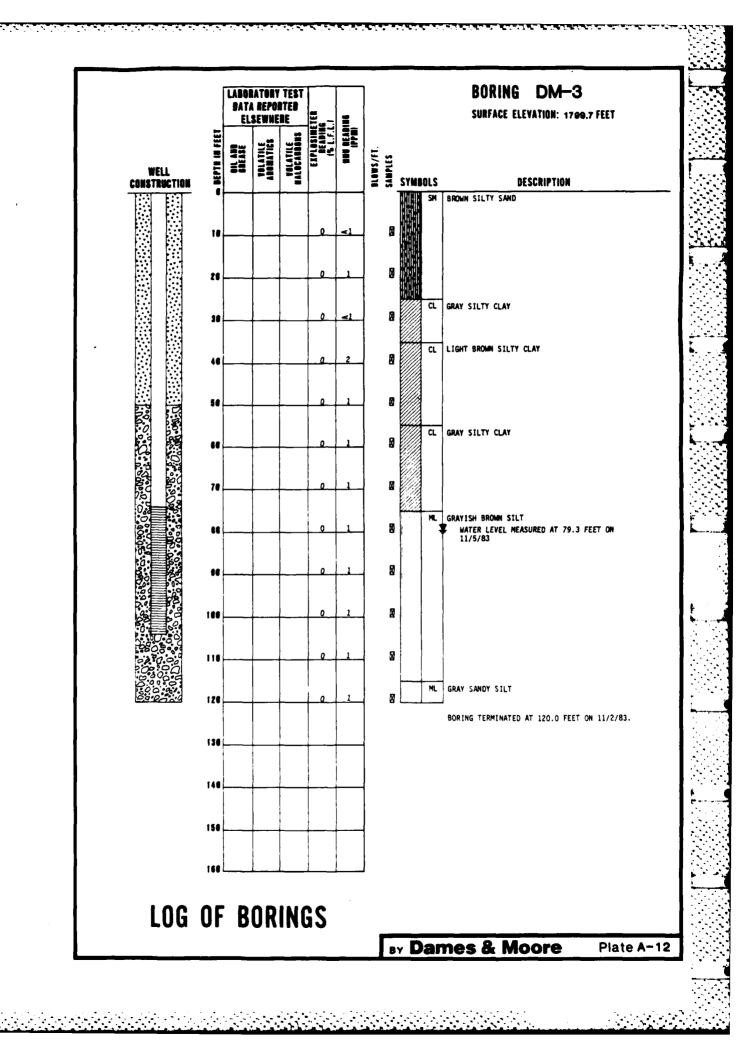
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G SPECIFIC GRAVITY	
PH HYDROGEN ION CONCENTRATION	
MA MECHANICAL ANALYSIS	
SA SIEVE ANALYSIS (+200 ONLY)	
HA HYDROMETER ANALYSIS (-200 ONLY)	
AL ATTERBERG LIMITS (LL & PL)	
SL SHRINKAGE LINIT	
FS FREE SWELL	
SS SHRINK-SWELL	
EXP EXPANSION	
C (COL) CONSOLIDATION (COLLAPSE)	
VC VIBRATING CONSOLIDATION	LIQUID LIMIT
P PERMEABILITY	
FP FIELD PERMEABILITY	DI AATIAITY ALLAST
UC UNCONFINED COMPRESSION	PLASTICITY CHART
TRIAXIAL COMPRESSION TEST	
TXUU I. UNCONSOLIDATED-UNDRAINED	
TXCU 2. CONSOLIDATED-UNDRAINED	
TXCUM 3. CU/MULTIPHASE**	
	THEN TR
TXCUPP 4. CU/WITH PORE PRESSURE MEASURE	
TXCD 5. CONSOLIDATED-DRAINED	
DIRECT SHEAR TEST	
DS/UU 1. UNCONSOLIDATED-UNDRAINED	
DS/CU 2. CONSOLIDATED-UNDRAINED	
DS/CD 3. CONSOLIDATED-DRAINED	
DS/CD/MO 4. CD/MULTIPHASE**	
LV TORVANE SHEAR (LAB VANE SHEAR)	
INCLUDES COMPLETE ANALYSIS, SIEVING AND HYDRO SERIES OF TESTS RUN ON SAMPLE	
A - ACKER SOIL SAMPLER D - DAMES & MOORE, TYPE D SAMPLER P - DAMES & MOORE PISTON SAMPLER U - DAMES & MOORE TYPE U SAMPLER PT - PITCHER TUBE SAMPLER NX - NX CORE SAMPLER TW - DAMES & MOORE TYPE U SAMPLER WIT THIN WALL ATTACHMENT SPT - STANDARD PENETRATION TEST SA ST - SHELBY TUBE SAMPLER	RQD (ROCK QUALITY DETERMINATION) PERCENT OF THE TOTAL CORE RUN HAVING AN UNFRACTURED LENGTH OF * OR MORE PERCENT OF CORE RUN RECOVERED INDICATES DEPTH OF FIELD VANE SHEAR TEST NOTE UNLESS OTHERWISE NOTED SAMPLING RESISTANCE IS WEASURED IN BLOWS PER FOOT REQUIRED TO DRIVE
KEY TO SAMPLER	S KEY TO SAMPLES
	KEY TO LOG OF BORINGS
	BY Dames & Moore Plate A-1

TYPE OF TEST SYMBOL MOISTURE M QUICK MO TEST BASED ON ASSUMED SPECIFIC GRAVITY QD MOISTURE-DENSITY MD CHUNK DENSITY ON BULK SAMPLE CD RELATIVE DENSITY RD COMPACTION CURVE COMP CALIFORNIA IMPACT CI COMPACTED CORE cc

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LETTER GRAPHIC MAJOR DIVISIONS TYPICAL DESCRIPTIONS WELL GRADED GRAVELS GRAVEL SAND MIX TURES LITTLE OR NO FINES a GRAVEL AND GRAVELLY SOILS CLEAN GRAVELS ILITTLE OR NO PODRLY GRADED GRAVELS. GRAVEL SAND MIXTURES, LITTLE OR NO FINES œ COARSE GRAINED SOILS SILTY GRAVELS GRAVEL SAND -AVELS WITH PH NORE THAN SOL OF COARSE FRAC TION RETAINED ON NO. 4 SIEVE CLAYEY GRAVELS. GRAVEL SAND-CLAY MIXTURES GC WELL-GRADED SANDS GRAVELLY SANDS, LITTLE OR NO FINES sw CLEAN SAND SAND AND SANDV SOILS ILITTLE OR NO POORLY GRADED SANDS, GRAVEL LY SANDS, LITTLE OR NO FINES 9 NORE THAN SOL OF MATERIAL IS LARGER THAN NO 200 SIEVE SIZE SILTY SANDS, SAND SILT SM NORE THAN 50% OF COARSE FRAC TION PASSING NO 4 SIEVE CLAVEY SANDS SAND-CLAY sc INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT FLASTICITY MIL. INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS SILTS AND CLAYS LIQUID LIMIT FINE GRAINED CL ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY oL INORGANIC SILTS MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS 1004 MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE SILTS AND CLAYS LIQUID LINHT INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS СН ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY ORGANIC SILTS OH PEAT HUMUS SWAMP SOILS WITH HIGH ORGANIC CONTENTS 21

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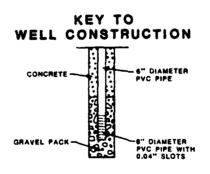
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NOTE DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



UNIFIED SOIL CLASSIFICATION SYSTEM

BY Dames & Moore PI

Plate A-14

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On-Base Well Records

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			ENGIN	REPORT TO THE STATE EER OF NEVADA	Log No. Rec
			Porce		
•			Ir Porce		
				Address 231 ija	
	Location of	well: 27	¼ ≣● ¼ S	e9, T.20.N/S, R62.E, in	crk. C
	Water will	be used for.	BaseR	Cuesi-kuricipal	of well 558 1000
				12-5/4-11:00 Weight of casing per l	
		na tengta or	(Casing	D" I D. 100 fort 127/1 C. D. S. 12	sing D in diameter give outside dina
	• If flowing	well give flo	w in c.f.s. or	g.p.m. and pressure	
				anding water from surface 58.11 11	./16/51
	If Assume	well describe			
	II NOWINE .	wei, des	concion wor	ks	alve, etc)
	Date of cor	mmencement	of well	Sept. 12, 1951Date of completion of	well
~	Type of we			cono 50 A Cable tools	
i -				OF FORMATIONS	
	From	To	Thickness		Water-bearing Formation Cast Perforations, Etc
	feet O	. feet 4	feet 4	Type of material	
	4	16	12	Top scil Caliche	Chief squifer (water bearing
	16 69	69 74	53	Brown clay	formation)
	74	127	5 53	water scal and gravel brown clay	from 730 to 750
	127 130	130 165	3	sandy gravel	Other aquifers 750 to 750
	165	175		jandy brown clay brown clay	127 to 130, 247 20 2
	175 182	182	17	white clay	385 to 405, 555 to 5
	200	200	18 35	brown clay and gravel brown clay	670 to 673, 787 to 5
	235 240	240	5	sandy brown clay	
	245	245	552	brown clay and gravel	818 to 528, 950 to 5
	247 250	250	3	Sandy gravel	First water at E9 to ter
	265	285 205	15	light brown clay and gravel brown clay	Casing perforated
	785 405	405	20	Hard brown sand. Some water	
	410	-10 -70	5 60	sticky wet clay brown clay	1700 to 620
	470	405	15	blue clay	Size of perforations
\leq	485 49 490	20 4 <u>50</u> 530 -	5 40	sandy blue clay blue clay	5/32" X 1 1/4" IOn-
~	530	555	25 5	brown clay	
	555 560	560 650	5 90	water sand	
	650	670	20	sandy brown clay blue and grey clay	
	670	673	3	white sand (over	-

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		6
Thickness	LOG OF FORMATI	Type of material
17 40 20 10 20 7 23 8 10 27 3 45 10 10	blue and brown o brown sant brown clay grey sand blue clay grey sand blue-grey clay grey sand sticky grey cla sticky blue cla sticky blue cla	925940 blue clay with streads of 132 940945 white clay and line 940945 white clay and line 950955 sand 9551000 sandy grey clay & line 7 27 blue clay
	CASING I	ÉCORD -
100 850	A bit stee 850' liner with perforated 1 '" 31" a Gravel pag	"Remarks"-Seels, Grounds, Etc. n place with 138 cacks of straight coment, 1 shoe 8" x 20" x 1" bit stoel shie 8" x 12 3/4" x 3/4" machino from 144 feet to 826, Ferforations 5/32 gart around circumference 12" between rew Med between 20" hole and 12 3/4" liner, with "" growel.
<u></u>	<u> *</u>	the a depth of 160 foot. (donth of test ;
the subscript of the su		
RULLERS S filled under true to my be Wel	my jurisdiction and the st information and belief.	(Not to be filled in by Driller)
	40 20 10 20 7 23 8 10 27 3 45 10 27 3 45 10 10 27 3 45 10 20 7 23 8 10 27 3 45 10 20 27 3 45 10 20 27 3 45 10 20 27 3 45 10 20 27 3 45 10 20 27 3 45 10 10 20 27 3 45 10 10 20 27 3 45 10 10 20 27 3 45 10 10 10 20 27 3 45 10 10 10 10 10 10 10 10 10 10	17 sandy brown clay 40 blue and brown clay 20 brown sand 10 brown clay 20 grey sand 7 blue clay 23 grey sand 2 sticky prey clay 27 sticky prey clay 27 sticky blue clay 27 sticky blue clay 10 blue clay with 10 blue clay with 10 blue clay with 10 blue clay with 10 blue clay 100 lco' 101 frage 102 loo' 103 </td

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		WEL	L DATA
WELL #	6		FACILITY # 490
location _	Nellis AFB		
DATE DRILLE	D 1951		DEPTH 1000 '
DRILLER	Allen Water	Well Service	
BOTTOM ELE	WATION <u>B42</u>	TOP 1842 52	WILL DIAMETER
GRAVEL PACI	KYes		CASING DIAMETER 12*
			nown
	·····		
COLUMN SU	æ8•		GAGE LINE None
FORME SETTIN	NG		PUMP STAGES12
			PUMP STAGES 12
			Morse
PUMP: MAN	IUFACTURER	Fairbanks	Morge
PUMP: MAN	PR 2953	Fairbanks	Morse
PUMP: MAN	PR 2953	Fairbanks Oil	Mor se
PUMP: MAN	PR 2953	Fairbanks Oil	Morse
PUMP: MAN SERIAL # TYPE SHAFT MOTOR: MA	IUFACTURER PR 2953 LUBRICATION	Fairbanks Oil Fairbanks Mor	Mor se
PUMP: MAN SERIAL # TYPE SHAFT MOTOR: MA HP AND VOL	IUFACTURER PR 2953 LUBRICATION NUFACTURER TAGE75 PR 2	Fairbanka Oil Fairbanka Mor 953 220-440	Morse
PUMP: MAN SERIAL # TYPE SHAFT MOTOR: MA HP AND VOL AUXILIARY E	IUFACTURER PR 2953 LUBRICATION NUFACTURER TAGE75 PR 2	Fairbanka Oil Fairbanka Mor 953 220-440 RPTIGN BU	Mor se
PUMP: MAN SERIAL # TYPE SHAFT MOTOR: MA HP AND VOL AUXILIARY EI 6 •	PR 2953 PR 2953 LUBRICATION INUFACTURER TAGE 75 PR 2 NGINE: DES CH YOLO CY/.	Fairbanks Oil Fairbanks Mor 953 220-440 RIPTIGN BU	Morse AC TRANSFORMER CAPACITY DA Eng & Equip Co Mod #L525 Serial #3595
PUMP: MAN SERIAL # TYPE SHAFT MOTOR: MA HP AND VOL AUXILIARY EI 6 0 WELL HOUST	TAGE 75 PR 2 PR 2953 LUBRICATION INUFACTURER TAGE 75 PR 2 NGINE: DES CH YOLO CY/.	Fairbanks Oil Fairbanks Mor 953 220-440 RIPTION BU G Fac #490	Morse AC TRANSFORMER CAPACITY DA Eng & Equip Co Mod #L525 Serial #3595

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. WATER	WELL DATA #6
Well Depth: 1000	·
Pump Setting: 350'	
Production Column Diameter:	8
Casing Diameter: <u>12"</u> ar	
Well Diameter: 20" packed	well is gravel packed; not gravel
Type drive shaft lubrication: Oil	
Orive Shaft Diameter:	
Electric motor: 75 HP	220-44 <u>0</u> _Voltage
Auxiliary motor, type and HP	5 FUSINE (ENdA) 6(Ex/)
Static water level: 102	
Well design capacity: 600	GP
Pump Description: Vertical Lurbing	pumps, <u>/2</u> Stage_Stage_

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Description of building heising the well. Does it have removable haten?

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				- (0	Log No.
1	WE	LL LO	G AND	REPORT TO THE STATE	Rec
s .				IEER OF NEVADA	Well No.
			LINGIN	ILLER OF NEVADA	Permit No. 13769
۶.	H		Fores	720,6	Do not fill in
	OwnerItc	1118	Ir Forse	Driller Allen	"dater Well Service C
	Address	5-Vega	oj Nevad	la	ryland Flary Lic. No40
				ec9, T.20.N/S, R62.E, in01	
	or		•••••		
	Water will b	e used for.		Guasi-Luricipal Jup ly Total dept	h of well 558 1000
				12.3/4.11nor Weight of casing per	•
					•
			(Casing	20 ¹¹ I. D. 100 fort 127/1. C. D. C. 12 in dameter and under give inside diameter; d	asing 12" in diameter give outside diam
				g.p.m. and pressure	
	If nonflowin	g well give	e depth of st	anding water from surface 58.11 11	1/15/51
	If flowing we	ell describe	e control wor	rks(Type and size of y	
				Sept 12, 1951Date of completion o	• -
	Type of well	l rig	Heys	tone 50 A Cable tools	
					11
				OF FORMATIONS	
	From feet	To feet	LOG Thickness feet	OF FORMATIONS Type of material	Water-bearing Formation, Cas Perforations, Etc.
		To feet 4	LOG Thickness feet 4	OF FORMATIONS Type of material TCP 3C11	Water-bearing Formation. Cast
		To feet 4 16	LOG Thickness feet 4 12	OF FORMATIONS Type of material Top Scil Calicho	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing
	16 16 69	To feet 4 16 69	LOG Thickness feet 4 12 53	OF FORMATIONS Type of material Tcp 3cil Calicho Eroin clay	Water-bearing Formation. Cas- Perforations, Etc. Chief nquifer (water-bearing formation)
	reet 0 4 16 69 74	To feet 4 16 69 74 127	LOG Thickness feet 4 12 53 5 5 53	OF FORMATIONS Type of material Top Scil Calicho	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing
	reet 0 4 16 69 74 127	^{To} feet 4 16 69 74 127 130	LOG Thickness feet 4 12 53 5 5 5 5 3 3	OF FORMATIONS Type of material Tcp scil Calicho Brown clay water sand and gravel brown clay sandy gravel	Water-bearing Formation. Cas- Perforations, Etc. Chief nquifer (water-bearing formation)
	reet 0 4 16 69 74 127	4 16 69 74 127 130 165	LOG Thickness feet 4 12 53 5 53 3 35	OF FORMATIONS Type of material Top scil Caliche Brown clay water sand and gravel brown clay sandy gravel Sandy brown clay	Water-bearing Formation. Cas- Perforations, Etc. Chief nquifer (water-bearing formation) from
	reet 0 4 16 69 74 127 130 165 175	To feet 4 16 69 74 127 130 165 175 182	LOG Thickness feet 4 12 53 5 53 3 35 10 7	OF FORMATIONS Type of material Top scil Caliche Brown clay water sand and gravel brown clay brown clay brown clay	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 750 to 750 127 to 130, 247 20 2
	reet 0 4 16 69 74 127 130 165 175 182	To feet 4 16 69 74 127 130 165 175 182 200	LOG Thickness feet 4 12 53 5 5 53 35 10 7 18	OF FORMATIONS Type of material Top scil Caliche Brown clay water sand and gravel brown clay brown clay white clay brown clay and gravel	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 760 to 750 127 to 130, 247 20 2 385 to 405, 555 to 5
	reet 0 4 16 69 74 127 130 165 175 182 200 235	16 69 74 127 130 165 175 200 235 240	LOG Thickness feet 4 12 53 5 5 53 35 10 7 18	OF FORMATIONS Type of material Top scil Caliche Brown clay Water schil and gravel brown clay brown clay brown clay brown clay brown clay brown clay brown clay sandy brown clay brown clay brown clay brown clay brown clay brown clay brown clay brown clay brown clay	Water-bearing Formation. Casperforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 other aquifers 760 to 750 other aquifers 760 to 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787 to 8
	reet 0 4 16 69 74 127 130 165 175 182 200 235 240 245	4694 1694 1305 1780 1655 2050 2457 247	LOG Thickness feet 4 12 53 5 5 53 35 10 7 18	OF FORMATIONS Type of material Top scil Caliche Brown clay water schil and gravel brown clay brown clay brown clay brown clay brown clay and gravel brown clay sandy brown clay brown clay brown clay brown clay sandy brown clay	Water-bearing Formation. Casperforations, Etc. Chief aquifer (water-bearing formation) from
	reet 0 4 16 69 74 127 130 165 175 182 200 235 240 245 247	4694 1694 1305 1780 2340 2457 250	LOG Thickness feet 4 12 53 5 5 53 35 10 7 18	OF FORMATIONS Type of material Tcp scil Caliche Brown clay water schil and gravel brown clay sandy gravel Sandy brown clay brown clay and gravel brown clay and gravel white clay brown clay and gravel white clay sandy brown clay sandy brown clay sandy brown clay brown clay and gravel white clay sandy gravel	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 760 to 750 Other aquifers 760 to 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787 to 8 818 to 828, 950 to 5 First water at 69 to 7
	reet 0 4 16 69 74 127 130 165 175 182 200 235 240 245 247	ret 4694 1305520 24457 2555 2050 24457 2555 2050 5055 2050 5055 2050 5055 2055 5055 2055 50555 5055 5	LOG Thickness feet 4 12 53 5 53 35 10 7 18 35 5 5 2 3 10 7 18 35 5 5 10 7 18 35 5 5 10 7 12 12 10 10 10 10 10 10 10 10 10 10	OF FORMATIONS Type of material Tcp scil Caliche Eroun clay water sand and gravel brown clay sandy gravel Sandy brown clay brown clay and gravel brown clay and gravel brown clay and gravel white clay sandy brown clay brown clay and gravel white clay sandy gravel light brown clay and gravel brown clay	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 750 to 750 Other aquifers 750 to 750 Other aquifers 750 to 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787.10 8 818 to 828, 950 to 7 First water at 69 to fer- Casing performed
	reet 04 16 69 74 127 130 165 1752 2350 2457 2457 2455 2455 2455 2455 2455 2455	4694705520505445705555 12050505050505555	LOG Thickness feet 4 12 53 5 53 35 10 7 18 35 5 5 2 3 10 7 18 35 5 5 2 3 10 7 18 35 5 2 3 2 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2	OF FORMATIONS Type of material Tcp scil Caliche Eroun clay water sand and gravel brown clay sandy gravel Sandy brown clay brown clay white clay brown clay and gravel brown clay and gravel white clay sandy brown clay brown clay and gravel white clay sandy gravel light brown clay and gravel brown clay hord brown sand. Some water	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 760 tc 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787 to 8 818 to 828, 950 to 6 First water at 69 to fer- Casing performed
	reet 04 16 69 74 127 130 165 1752 205 2457 2457 2457 2655 5 2457 2655 2457 2655 5 2457 2655 5 2457 2655 5 2457 2655 5 2457 2655 2457 2655 2457 2655 2457 2655 2457 2655 2457 2655 2457 2655 2457 2655 2655 2655 2655 2655 2655 2655 26	4694705520505705550 1694705520505055550050505555005050555500505555500505	LOG Thickness feet 4 12 53 5 53 35 10 7 18 35 5 2 35 5 2 35 5 5 5 5 3 10 7 18 35 5 5 5 5 5 5 5 5 5 5 5 5 5	Type of material Type of material Top scil Caliche Eroun clay water sand and gravel brown clay sandy gravel Sandy brown clay brown clay and gravel brown clay and gravel brown clay and gravel white clay sandy brown clay brown clay and gravel white clay sandy gravel light brown clay and gravel brown clay sandy stavel light brown sand. Some water sticky wet clay brown clay	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 750 to 750 Other aquifers 750 to 750 Other aquifers 750 to 755 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787. to 5 818 to 828, 950 to 5 First water at 69 to fer- Casing performated
	reet 0 4 16 69 74 127 130 165 175 182 235 245 245 245 245 245 245 245 24	4 16 94 70 130 552 050 552 050 552 050 552 050 555 205 555 205 555 205 555 205 555 205 555 205 555 205 555 205 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555 555	LOG Thickness feet 4 12 53 5 53 35 10 7 18 35 5 2 35 5 2 35 5 5 5 5 3 10 7 18 35 5 5 5 5 5 5 5 5 5 5 5 5 5	Type of material Type of material Top scil Caliche Eroun clay water sand and gravel brown clay sandy gravel Sandy brown clay brown clay and gravel brown clay and gravel brown clay and gravel white clay sandy brown clay brown clay and gravel white clay sandy gravel light brown clay and gravel brown clay hard brown sand. Some water sticky wet clay blue clay	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 760 tc 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787 to 8 818 to 828, 950 to 6 First water at 69 to fer- Casing performed
	reet 0 4 16 69 74 127 130 165 1752 2055 245 245 245 245 245 245 245 2	4 16 9 1 1 1 1 1 1 1 1 1 1	LOG Thickness feet 4 12 53 5 53 35 10 7 18 35 5 2 3 15 120 20 5 60 15 5 40	Type of material Type of material Top scil Caliche Brown clay water sand and gravel brown clay sandy gravel Sandy brown clay brown clay and gravel brown clay and gravel brown clay and gravel white clay sandy brown clay sandy brown clay sandy brown clay brown clay and gravel white clay sandy gravel light brown clay and gravel brown clay Hard brown sand. Some water sticky wet clay brown clay blue clay sandy blue clay blue clay	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 760 tc 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787 to 8 818 to 828, 950 to 5 First water at 69 to fer Casing perforated from 144 to 826
	reet 0 4 16 69 74 127 130 165 1752 2055 245 245 245 245 245 245 245 2	4694705520505705550050 46947055205050555005550 445555005055550055550	LOG Thickness feet 4 12 53 5 53 35 10 7 18 35 5 2 35 10 7 18 35 5 2 35 10 7 18 35 5 2 35 10 7 15 5 2 35 5 2 35 5 2 35 5 5 5 5 5 5 5 5 5 5 5 5 5	Type of material Type of material Top scil Caliche Brown clay water sand and gravel brown clay sandy gravel Sandy brown clay brown clay and gravel brown clay and gravel brown clay and gravel white clay sandy brown clay sandy gravel light brown clay and gravel brown clay Hard brown sand. Some water sticky wet clay brown clay blue clay blue clay brown clay blue clay brown clay	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 760 to 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787 to 5 818 to 828, 950 to 5 First water at 69 to fer Casing perforated from 144 to 826 Size of perforations
	reet 0 4 16 69 74 130 165 1752 2350 2457 2655 550 490 490 490 550 550 550	46947055205057055500500500500500500	LOG Thickness feet 4 12 53 5 5 3 5 5 3 5 5 3 5 5 3 5 5 5 5 5 5 5 5 5 5 5 5 5	Type of material Type of material Top scil Caliche Brown clay water sand and gravel brown clay sandy gravel Sandy brown clay brown clay and gravel brown clay and gravel brown clay and gravel white clay sandy gravel light brown clay and gravel brown clay Hard brown sand. Some water sticky wet clay brown clay blue clay brown clay blue clay brown clay blue clay brown clay brown clay brown clay brown clay brown clay brown clay blue clay brown clay	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 760 to 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787 to 5 818 to 828, 950 to 5 First water at 69 to fer Casing perforated from 144 to 826 Size of perforations
	reet 0 4 16 69 74 127 130 165 1752 2055 245 245 245 245 245 245 245 2	4694705520505705550050 46947055205050555005550 445555005055550055550	LOG Thickness feet 4 12 53 5 5 3 5 5 3 5 5 3 5 5 3 5 5 5 5 5 5 5 5 5 5 5 5 5	Type of material Type of material Top scil Calicho Brown clay water sand and gravel brown clay sandy gravel Sandy brown clay brown clay white clay brown clay and gravel brown clay and gravel white clay sandy gravel light brown clay and gravel brown clay Hard brown sand. Some water sticky wet clay blue clay blue clay brown clay blue clay brown clay blue clay brown clay brown clay brown clay brown clay brown clay brown clay brown clay blue clay brown clay	Water-bearing Formation. Cas- Perforations, Etc. Chief aquifer (water-bearing formation) from 730 to 750 Other aquifers 760 to 750 0ther aquifers 760 to 750 127 to 130, 247 20 2 385 to 405, 555 to 5 670 to 673, 787 to 5 818 to 828, 950 to 5 First water at 69 to fer- Casing perforated from 144 to 826

Ь LOG OF FORMATIONS-Continued To . fcet Type of material Thickness 925---940 blue clay with streaks of sandy brown clay 690 17 blue and brown cley 40 730 940--945 white clay and line brown sand 0 750 20 545--950 sandy light blue clay & 1 50 brown clay 0 760 950--955 sand grey sand blue clay 0 20 780 955--1000 sandy grey clay & lime 💬 7 50 787 23 37 grey send 810 8 blue-groy clay 10 81.8 grey sand 228 10 2 sticky grey clay 28 830 • sticky black clay 27 30 857 sandy black and blue clay 860 3 57 45 sticky blue clay 5Ò 905 blue clay with streaks of line 915 10 C5 blue cley 15 025 10 . . <u>.</u> . CASING RECORD From Diam. То Length "Remarks"-Seals, Grouting, Etc. casing feet feet Comented in place with 138 cacks of straight cement, 100' 20"10 0 100 A bit steel shoe 8" X 20" X 1" liner with bit stoel shoe 8" (12 3/4"X 3/4" machine 850' 850 12 3/4 0 perforated from 144 feet to 826, Perforations 5/32 1 ." 32" apart around circumference 12" between row Gravel racked between 20" hole and 12 3/4" liner, w 1/4" to 3/8" gravel. - 7 GENERAL INFORMATION-Pumping Test, Quality of Water, Etc. 3.2 gallens per fost of draw down to a depth of 160 foot. (douth of test I 650 2 PM With DD. 25 220' reel. <u>()</u> و ت ا 7 33 557 • • CL ;== , J_1 ... ; =_ WELL DRILLERS STATEMENT **,**C (Not to be filled in by Driller) This well was drilled under my jurisdiction and the • ·* .5 SSS 07 _____ above information is true to my best information and belief. Signed Well Driller _____ By License No. 40 ***** BARDY ALL I/I/ LINE

•	WELL DATA
ELL #6	FACILITY # 490
OCATION Nellis AFB	
DATE DRILLED1951	DIPTH 1000 '
	Service
BOTTOM ELEVATION B42 TOP	1842_52WEĹL DIAMETER20"
GRAVEL PACK Yes	CASING DIAMETER 12"
CASING PERFORATIONS Locat	ion not Known
	GAGE LINE None
UMP SETTING 350'	PUMP STAGES 12
PUMP: MANUFACTURER F	airbanks Morse
SERIAL & PR 2953	
	011
	anka Morse
HP AND VOLTAGE 75 PR 2953 2	20-440 TRANSFORMER CAPACITY
f anala a d	N BUDA Eng & Equip Co Mod #L525 Serial #359557
WELL HOUSED IN BUILDING F	ac #490
	•
	LATEST PRODUCTION 239 December 1971

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WATER WELL DATA	
Well Depth: 1000	
Pump Setting: 350'	
Production Column Diameter: <u>&</u>	
Casing Diameter: 12" and location of perforations	
Well Diameter: 20" well is gravel packed; not gravel packed.	
Type drive shaft lubrication: Oil or Water OIL	
Drive Shaft Diameter:	
Electric motor: 75 HP 220-440 Voltage	
Auxiliary motor, type and HP GAS FISCINE (Budit) 6(ex)	
Static water level: 102	
Well design capacity: 600	GPM
" bowl assembly with rated capacity 390	tages GPM
at TDH	

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Description of building housing the well. Does it have removable hatch?

WALLR LEVEL LUDING FORM (6-76) Ò PERIODIC MEASUREMENTS Local LI Number Project above LSD × MP description and sketch: Station ID (lat-long) 3013311152253 All the 5 WATER LEVEL, IN FT ž DATE BELOW BELOW LSD WET (mo/day/year) HOLD REMARKS ۲: 1.7. 1: - 12 TA. 7/-5/1977 1.3 <u>____</u> 8 hrs 75 =/ /19-<u>. /: : /19---</u> · -1 46.44 5 5. LW 2F 12 9000 93.9) 5.53 93,9) 31.13 .78.87 02/26/1980 100 13.37 ۶ ow ni 18 UP. 122 77 2 1a6 /1981 DW 7.20 72.6 12 S DW/LS :0 : 1 35/19 -2 0 /19 /19 /19 1 /19 /19 /19 /19 /19 /19 1 /19 1 /19 /19 1 /19 /19 /19 /19 计十 ·. · . /19 /19 /19 49 56 ଟ୍ଟଟ୍ଟ 44 0 ٩ KEY PUNCHING INSTRUCTIONS: Duplicate col. 5-33 for all cards R=234#T=A#235# ① #237= ① #238= ② #239= ① # R= Q 34 44 49 56 61 62 67 68 D-drv D-obstruct. F-flowing P-pumping G-mearby, R-recently flowing pumped H-mearby, S-mearby, recently pumping T-nearby, recently sumped V-foreien substance X-surface water effects Z-other ∂-obstruction Location sketch: CISITE G-nearby, R-CISITE flowing H-nearby, S-recently flowing has songet - sk for 2W Mathod A-niriine R-reported T-electric tape 00 of C-calibrated S-steel tape 2-other measure- airline ment Punched Entered_ Checked Local Well No.

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WAICK LEVEL CUDING FORM (6-76) PERIODIC MEASUREMENTS Local CII Number 20 E 10 2 9 T. R. Sec Project _____6 above Name ft LSD below MP description and sketch: Station ID (lat-long) 361331115 2153 WATER LEVEL, IN FT DATE BELOW BELOW LSD D D BY (mo/day/year) HOLD WET REMARKS 7/=5/1977 for for 1:7.03 16 103 ÷... TK \$ hro 37.5 =/ /19 ... -, 78 -21:6/19-79 96.54 120 -146 46.44 bw off guda. 100 6.53 93.97 np. 02126/1980 5 93.3> ΔW S n2 126 /1981 137.0 31.13 -78.87 58 .77 DW c u 13/03/1982 150, 7.39, 92 12 5 61 DW/LS off 1 month 1 /19 1 /19 1 /19 1 /19 1 /19 1 /19 1 /19 ۰. 1 /19 /19 /19 1 1 /19 1 /19 1 /19 1 1 /19 1 /19 /19 1 .1. 1 /19 1 /19 719 34 49. 44 56 00 0 3 KEY PUNCHING INSTRUCTIONS: Duplicate col. 5-33 for all cards 1 R=234*T=A*235# Ð *237= 0 * 238= 🕘 * 239= 🛈 🛊 19 20 34 44 49 56 61 62 67 68 B-obstruction T-nearby, recently pumped D-drv Location sketch: F-flowing P-pumping G-nearby, R-recantly flowing pumped H-nearby, S-nearby, recently pumping has spriget - at for aW CE SI te status V-foreign substance X-surface water effects Z-other flowing Method A-atriine R-reported T-electric tape ΩD. of D of C-callbrated S-steel tape Z-other measure- alriine ment Punched Entered _Checked Local Well No.

•					Log No
V	VELL LO	G AND	REPORT TO THE S	STATE	Rec
		ENGIN	EER OF NEVADA		Well No. 691
· •••			#7		Permit No. 13770 Do not fili in
	2		The g	. Allen)	ater Well 3. Trice Co.
					rylene Tariway Lie. No.40
					Lrk County
97		Case			of well 760 Feet
				-	near foot 40.2
		2/16"	_		
	s of casing		•		
Diamete	r and length of	casing 20"	I.D. & 12 3/4" C.D. 12" in diameter and under give inside	e diameter; cas	ing 12" in diameter give outside diameter.
If flowin	g well give flow	in c.f.s. or g	p.m. and pressure		
If flow un	ig well describe	control work	3	e and size of ta	Ive, etc.)
		A Noysta	Saber 18, 1951 Date of one cable tools of FORMATIONS	-	
From		Thickness :	Type of material		Wate: bearing Formation. Casing Perforations, Etc.
4	10	10	sandy soil		
10 30	30 50	20 20	Grad ojal Gradoj	[Chief squifer (water-bearing formation)
50	65		brom clay		from 245 to 252 ft
65 70 8	70 80	5 10	white clay sand (fine gro	ey)	Other aquiters 286 to 292
20 167	147 177	67 10	grey clay gravelly brown clay		420 to 429, 434 to 440
177	209	32	brown clay		485 to 490, 550 to 557
209 219	228	10	brown clay and crave white clay	el	591 to 596, 687 to 693
228	240	12 '	brown clay	4	754 to 759,
240 243	243	32	sticky white clay sandy light brown c	107	
245	252	7	gravel		First water at 70 to 89eet.
252 273	273	21 7	brown clay brown clay and grav	el	Casing perforated
236	263	52	gravel	l	150 to 760 ft
205 287	်လ	5	brown clay gravel)	10 A
292	327	15 23	sendy grey clay brown clay	ł	Size of perforations
527 350 410	550 410	60	sandy brown clay		5/32 : 1 1/4 , 3 2"
410 420	420	10 9	brown clay and grav sandy gravel	01	apart around circumfer 1 2" between rows
429	434	5	brown clay		₩ F manualt thun
4 3 4 440	440	6 19	fine crey sand caliche		•
	1	1	(OT22)		_

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To	Thickness		Type of material	
470 475	11	white calic	clay 754-759 5ft, grey send & gre	vel
485	10	brown	clay 788-980 192 ft. blue clay	
490 535	5 45	finc brown	cand 980-985 5 ft. brown clay clay and gravel	
540	· 5 10	blue	olay 938-1000 15 ft. blue clay.	
550 557	7	sandy brown	sand	
566 591	9 25		clay clay & <u>rravel</u>	
596 660	5	grave		
687	.27	stic!	y grey clay	
693 705	6 12	Srey grey	sand olay	
154	49			
From	To		CASING RECORD "Remarks"-Seals, Grouting, Etc.	
feet	feet	Length	in	; :
. 0	100'	100'	Cemented place with 138 sacks of straight has a 3/4" X 8" X 20" bit steel shoe.	c sne
" 0	750	700	liner (3/16" wall) Fachine perforated for 760' 5/32 % 1 1/3 3 1/2" apart around the second the se	om 1
		:	forence with 1 1/2" between rows	
-	_	ì	forence with 1 1/2" between rows	
	GE	NERAL INF	ORMATION-Pumping Test, Quality of Water, Etc.	
fcot_	ter 1990	2 43 7 deum	ORMATION-Pumping Test, Quality of Water. Etc.	
otella	ter 1990 of draw cell for	l 13 J' deum mations	ORMATION-Pumping Test, Quality of Water, Etc.	
fcot. otaliz	ter 1990 of draw cell for	l 12 J deim mations	ORMATION-Pumping Test, Quality of Water. Etc. Trot, tost pumping shows a yould of 5.4 to 1000 ft. but back filled to 750	
foot	ter leve of draw rell for - 330 - 410 c	deum mations .1 p.M strl	ORMATION-Pumping Test, Quality of Water. Etc. Frot, tost pumping shows a yould of 5.4 to 1000 ft. but back filled to 750 -0.0.0.2.2.0' fac- Surface	
vell I	ter leve of draw rell for - 320 410 (PRILLERS S	deim mations .: p.M s/r(TATEMENT	ORMATION-Pumping Test, Quality of Water. Etc. frot, that pumping about a yould of 5.4 to 1000 ft. but back filled to 750 	
WELL I ell was du	ter leve of draw rell for - 330 410 c ORILLERS S' rilled under	2 12 1 deim mations 	ORMATION-Pumping Test Quality of Water. Etc.	
WELL I ell was du	ter 1996 of draw rell for - 320 <u>410 (</u> 9RILLERS S' rilled under true 19 my be	2 12 2 deim mations 	ORMATION-Pumping Test, Quality of Water. Etc. <u>frot</u> , tost pumping about a yould of 5.4 to 1000 ft. but back filled to 750 <u>D</u> 220' for - Sour for ca	
WELL I ell was du	ter leve of draw rell for - 330 <u>410 (</u> 0RILLERS S' rilled under true to my be	2 12 2 deim mations 	ORMATION-Pumping Test, Quality of Water. Etc. <u>frot</u> , tost <u>pumping</u> shows a yould of 5.4 <u>to 1000 ft</u> , but back filled to 750 <u>D 2 20' fn 2.4</u> (Not to be filled in by Driller) tion and the	
wELL I ell was di Signed	ter leve of draw rell for - 320 410 (All Construction Filled under true to my be Well	2 12 The second	ORMATION-Pumping Test, Quality of Water. Etc. <u>frot</u> , tost pumping about a yould of 5.4 to 1000 ft. but back filled to 750 <u>D</u> 220' <u>Ence</u> <u>Surface</u> (Not to be filled in by Driller) tion and the on and belief.	
foot. ota) = = = = = = = = = = = = = = = = = =	ter leve of draw rell for - 320 4100 PRILLERS S rilled under true to my be Well	2 12 T deim mations .: pA str(TATEMENT my jurisdic st informati	Image: Second Street 1/2" between rows ORMATION-Pumping Test, Quality of Water. Etc. frost, toot pumping about a yould of 5.h. to 1000 ft. but back filled to 760 D > 2 ' form - Sum force (Not to be filled in by Driller) tion and the on and belief.	
Foot. Dia) = = = = = = = = = = = = = = = = = =	ter leve of draw rell for - 320 410 (All C PRILLERS S' rilled under true to my be Well Licer	A 12 The set of the se	ORMATION-Pumping Test, Quality of Water. Etc. frot, tost pumping about a yould of 5.h. to 1000 ft. but back filled to 750 D > 2 0' for - Surface (Not to be filled in by Driller) tion and the	
Foot. Dia) = = = = = = = = = = = = = = = = = =	ter leve of draw rell for - 320 4100 PRILLERS S rilled under true to my be Well	A 12 The set of the se	Iterance with 1 1/2" between rows ORMATION-Pumping Test, Quality of Water. Etc. frot, test pumping about a yould of 5.h (to 1000 ft. but back filled to 760 .0 D 2 20' from - Sum force (Not to be filled in by Driller) tion and the	
WELL I ell was du Signed	ter leve of draw rell for - 320 410 (All C PRILLERS S' rilled under true to my be Well Licer	A 12 The set of the se	Iterance with 1 1/2" between rows ORMATION-Pumping Test, Quality of Water. Etc. frot, test pumping about a yould of 5.h to 1000 ft. but back filled to 750 .0 D > 2 o' from - Sum force (Not to be filled in by Driller) tion and the	
WELL I ell was du Signed	ter leve of draw rell for - 320 410 (All C PRILLERS S' rilled under true to my be Well Licer	A 12 The set of the se	Image: Second state of the second s	

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 R=234☆T=A☆235#
 ①
 ☆237=
 ①
 ☆238=
 ○
 ☆239=
 ①

 19
 20
 34
 44
 49
 56
 51
 62
 67
 68
 44 56 61 62 67 68 T-nearby, recently pumped Location sketch: B-obstruction recently pumped V-forelen substance X-surface weter effects Z-other er for QW G-nearby flowing H-nearby, recently flowing C Status nearby, eumping 5 Method A-niriine R-reported T-electric tape DF C-Calibrated S-steel tape Z-other measure alriine Punched Entered_ Checked Local Well No. . .

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• • • • •		Driller All	Do not Ali in 🔄
		Address231	
			Clark
			_
		Jupply Total	
			per linear foot 40.2
			per linear toot. TV .C
Diameter and length	of casing20 (Casing	"I.D. & 12 3/4" C.D. 12" in diameter and under give inside diamete	r; casing 12" in diameter give outside diamet.
If flowing well give		g.p.m. and pressure	-
			et .
n nonnowing wen g		anding water from sufface	%
If flowing well desr:	ribe control wor	ks(Type and size	e of valve, etc.)
		vonber 18, 1951 Date of completi	
		one cable tools	
		0.00 0.0010	
			······
	LOG	OF FORMATIONS	Water-bearing Formation, Casing Perforations, Etc.
From To feet feet	LOG Thickness feet	OF FORMATIONS Type of material	Water bearing Formation, Casing Perforations, Etc.
From To feet feet D 10 10 30	LOG Thickness feet 10 20	OF FORMATIONS Type of material Danly Scil Gravel	Chief aquifer (water-bearing
From To feet feet D 10	LOG Thickness feet 10	OF FORMATIONS Type of material DRMAY SCIL	Chief aquifer (water-bearing formation)
From To feet feet 10 10 10 30 30 50 50 65 65 70	LOG Thickness feet 10 20 20 20 15 5	OF FORMATIONS Type of material DINAY Soil Gravel Gravel Gravel brown clay white clay	Chief aquifer (water-bearing formation) from
From feet To feet 10 10 10 30 50 65 65 70 70 8 80 80 147	LOG Thickness feet 10 20 20 15 5 10 67	OF FORMATIONS Type of material Dandy Soil gravel gravel proven clay white clay white clay white clay white sand (fine grey) grey clay	Perforations, Etc. Chief aquifer (water-bearing formation) from 245 to 252 ft Other aquifers 285 to 292
From feet To feet 10 10 10 30 50 50 65 70 70 8 80 147 167 177	LOG Thickness feet 10 20 20 15 5 10 67 10	OF FORMATIONS Type of material Dandy Soil gravel gravel brown clay white clay white clay white sami (fine grey) grey clay grey clay grey clay	Perforations, Etc. Chief aquifer (water-bearing formation) from 245 to 252 ft Other aquifers 236 to 292 420 to 429, 434 to 440
From feet To feet 10 10 10 30 50 65 65 70 70 8 80 147 167 177 177 209 200 12	LOG Thickness feet 10 20 20 15 5 10 67 10 32 10	OF FORMATIONS Type of material Sandy Scil gravel gravel brown clay white clay white clay white sand (fine grey) grey clay grey clay cravelly brown clay brown clay brown clay brown clay	Perforations, Etc. Chief aquifer (water-bearing formation) from 245 to 252 ft Other aquifers 286 to 292 420 to 429, 434 to 440 485 to 490, 550 to 557
From feet To feet 10 10 10 30 30 50 50 65 65 70 70 8 80 147 167 177 177 209 200 1219 219 228	LOG Thickness feet 10 20 20 15 5 10 67 10 32 10	OF FORMATIONS Type of material Sandy Scil gravel gravel brown clay white clay white clay grey clay grey clay grey clay brown clay brown clay brown clay brown clay brown clay brown clay	Perforations, Etc. Chief aquifer (water-bearing formation) from 245 to 252 ft Other aquifers 286 to 292 420 to 429, 434 to 440 485 to 490, 550 to 557 591 to 596, 687 to 693
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From feet To feet 10 10 10 30 50 65 65 70 70 8 80 147 167 177 177 209 219 228 240 243 243 245 245 252 273 220	LOG Thickness feet 10 20 20 15 5 10 67 10 32 10 9 12 3 2 7 21	OF FORMATIONS Type of material Dandy Scil Gravel Gravel brown clay white clay white clay crater sand (fine grey) grey clay Gravely brown clay brown clay brown clay and gravel white clay brown clay sticky white clay sandy light brown clay gravel	Perforations, Etc. Chief aquifer (water-bearing formation) from 245 to 252 ft Other aquifers 236 to 292 420 to 429, 434 to 440 485 to 490, 550 to 557 591 to 596, 687 to 693 754 to 759, First water at 70 to 89eet. Casing perforated
From feet To feet 10 30 10 30 50 55 65 70 70 8 80 147 167 177 177 209 219 228 240 243 243 245 252 273 273 220 255 257	LOG Thickness feet 10 20 20 15 5 10 67 10 32 10 9 12 3 2 7 21	OF FORMATIONS Type of material Dandy Scil Gravel Gravel Drown clay white clay white clay white clay Grey clay Grey clay Grey clay brown clay brown clay and gravel white clay brown clay brown clay sticky white clay sandy light brown clay gravel brown clay brown clay	Perforations, Etc. Chief aquifer (water-bearing formation) from 245 to 252 ft Other aquifers 286 to 292 420 to 429, 434 to 440 485 to 490, 550 to 557 591 to 596, 687 to 693 754 to 759. First water at 70 to 89eet.
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From feet To feet 10 10 10 30 50 65 65 70 70 8 80 147 167 177 177 209 209 219 228 240 240 243 245 252 257 287 257 287 292 327 350 410 420 429	LOG Thickness feet 10 20 20 15 5 10 67 10 32 10 9 12 3 2 7 21 7 5 23 60 10	OF FORMATIONS Type of material Dandy Soil Gravel Gravel Grey clay Unite clay Unite clay Unite clay Grey clay Grey clay Grey clay Drown clay brown clay and gravel white clay brown clay sticky white clay sticky white clay sticky white clay gravel brown clay gravel brown clay and gravel Gravel brown clay brown clay brown clay brown clay brown clay brown clay brown clay brown clay brown clay brown clay sandy grey clay brown cla	Perforations, Etc. Chief aquifer (water-bearing formation) from 245 to 252 ft Other aquifers 286 to 292 420 to 429, 434 to 440 485 to 490, 550 to 557 591 to 596, 687 to 693 754 to 759. First water at 70 to 89eet. Casing perforated from 150 to 760 ft Size of perforations
From feet To feet 10 10 10 30 50 65 65 70 70 8 80 147 167 177 177 209 209 219 228 240 240 243 245 252 257 273 200 215 257 273 257 257 257 257 257 257 257 257 257 257 257 257 257 257 257 257 257 257 257 350 350 410 420 420	LOG Thickness feet 10 20 20 15 5 10 67 10 32 10 9 12 3 2 7 21 7 5 23 60	OF FORMATIONS Type of material Dandy Soil Gravel Gravel Grey clay white clay white clay white sand (fine grey) grey clay Grey clay Grey clay brown clay brown clay brown clay brown clay sticky white clay sticky white clay sticky white clay gravel brown clay brown clay brown clay cravel brown clay gravel brown clay brown clay	Perforations, Etc. Chief aquifer (water-bearing formation) from 245 to 252 ft Other aquifers 286 to 292 420 to 429, 434 to 440 485 to 490, 550 to 557 591 to 596, 687 to 693 754 to 759. First water at 70 to 89 eet. Casing perforated from 150 to 760 ft Size of perforations $5/32 \times 1 1/4$, $3 2^{n}$ Apart around circumfer

	· · · · · · · · · · · · · · · · · · ·	. <u>L</u>	OG OF FORMATIONS—Continued	•
ro feet	Thickness		Type of material	
470	11		clay 754-759 5ft. grey sand & gravel	
475 485	5 10	calic brown	bhe 759-388 29ft. grey clay a clay 788-980 192 ft. blue clay	
490 -	5 -	fine	sand 980-965 5 ft. brown cley	- ^
535 540	45 5		olay and gravel olay 985-1000 15 ft. blue clay.	
550	10	sandy	r clay	
557 566	7		n sand n clay	
591	9 25	brown	1 clay & gravel	
596 660	5 64	grave brown	el 1 olay	
667	.27	stick	cy grey clay	
69 3 705	6 12	grey grey		
-154	49		1 clay	
From	T o		CASING RECORD	
feet	feet	Length	"Remarks"—Seals, Grouting, Etc.	÷
. 0	100'	100'	Generated place with 138 sacks of straight comen	t.
" · O	760		bas a $3/47 \leq 87 \leq 207$ bit stepl phoe	
		700	liver (7/16" wall) "sching performed from 16	A1 +-
	1 100	760	has a $3/4" \times 8" \times 20"$ bit steel shoe. liner ($3/16"$ wall) Eachine perforated from 15 760' 5/32 x 1 1/2 x 3 1/2" apart around the ci	0' to rcum-
	100	760	liner ($3/16"$ wall) Machine perforated from 15 760' $5/32 \times 1 1/3 \times 3 1/2"$ apart around the ci forence with 1 $1/2"$ between rows	0' to rcum-
	100	700	1 700° 5/32 X 1 1/3 X 3 1/2" apart around the ci	0' to rcum-
	-		forence with 1 1/2" between rows	0' to roum-
	-		1 700° 5/32 X 1 1/3 X 3 1/2" apart around the ci	0' to roum-
. 	GE	NERAL INF	FORMATION-Pumping Test, Quality of Water, Etc.	0' to roun-
tie wa	GE ter leve of draw	NERAL INF	FORMATION-Pumping Test, Quality of Water, Etc.	0' to rcum-
tie wa foot	GE ter leve of draw rell for	NERAL INF 13 54 dourn mations	FORMATION-Pumping Test Quality of Water, Etc.	0' to .rcum-
tic va foot	GE ter leve of draw rell for :_32e	NERAL INF 13 54 doim mations 2 pM	FORMATION-Pumping Test, Quality of Water, Etc.	0' to roum-
tic te foot	GE ter leve of draw rell for	NERAL INF 13 54 doim mations 2 pM	FORMATION-Pumping Test Quality of Water, Etc.	0' to rcum-
tic the second s	GE ter leve of draw rell for - 32e 410 (NERAL INF close mations close mations close mations	FORMATION-Pumping Test, Quality of Water, Etc. * feet, test pumping shows a yeald of 5.4 caller to 1000 ft. but back filled to 750 DD >>o' Grand Sumping contended	O' to roum-
tic foot ote) : ca/s' WELL I	GE ter leve of draw rell for - 320 410 (DRILLERS S	NERAL INF clown mations clown mations clown mations clown mations	760* 5/32 % 1 1/3 % 3 1/2" apart around the ciference with 1 1/2" between rows FORMATION-Pumping Test, Quality of Water, Etc. ** feet, test pumping chows a yould of 5.* caller to 1000 ft. but back filled to 760	O' to roum-
tic fcot ote) : cu/d WELL I ell was du	GE ter leve of draw rell for - 320 410 (DRILLERS S' rilled under	NERAL INF down mations <i>2.9M</i> <i>5?~(</i> FATEMENT my jurisdic	760* 5/32 % 1 1/3 % 3 1/2" apart around the cifforence with 1 1/2" between rows FORMATION-Pumping Test, Quality of Water, Etc. 4 frot, test pumping the state of the s	O' to roum-
tie te fcot te ote te ote te weil te weil was du	GE ter leve of draw rell for - 320 410 (DRILLERS S' rilled under	NERAL INF down mations <i>2.9M</i> <i>5?~(</i> FATEMENT my jurisdic	760* 5/32 % 1 1/3 % 3 1/2" apart around the ciference with 1 1/2" between rows FORMATION-Pumping Test, Quality of Water, Etc. ** feet, test pumping chows a yould of 5.* caller to 1000 ft. but back filled to 760	O' to roum-
tic fcot ote) : cu/d WELL I ell was du	GE ter leve of drew rell for - 320 410 (DRILLERS S' rilled under true to my be	NERAL INF down mations <i>2.9M</i> <i>5?~(</i> FATEMENT my jurisdic	760* 5/32 % 1 1/3 % 3 1/2" apart around the cifforence with 1 1/2" between rows FORMATION—Pumping Test, Quality of Water, Etc. ** fcet, test pumping Ghows a yould of 5.* caller to 1000 ft. but back filled to 760	O' to roum-
the second secon	GE ter leve of drew rell for - 320 410 (DRILLERS S' filled under true to my be Well	NERAL INF 1 13 54 down mations 1 2 9 M 57~1 TATEMENT my jurisdict st informatic Driller	700° 5/52 % 1 1/2 % 5 1/2" apart around the cifference with 1 1/2" between rows FORMATION-Pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 5 1000 ft. but back filled to 750	O' to roum-
the second secon	GE tor leve of draw rell for = 320 A10 (DRILLERS S' rilled under true to my be Well	NERAL INF 1 13 54 dourn mations 1 2 2 M 57 (TATEMENT my jurisdic st informatic Driller	760° 5/32 × 1 1/2 × 5 1/2" apart around the cl forence with 1 1/2" between rows FORMATION—Pumping Test, Quality of Water, Etc. * feet, test pumping shows a yeald of 6.4 caller to 1000 ft. but back filled to 760 D 2 20' Grand Sumplement (Not to be filled in by Driller) ction and the on and belief.	O' to roum-
the transmission well use during the second secon	GE ter leve of draw rell for = 320 A10 (DRILLERS S' rilled under true to my be Well Licer	NERAL INF 1 13	700° 5/52 % 1 1/2 % 5 1/2" apart around the cifference with 1 1/2" between rows FORMATION-Pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 4 freet, test pumping Test, Quality of Water, Etc. 5 1000 ft. but back filled to 750	O' to roum-
the transmission well use during the second secon	GE tor leve of draw rell for = 320 A10 (DRILLERS S' rilled under true to my be Well	NERAL INF 1 13	760° 5/32 × 1 1/2 × 5 1/2" apart around the cl forence with 1 1/2" between rows FORMATION-Pumping Test, Quality of Water, Etc. * feet, test pumping shows a yeald of 6.4 caller to 1000 ft. but back filled to 760 D 2 20' Grand Sumplement (Not to be filled in by Driller) ction and the on and belief.	O' to roum-
tie fcot ote) : wELL I ell was du mation is Signed By	GE ter leve of draw rell for = 320 A10 (DRILLERS S' rilled under true to my be Well Licer	NERAL INF 1 13	760° 5/32 × 1 1/2 × 5 1/2" apart around the cl forence with 1 1/2" between rows FORMATION-Pumping Test, Quality of Water, Etc. * feet, test pumping shows a yeald of 6.4 caller to 1000 ft. but back filled to 760 D 2 20' Grand Sumplement (Not to be filled in by Driller) ction and the on and belief.	0' to roum-

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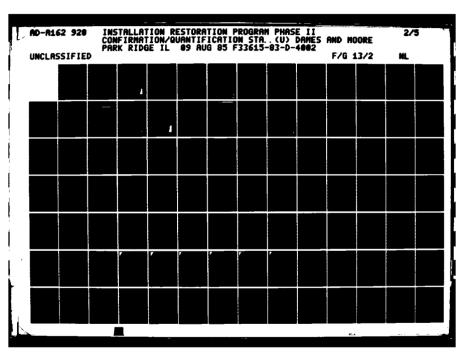
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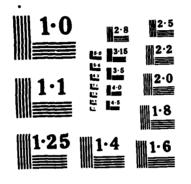
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\bigcirc	rchiou	IC MEASUREMENTS	Los	N Number	3 / .
Project	7				ec us seq
Name	·		W. Personal and	_MP:	ft above LSD
Station ID (lat-	MP de	escription and s	ketch:		
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		ER LEVEL, IN FT	t us		1
DATE		ER LEVEL, IN FT	Stat	· .	:
(mo/day/year)	HOLD WET HE	BELOW LSD		Y	
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02/26/1981	123.0 40.13 82	87 82.47	BP	W no oil on tu	e. Welloverto
13/03/19 92	10.5 1.74 74	77.82	<u> </u>	WIS off about 1 m	inch
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	<u> </u>	and the second second second second second second second second second second second second second second secon	<u>*237=</u>	③ ³ :238= ④ 56 61	62 67 68
D-drv	Bobstruction	T-nearby.		Location sketch:	
F-flowin stra G-nearby	9 P-pumping r. R-recently	recently pumpe V-foreign substa	8 d	the for QW	, ·
DEStatus flowing H⊸nearby	ng pumped 1, S-nearby,	X-sufface water effects		a pre du	
flowin	9 	Zother			
Method A-airii DG of C-cailor measure- airii ment	sted S-steel the	T-electric tap 2-other	•		
Punched	Entered	Checked			
Local Well No.	5- 11.20				•
			I		, he

21 12.7 WELL DATA FACILITY & 1703 LOCATION Neille AFS -Ny ستتبه بينب DEPTH BU2 DRILLER Pol Thomason BOTTOM ELEVATION 10181 GRO 7422 WELL DIAMETER GRAVEL PACK GRAVEL PACK CASTING PERFORATIONS (16"x 3" SH. Z 1/3 CLATELS STREED) GAGE LINE The second states of COLUMN SIZE 5 PUMP SETTING 260' PUMP STAGES 12.23 FUMP: MANUFACTURER Johnson Pump · · · · . TYPE SHAFT LUBRICATION CI MOTOR: MANUFACTURER IV. 8. Mottes Antelled Apr -11 - 6105 Poses EZANE A 344 SOAMP. DESIEN'E COPES THE ISON POR SER & 393042 HP AND VOLTAGE 40 140 TRANSFORMER CAPACITY 45 KVA AUXILIARY ENGINE: DES CRIPTION Continental Engine No 3791 Mod M363 Spec 2309 Engine No 3791 - 1.41.11 WILL HOUSED IN BUILDING None INITIAL PRODUCTION, SPM 400 LATEST PRODUCTION 310 Dec 197 .3 . 55 " · · · · · د می است. به می می است که است از در مانوع می داده است که می می واقعه در مانوع می دور می می واقعه می واقعه در مانوع می واقعه ** . .

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NATIONAL BUREAU OF STANDARDS

	WATER WELL QATA	//	
Well Depth: 202	<u>^</u>		
Pump Setting: 250			
Production Column Diamete	r:	•	
Casing Diameter: 14	and location o	(perforatio	ns
Well Diameter:20 packed	gwetl,is grav	el packed; n	ot gravel
Type drive shaft lubricat	ion: Oil or Water		4
Drive Shaft Diameter:			
Electric motor: 40	HP 270/	:40	Voltage
Auxiliary motor, type and	HP		
Static water level:	98'		
Well design capacity:			
	al turbine pumps,	4	

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Kasalaria - Basarra

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Description of building housing the well. Does it have removable hatch?

and the second second second second second second second second second second second second second second second ~ È CLILL CONTING FOR PERIODIC MEASUREMENTS Project MP description and sketch: Station ID (lat-long) 3018 31.52 . : WATER LEVEL, IN FT. ğ DATE BELOW BELOW LSD VET (mo/d#y/year) HOLD 81 EMART 12/01/1977 114 50 35-12 1/3.18 ТК 131. 1/19-17 . -71 11 21 02:10 76 110 13.31 76.65 105 10.97 99.03 130.0 31.73 98.27 07=4/1974 De 7**5.**2 man 02/21/1980 ٩٤. 2 (3 DW MP -+0,27 96.87 02/26/1981 S Dw Electore - 99.64 bap or: 6.10 92.90 92.50 /19 m/18 . /19 . /19 /19 /19 ÷. . /19 \$7 /19 /19 /19 /19 /19 /19 /19 /19 119 /19 F /19 /19 . 4 - 1 1. 119 719 . . 1 88 ۲ 0 KEY PUNCHING INSTRUCTIONS: Duplicate col. 5-33 for all cards 1 TOL R=234+T=A+235# 4238≈ @ 4239= @'fe 56 61 62 67.00€ **()** +237= 0 20 44 61 T-marby, recently pumped V-foreign substance A-mrfoce water offocts 2-other Pubstruction Location sketch: D-drv P-pumping R-recontly pumped F-flowing of faces. TSILE flowing status flowing recently flowing 5warby. Pumbing Method A-niriing R-reported T-electric tape B of C-Collbrated S-steel tape Z-other mens Punched . Entered Checked Local Well No. 1 1 ł ۶s **k** ...

22----1. 194 72 WELL DATA

ACTINA J784 WELL #. LOCATION Netle Ars, Nr Second A

DATE DRILLED DEPTH B02 DRILLER Par Themoson BOTTOM ELEVATION JOHN GOO 75 WELL-DIAMETER

GRAVEL PACK CASING PERFORATIONS

126 4 3 6H Z IS SAMASES (STAGS STORED) 1. D.W. C. S. ... The second second 1. A. g. - 5. COLUMN SEZE the stand of the start

PUMP SETTING 280 PUMP STAGES 8 the second second second second second second second second second second second second second second second s The year's Train 22. and the second second 13 M 18 4 1 and the second second

A CONTRACTOR SERIAL 4 TV 2253

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frank in the state of the state of the TYPE SHAFT LUBRICATION

MOTOR: MANUFACTURER TO BE MOMES ANALAILAR APT TI - CISS POR A CHES ERAN 2364 SOAMP PESIEN & CAPEC THAT I THE AND SER & 3930425 And the second second -

TRANSFORMER CAPACITY 45 KIA HP AND VOLTAGE 40 40

AUXILIARY ENGINE: DES CRIPTION Continental Mod M363 Spec 2309 Engine No 3791 - Statistics 10.5 . -- A

A CARLES AND A CARLES THE AND A CARLES

WILL HOUSED IN BUILDING None

INITIAL PRODUCTION SPM

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WATER WELL DATA
Well Depth:
Pump Setting: 257
Production Column Diameter:
Casing Diameter: 14 and location of perforations
Well Diameter: <u>26</u> well is gravel packed; not gravel packed
Type drive shaft lubrication: Oil or WaterOIL
Drive Shaft Diameter:
Electric motor: 40 HP Torday Voltage
Auxiliary motor, type and HP
Static water level:98′
Well design capacity:GP
Pump Description: Vertical turbine pumps, 255 Stage "bowl assembly with rated capacity 355 GP

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Description of building housing the well. Does it have removable hatch?

ANTEN LEVEL CONTINU FURT (6----Local 11 Number PERIODIC MEASUREMENTS Sade Us Project Name_ MP description and sketch: Ň. Station ID (lat-long) -• ۲. WATER LEVEL, IN FT DATE BELOW BELOW LSD (mo/day/year) Ö 🖸 HOLD WET BY REMARKS 1'3.18 3T-12 IN CO TK (orli 8 hrs 12/10/1977 0-:10 77 -/ 1/19-2 16 00 1.1 51: 119 15.29 13,31 -6:4 2 De. 113 92.63 WD - + 0,27 ? 02/21/19.80 105 10.97 94.03 DW 96 .87 DW Electope = 99.64 bop 02/26/1981 1:00 31.73 48.27 S / /19 92.50 Dw/LS 010 6.10 92.92 oill 1 /19 /19 1 /19 1 /19 /19 1 1 /19 1 /19 /19 1 /19 /19 1 1 /19 1 /19 /19 1 1 /19 /19 1 1 /19 1 /19 1 /19 /19 56 61 67 0 0 34 44 49. 0 i c 0 KEY PUNCHING INSTRUCTIONS: Duplicate col. 5-33 for all cards 0 R=234*T=A*235# \mathbf{O} ×237= ٩ *238= O *239= O 19 20 44 49 56 34 61 62 67 M Location sketch: D-drv nearby. recently B-obstruction T-F-flowing P-pumptng pumped of for QW. G-nearby. -foreign substance R-recently pumped CC Status flowing X-surface water S-nearby. pumping H-nearby, recently flowing effects Z-other A-airline T-electric tape Method R-reported D of C-Calibrated S-steel tape 2-other measure- airline ment Punched Entered Checked. Local Well No. - • • 3 all and a

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• ,	/			R	1 Log No
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	101 ·		Forme Ba	e, Nevada	Laga, No. Las Vilgan Lie No
.	Y asisten of	_1.	5 5 E	See TT TO TA ROOT I IN CLARK	Cou
•				753 8 660, 476 Ground Surface Elev.	•
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	Water will h			Total depth (of well
	Size of drill	ed bole	i (pilot) 26 m Weight of casing per li	B447 foot
	Thickness of	main a 1	inch	Tamp of water	degrees F
			TL*	ID , single wall ; Two feet above gr	ound surface to TOOOfeet.
	Diameter an	d length of	casing	g 12" in diameter and under give inside diameter ; casi	ing 13" in diameter eine antelde diamet
	V. Boundary -	ما منع الم		C.p.m. and pressure	-
• .	•	-		•••••	
	If nonflowin	ng well give	depth of sta	ading water from earface	•
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	-			the	ive, etc.)
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()	Date of com	na chotheal	of well J	the	vel 20 Feb . 1969
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No. No. Subir & Clair & C. Free prime color. Free prime	4	To	Thickness		Type of material				
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140 100 1111 & GLATI F.L. gray tan & white , soft; to indurwisd; clay is the white value white color & the silt is the lt. gray tan. 780 895 115 CLATI F.L. gray tan & white , soft; to indurwisd; clay is the white value white color & the silt is the lt. gray tan. 780 895 115 CLATI F.T. J. gray tan & white , soft; to indurwisd; clay is the white value white color & the silt is the lt. gray tan. 780 895 115 CLATI F.T. J. gray tan, soft to indurwisd. 895 940 145 CLATI Gray tan, soft with some indurwisd straks. Jarky drilling from to 905 feet. 940 995 55 SILT WITH CLAT STREAKS: Gray, gray brn & white, soft to indurwisd, fr 980 to 995 feet the clay and the silt are about equal mounts. 995 1000. 5 CLAT: Greenish gray & buff, soft to hard, greenish gray clay has a greasey feel and is very lean. Jerky drilling at time . The lean cla: does not first wheb acid is put of it. BOTTOM OF HOLE IO00' CASING RECOND Diam feet length 'set length 'set first surface casing is grouted in place the entire distance. Joor 50' 52' This surface casing is grouted in place the entire distance. Joor 50' 52' This surface casing is grouted in place the entire distance. Joor 50' 52' Perforated from 320' to 980' below G. S.	-			gray br	n color. New selenite groups streeks for 720 to 760 feet-				
760 895 IIS white color 4 the silt is the fit, gray tan. 780 895 IIS CLAI: Brn, soft to indursted. 895 910 15' CLAI: Grey tan, soft with some indursted streaks. Jerky drilling from to 905 feet. 910 995 55 SILT WITH CLAI STREAKS: Gray, gray brn & white, soft to indursted, fr 980 to 995 feet the clay and the silt are about equal mounts. 995 1000. 5 CLAI: Greenish gray & buff , soft to hard, greenish gray olay has a grassey feel and is very lean. Jerky drilling at time . The lean claid does not firm when acid is put of it. BOTION OF HOLE IO00' CASING RECOND Diam. To leagth To surface casing is grouted in place the entire distance. Jour Soft 52' This surface casing is grouted in place the entire distance. GENERAL INFORMATION-Fumping Test Quality of Water. Etc.		1		CLAT: G	ray brn, soft.				
780 895 II5 CLAY: Brn, soft to indurated. 895 940 45" CLAY: Orky tan, soft with some indurated stranks. Jerky drilling from to 905 feet. 940 995 55 SILT WITH CLAY STREAKS: Gray, gray brn & white, soft to indurated, fr 980 to 995 feet the clay and the silt are about equal mounts. 995 1000. 5 CLAY: Greenish gray & buff, soft to hard, greenish gray clay has a greasey feel and is very lean. Jerky drilling at time. The lean clay does not firm when acid is put of it. 995 1000. 5 CLAY: Greenish gray & buff, soft to hard, greenish gray clay has a greasey feel and is very lean. Jerky drilling at time. The lean clay does not firm when acid is put of it. 901 995 50' 52' CLASING RECORD Diam. To test tagth To surface casing is grouted in place the entire distance. 30" 2'above 50' 52' This surface casing is grouted in place the entire distance. GENERAL INFORMATION-Fumping Test Quality of Water. Etc.	7 -9 .	780	20	SILT & GLAIT LT. gray tan & white , sort; so incurrence; clay is the w					
895 940 45" CLAT: Orby tan, soft with some indurated stranks. Jerky drilling from to 905 feet. 940 995 55 SILT WITH CLAT STREAKS: Gray, gray brn & white, soft to indurated, fr 980 to 995 feet the clay and the silt are about equal smounts. 995 1000. 5 CLAT: Greenish gray & buff , soft to hard, greenish gray clay has a greeney feel and is very lean. Jerky drilling at time . The lean cla: does not firm when acid is put of it. 995 1000. 5 CLAT: Greenish gray & buff , soft to hard, greenish gray clay has a greeney feel and is very lean. Jerky drilling at time . The lean cla: does not firm when acid is put of it. 995 1000. 5 CLAT: Greenish gray & buff , soft to hard, greenish gray clay has a greeney feel and is very lean. Jerky drilling at time . The lean cla: does not firm when acid is put of it. 995 1000. 5 CLAT: Greenish gray & buff , soft to fill ing at time . The lean cla: does not firm when acid is put of it. 995 1000. CASING RECORD ECASING RECORD 90a 2'above 50' 52' This surface casing is grouted in place the entire distance. E. 90 1002' Perforeted from 320' to 980' below G. S. E. GENERAL INFORMATION-Fumping Test, Quality of Water. Etc. GENERAL INFORMATION-Fumping Test, Quality of Water. Etc. GENERAL INFORMATI	780	800	+++						
Sk0 995 55 SILT WITH CLAT STREAKS: Gray, gray brn & white, soft to induced, fr 980 to 995 feet the clay and the silt are about equal mounts. 995 IDOO. 5 CLAT: Greenish gray & buff, soft to hard, greenish gray clay has a greasey feel and is very lean. Jerky drilling at time. The lean claid does not firm when acid is put of it. Diam. From feet To itest Image: Soft to hard, greenish gray clay has a greasey feel and is very lean. Jerky drilling at time. The lean claid does not firm when acid is put of it. Diam. From feet To itest Image: Soft Soft Soft Soft Soft Soft Soft Soft									
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995 1000. 5 980 to 995 feet the clay and the silt are about equal mounts. CLAY: Greenish gray & buff, soft to hard, greenish gray clay has a greasery feel and is very lean. Jerky drilling at time. The lean clay does not firm when acid is put of it. BOTTOM OF HOLE 1000' CASING RECORD Diam. from To test feet feet length "Remarks"-Seals, Grouting, Etc. JUNO 2' above 50' 52' This surface casing is grouted in place the entire distance. Es F. JUNO 2' above 50' 52' This surface casing is grouted in place the entire distance. Es F. JUNO 2' Perforated from 320' to 980' below G. S. JUNO 2' Perforated from 320' to 980' below G. S. GENERAL INFORMATION-Fumping Test, Quality of Water. Etc.	240	995	55						
995 IDOO. 5 CLAT's Greenish gray & buff , soft to hard, greenish gray clay has a greasey feel and is very lean. Jerky drilling at time . The lean clay does not fire when acid is put of it. BOTTOM OF HOLE IDOO' CLATING RECORD Diam. Too Ist into Ist when acid is put of it. BOTTOM OF HOLE IDOO' CLATING RECORD Diam. Too Ist into Ist Ist Ist Ist Ist Ist Ist Ist Ist Ist		1		995 feet the clay and the silt are about equal mounter.					
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Same Set Lesgth "Remarks"-Seals, Growting, Etc. 30" 2'above 50' 52' This surface casing is grouted in place the entire distance. 30" 2'above 50' 52' This surface casing is grouted in place the entire distance. 30" 2'above 1000' 1002' Perforated from 320' to 980' below G. S. OENERAL INFORMATION-Fumpler Test, Quality of Water, Etc. OENERAL INFORMATION-Fumpler Test, Quality of Water, Etc. GEAM Image: Start C. Dest: Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2">Colspan="2"Colspan="2"Colspan="2">Colspan="2"Cols					BOTTOM OF HOLE 1000'				
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Ep F. III IIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII				Length	CASING RECORD				
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GENERAL INFORMATION-Fumping Test, Quality of Water, Etc. GPM Mumping Stotec, Drowidswiry Specific Sound count Removes	casing	feet 21above	feet		CASING RECORD				
GENERAL INFORMATION-Fumping Test, Quality of Water, Etc. GPM Mumping Stotec, Drowidswiry Specific Sound count Removes	casing	feet 21above	feet		CASING RECORD "Remarks"—Seals, Grouting, Etc.				
GENERAL INFORMATION-Fumpling Test, quality of Water, Etc. GPM Humping Stotec, Drowcewirg Specific Sound rount Removes	30w	feet 21above Ep Fe	1005 501	52 '	CASING RECORD "Remarks"-Beals, Grouting, Etc. This surface casing is grouted in place the entire distance.				
GPM transford State Draw and sound found Remarks	30 ^w	feet 2 *above Ep ==- 2 * above	1005 501	52 '	CASING RECORD "Remarks"-Beels, Growting, Etc. This surface casing is grouted in place the entire distance.				
GPM Reach Stote Drawer Specific Sound rount Reacords	30W	feet 2 *above Ep ==- 2 * above	1005 501	52 '	CASING RECORD "Remarks"-Beels, Growting, Etc. This surface casing is grouted in place the entire distance.				
GPM Trend Stote Dramaning Specific Sound round Remorks	30w	feet 2 *above Ep ==- 2 * above	1005 501	52 '	CASING RECORD "Remarks"-Seals, Growting, Etc. This surface casing is grouted in place the entire distance.				
GPM leech intrier: Fri jield Sound round Kampiles	30W	feet 2 *above Ep ==- 2 * above	1005 501	52 '	CASING RECORD "Remarks"-Seals, Growting, Etc. This surface casing is grouted in place the entire distance.				
	30w	feet 2 *above Ep ==- 2 * above	feet 50 1 1000 1	52 ° 1002 °	CASING RECORD "Remarks"—Seals, Growting, Etc. This surface casing is grouted in place the entire distance. Perforated from 320' to 980' below G. S.				
3σ $1,00^{-1}$ 57 41^{-1} 50^{-1}	zastag 304 TL+	feet 2'above 89 F. 2' above 8. F.	feet 50 1 1000 1 02	52 '	CASING RECORD "Remarks"-Seein, Growting, Etc. This surface casing is grouted in place the entire distance. Perforated from 320' to 980' below G. S. FORMATION-Pumping Test, Quality of Water, Etc.				

<u>GPM</u>	Level	Stote !!	Dremerusey	Specific	Sound count	Remotes
230	100'	51	41	5.61	N.I.	
560	160'	(101'	5.54	Nec	· · · · · · · ·
750	198'		.131'	5.72	N. L	
1240	271'		212'	5.85	Nil	cap of the fost engines Parp
465	172'		113'	5.88	N.L.	Finel 12 ho. tost
Ranged W	LL DRILLER'S S	TATEMENT		7 No Serdi	be filled in by Drille	· · · · · · · · · · · · · · · · · · ·

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This well was drilled under my jurisdiction and the above information is true to my best information and belief.

Signed THEPS PUMP AND FRUIPE ELT

Klopla 2 B 98 2 1963 7-1

D MAR 26 1963 DIV. OF WATER RESOURCES BRANCH CRECT ...

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È WELL DATA FACILI LOCATION Nellis 173 DATE DRILLED 1963 DRILLER PHELPS TUMP & EQUIP. CO. LAS VEGAS BOTTOM ELEVATION 818' TOP 1817.8 GRAVEL PACK Yes S. CASING DIAMETER 14" CASING PERFORATIONS 820' to 180" 0/8" x 2-1/2", 8 per round on 2-3/4" centers, staggered COLUMN SIZE 8" GAGE LINE PUMP SETTING 150' PUMP STAGES 12 PUMP: MANUFACTURER_ Johnson Pump SERIAL # . JU 2256 TYPE SHAFT LUBRICATION Ď11 . • • MOTOR: MANUFACTURER U.S. Motor HP AND VOLTAGE 50 220-440 TRANSFORMER CAPACITY AUXILLARY ENGINE: DES CRIPTION_ · None WELL HOUSED IN BUILDING ... None INITIAL PRODUCTION, SPM _ 600 LATEST PRODUCTION 450 December 197 ł

	WATER WELL DATA 72	
Well Depth:	•	
Pump Setting: 250	<u>, '</u>	
Production Column Diameter:	&	
Casing Diameter:	and location of perforations	
Well Diameter: 30"	well is gravel packed; not q	gravel
Type drive shaft lubrication:	Oil or Water OIL	
Drive Shaft Diameter:		
	HP 220/44: VO	bitage
Auxiliary motor, type and HP		
Static water level:		
Well design capacity:	475	GP
Pump Description: Vertical to	urbine pumps, /2	Stage

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Description of building housing the well. Does it have removable hatch?

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			12	Log No
WF	LL LO	G AND	REPORT TO THE STATE	Rec
······································			ER OF NEVADA	Well No
	!		TE THIS FORM IN ITS ENTIRETY	Permit No
			•	- •
Owner	I I KIF	Forme Re-		THE THE THE THE TANK
Address	······································	= 5E	Address 1008. Col	Lage, No. Las. YEgas Lic. No
Location of	well:	<u></u>	500 ₩, T. 20 ₩/S, R62 E, in Clark	C
•			53. E. 660, 176 Ground Surface Elev.	
		B		
Water will l	be used for.	3 /	Total depth	oi well
Size of drill	ed hole	r (pilot)	28 ² ⁿ Weight of casing per l	linear foot
			7] 	degrees T
		ᇳᄬ	ID, single wall ; Two feet above g:	round surface to IOOOfeet.
unameter ar	nd length of	casing	12" in diameter and under give inside diameter; cas	
If flowing	vell give An	wincfs or	g.p.m. and pressure	
-	-			
11 nonflowii	ug well give	aepth of star	nding water from surface	
If flowing v	well describe	e control wor	rks	alve, etc.)
			I Dec. 1962 Date of completion of	• •
			Uate of completion o	14 WC11
- ·			, , , ,	
Type of we	ll rig.Dri	led with	rotary mud type rig and swallbed wit	th 36L cable tool rig.
Type of we Web			rotary mud type rig and swalled wit OF FORMATIONS	Water-bearing Formation, Casin
			OF FORMATIONS Type of material	
Web	L "C"	LOG Thickness	OF FORMATIONS Type of material SANDY SILT Brn soft; sand fine&	Water-bearing Formation, Casin Perforationa, Etc.
We C From feet	To feet	LOG Thickness feet	OF FORMATIONS Type of material SANDY SILT Brn soft; sand fine& rounded.	Water-bearing Formation, Casin
Web From feet O	To feet IO	Log Thickness feet TO	OF FORMATIONS Type of material SANDY SILT Brn soft; sand fine& rounded. SILT& CLAY: Brn,& buff, firm. CALICHE& CLAY: Buff & lt. gray,	Water-bearing Formation, Casin Perforations, Etc. Chief aquifer (water-bearing formation)
We C From feet O IO	To feet IO 20	LOG Thickness feet IO IO	OF FORMATIONS Type of material SANDY SILT Brn soft; sand fine& rounded. SILT& CLAY: Brn,& buff, firm. CALICHE& CLAY: Buff & lt. gray, soft to indurated, few limestone	Water-bearing Formation, Casin, Perforations, Etc. Chief aquifer (water-bearing formation) fromtoto
Well From feet O IO 20 LO	L C C C C C C C C C C C C C C C C C C C	LOG Thickness feet IO IO	OF FORMATIONS Type of material SANDY SILT Brn soft; sand fine& rounded. SILT& CLAY: Brn,& buff, firm. CALICHE& CLAY: Buff & lt. gray,	Water-bearing Formation, Casin, Perforationa, Etc. Chief aquifer (water-bearing formation) from <u>540</u> to <u>200</u> Other aquifers. <u>70'6/10'</u>
Well From feet 0 10 20 10 20	20 10 20 10 10 10 10 10	LOG Thickness feet IO IO 20 50 20	OF FORMATIONS Type of material SANDY SILT Brn soft; sand fine& rounded. SILT& CLAY: Brn,& buff, firm. CALICHE& CLAY: Buff & lt. gray, soft to indurated, few limestone gravel. CLAY: Brn, soft, CALICHE: Buff, soft,& indurated.	Water-bearing Formation, Casing Perforationa, Etc. Chief aquifer (water-bearing formation) from 540 to 300 other aquifers 70'6110' 14-4,50', 300 to 3
Well From feet O IO 20 LO 90 LID	<u>г</u> <u>то</u> <u>feet</u> 10 <u>20</u> <u>10</u> <u>90</u> <u>100</u> <u>100</u> <u>110</u>	LOG Thickness feet IO IO 20 50 20 30	OF FORMATIONS Type of material SANDY SILT Brn soft; sand fine& rounded. SILT& CLAY: Brn,& buff, firm. CALICHE& CLAY: Buff & lt. gray, soft to indurated, few limestone gravel. CLAY: Brn, soft, CALICHE: Buff, soft,& indurated. CLAY: Brn, soft, sticky.	Water-bearing Formation, Casin, Perforationa, Etc. Chief aquifer (water-bearing formation) from 240 to 300 other aquifers 70'6110' 14-4,50', 300'63
Well From feet O IO 20 LO 90 LID ILO	10 10 10 10 10 10 10 10 10 10 10 10 150	LOG Thickness feet IO IO 2O 50 20 30 IO	OF FORMATIONS Type of material SANDY SILT Brn soft; sand fine& rounded. SILT& CLAY: Brn,& buff, firm. CALICHE& CLAY: Buff & lt. gray, soft to indurated, few limestone gravel. CLAY: Brn, soft, CALICHE: Buff, soft,& indurated. CLAY: Brn, soft, sticky. CALICHE: Buff, soft to indurated.	Water-bearing Formation, Casin, Perforationa, Etc. Chief aquifer (water-bearing formation) from = 40 to 300 Other aquifera 70' 6110' 0ther aquifera 70' 6110' 14 4 150' 300 63 = 52' 6 650' 760' 6
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		To	Thickness	LOG OF FO. TILINS-Lond ed	<u>۰</u> .
	680	740	60	SILT & CLAY: Lt. gray brok brn , soft; clay is brn color & the silt in	
,	740 7 40	- 7 60 780	2 0 20	gray brn color. Few selenite gypsum streaks for 720 to 740 feat, CLAY: Gray brn, soft. SILT & CLAY: LT. gray tan & white , soft; to indurated; clay is the whit	
				white color & the silt is the lt. gray tan.	: 5
	780	895	115	CLAY: Brn, soft to indurated.	
	895	940	45	CLAY: Gray tan, soft with some indurated streaks. Jerky drilling from to 905 feet.	
	9 <u>r</u> 0	995	55	SILT WITH CLAY STREAKS: Gray, gray brn & white, soft to indurated, from 980 to 995 feet the clay and the silt are about equal smounts.	
	995	1000	5	CLAY: Greenish gray & buff , soft to hard, greenish gray clay has a greasey feel and is very lean. Jerky drilling at time . The lean clay does not fizz when acid is put of it.	
				TO THE LOT R TOOOL	•.*

BOTTOM OF HOLE 1000'

				CASING RECORD
Diam. casing	From feet	To feet	Length	"Remarks"—Seals, Grouting, Etc.
30"	2'above g, s.	501	52 '	This surface casing is grouted in place the entire distance
Ш, н	21 æbove g. ≇.	1000 •	1005 ,	Perforated from 320' to 980' below G. S.

GENERAL INFORMATION-Pumping Test, Quality of Water, Etc.

GPM	Jevel Level	State:	Dramaculty	Specific	Sound count	Remo, les
230	100'	\$ I	41'	5.61	NI	
560	160'	(101'	5.54	N.L	
750	190'	(131'	5.72	N, C	
1240	271	5	212'	5.85	N. I	cop. of the engine & Po
665	172'		113 ' .	5,88	M, L ng problems	Finel 12 hr.

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MAR 26 1963

DE WATER RESOURCES

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This well was drilled under my jurisdiction and the above information is true to my best information and belief.

Signed PHEUPS PUMP AND EQUIPPERT Weill Driller By Shiph & France License No. 78 3 , 19 6 2 Dated

•	12
	Well Data Well #CFACILITY #
	LOCATION Nellis AFB
	DATE DRILLED 1963 DEPTH 1000'
	DRILLER PHELPS PUMP & EQUIP. CO. LAS VEGAS
	BOTTOM ELEVATION 818' TOP 1817.8 WELL DIAMETER 80"
·	GRAVEL PACK Yes CASING DIAMETER 14"
•	CASING PERFORATIONS 820' to 980' (1/8" x 2-1/2", 8 per round on 2-3/4" centers, staggered)
	COLUMN SIZE 8"GAGE LINE
	PUMP SETTING 250' PUMP STAGES 12
	PUMP: MANUFACTURER Johnson Pump
	SERIAL # JU 2256
•	TYPE SHAFT LUBRICATION DI
	MOTOR: MANUFACTURER U.S. Motor
	HP AND VOLTAGE 50 220-440 TRANSFORMER CAPACITY
	AUXILIARY ENGINE: DES CRIPTION None
	WELL HOUSED IN BUILDING None
	INITIAL PRODUCTION, SPM 500 LATEST PRODUCTION 450 December 1971

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WATER WELL DATA 2/2
Well Depth: 1600
Pump Setting: 250'
Production Column Diameter:
Casing Diameter:and location of perforations
Well Diameter: <u>30</u> well is gravel packed; not gravel packed
Type drive shaft lubrication: Oil or Water <u>O/L</u>
Drive Shaft Diameter:
Electric motor: 50 HP 23 - 44 Voltage
Auxiliary motor, type and HP
Static water level:
Well design capacity: <u>475</u> GPM
Pump Description: Vertical turbine pumps,

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Description of building housing the well. Does it have removable hatch?

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	WEI	110	G AND	REPORT TO THE STATE	Rec	
				ER OF NEVADA	Well No.	
t' .s:5	na-de X	•		TE THIS FORM IN ITS ENTIRETY	De not pit in	
		Ha Air	Force Be		p & Equipment Co. N. Las Vegas.	
382 12 1 1		LLE AFE		9	lege Ave. Lie No.	
:						
	Q1			517, E656 939 G.S. Elev. 1812.00		
	Water will be Size of drille				W 411	
	-		Tu 1 1		74 ° F	
	Thickness of	•	. 14			
	Non-star and					
	Diameter and	lingth of a	(Casing	" 1D Single wall 2' above G.S. to (12" in diameter and under give laude diameter ; cash	ng 12" in diameter give outside diar.	
	If Soving we	il give flow	(Casing	g.p.m. and pressure	ng 12" in diameter give estade diar.	
	If flowing we If nonflowing	il give flow ; well give ((Casing in c.f.s. or depth of stat	2. If in diameter and under give inside diameter ; cash g.p.m. and pressure	ng 12" in diameter give estade diam	
	If flowing we If nonflowing If flowing we	il give flow ; well give : il describe	(Casing in c.f.a. or depth of stat control wer	22' in diameter and under give inside diameter ; cash g.p.m. and pressure	re, etc.)	
<i>c</i> .	If flowing we If nonflowing If flowing we Date of comm	il give flow ; well give (il describe nencement	(Casing in c.f.s. of depth of star control www of well5	12" in diameter and under give inside diameter ; cash g.p.m. and pressure	re, etc.) well 16 Dec 1962	
Ċ	If flowing we If nonflowing If flowing we Date of comm	il give flow ; well give (il describe nencement	(Casing v in c.f.s. or depth of star control wer of well	12' in diameter and under give inside diameter ; cash g.p.m. and pressure	re, etc.) well 16 Dec 1962	
Ċ	If flowing we If nonflowing If flowing we Date of comm Type of well	il give flow ; well give a uil describe nencement i rigDr.i.J	(Casing in c.f.s. of depth of star control we of well. 5 led. W/RO LOG Thickness	2. IF is diameter and under give inside diameter ; cash g.p.m. and pressure	re, etc.) well 16 Dec 1962	
(If flowing we If nonflowing If flowing we Date of comm Type of well Prom fast	ill give flow a well give a ull describe nencement i rigDr.i.l To feet	(Casing in c.f.s. or depth of star control wer of well	IT is diameter and under give inside diameter ; cash g.p.m. and pressure	ve, etc.) well_16_Dec_1962 able_fogl. Water-braring Formation, Cast: Perforations, Etc.	
(If flowing we If nonflowing If flowing we Date of comm Type of well	il give flow ; well give a uil describe nencement i rigDr.i.J	(Casing in c.f.s. of depth of star control we of well. 5 led. W/RO LOG Thickness	IT is diameter and under give inside diameter ; cash g.p.m. and pressure	ve, etc.) well 16 Dec 1962 able fool. Water-braring Formation, Casi: Perforations, Etc. Chief equifer (water-bearing (ormation)	
(If flowing we If nonflowing If flowing we Date of comm Type of well Type of well Type of well Type of ut fast 0' 17' 24 '	Il give flow well give a il describe nencement i rigDrill To feet 17' 24' 40'	(Casing in c.f.s. of depth of star control wer of well 5 led W/r0 LOG Thickness feet 17 7 16	12' in diameter and under give inside diameter ; cash g.p.m. and pressure	re, etc.) well 16 Dec 1962 able fool. Water-bearing Formation, Casi: Perforations, Etc. Chief equifer (water-bearing formation) from 664 to 694	
(If Sowing we If nonflowing If Sowing we Date of comm Type of well Stort 0' 17'	Il give flow well give a il describe nencement i rigDril To test 17 ' 24'	(Casing in c.f.s. or depth of star control ww of well. <u>5</u> <u>led</u> <u>W/ro</u> <u>LOG</u> <u>Thickness</u> fost 17 7	IT is diameter and under give inside diameter ; cash g.p.m. and pressure	ve, etc.) well16_Dec_1962 able_foql, Water-bearing Formation, Casi: Perforations, Etc. Chief aquiler (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;	
(If Sowing we If nonflowing If Sowing we Date of comm Type of well Type of well Type of well Type of well 24. ' 40' 80' 90'	il give flow well give a il describe nencement i rig. Dr.i.l To feet 17' 24' 40' 80' 90' 100'	(Casine in c.f.s. or depth of star control wer of well 5 led W/R9 LOG Thickness foot 17 7 16 40 10	IT is diameter and under give inside diameter ; cash g.p.m. and pressure	re, etc.) well 16 Dec 1962 able fool. Water-bearing Formation, Casi: Perforations, Etc. Chief equifer (water-bearing formation) from 664 to 694	
(If Soving we If nonflowing If Soving we Date of communication Type of well Type of well Type of well Type of well Type of well 17' 24' 40' 80' 90' 100' 150'	Il give flow well give f il describe nencement rig. Drill To test 17 ! 24 ' 40 ' 80 ' 90 ' 100 ' 150 ' 315 '	(Casine in c.f.s. or depth of star control wer of well 5 Led W/KS LOG Thickness feet 17 7 16 40 10 50 165	IT is diameter and under give inside diameter ; cash g.p.m. and pressure	ve, etc.) well16_Dec_1962 able_foql, Water-bearing Formation, Casi: Perforations, Etc. Chief aquiler (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;	
<u>(</u>	If Sowing we If nonflowing If Sowing we Date of communication Type of well Type of well Type of well O' 17' 24 ' 40' 80' 90' 100' 150' 315'	Il give flow well give a il describe nenessent rigDr.i.l To feet 17' 24' 40' 80' 90' 100' 150' 315' 330'	(Castse in c.f.s. or depth of star control wer of well	IT is diameter and under give inside diameter; cash g.p.m. and pressure	ve, etc.) well16_Dec_1962 able_foql, Water-bearing Formation, Casi: Perforations, Etc. Chief aquiler (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;	
(.	If flowing we If nonflowing we Date of commu- Type of well	Il give flow well give for il describe nencement i rig. Dril To test 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385'	(Castse is c.f.s. or depth of star control wer of well 5 led w/x0 LOG Thickness feet 17 7 16 40 10 50 165 15 45 10	IT is diameter and under give inside diameter ; cash g.p.m. and pressure	ve, etc.) well16_Dec_1962 able_foql, Water-bearing Formation, Casi: Perforations, Etc. Chief aquiler (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;	
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	To	Thickness		 T794	of material	4	
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	- 1020' 650'	60 30	<u>_Clay</u> : G Silt &	ay hrn w/lt. gray str <u>la</u> y: Brn & gray, soft	eaks, soft . Silt is hrm	مار بالمراجع من منطقة المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع ا	atres)
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	700' 1000'	20 300 ·	Clav: L	gray, soft & indurat ypsum: Gray & greenis	ed Streaks. 4	Vell completed (& indurated stre	1 694'. Make. sos
			clay st	eaks are very lean. G	ypsum if of th	he Selenite (pla	ity) vari
			594' TO size du	1000' only opened by to brackish water fr	drilling 124" om gypsum as	pilot hole. Not shown by electr:	t opened ic log.
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_							
				CARING RECORD			
4. 4	Frum fort	To feet	Longth	"Re m e	rits"—Henis, Grouti	ng. Bic.	
-							
	2'above C.S.		52'	Surface casing gro	outed entire d	epth.	
	2' above G.S.	694'	690'	Perforated from 27 Gravel packed well			G.S.
				Used 100 cubic yar		AN BIRNEI	
				Used 100 cubic yan	rd of gravel.		
				Used 100 cubic yas	rd of gravel.		
atio	W.L. 72			Used 100 cubic yan	rd of gravel.		solids.
lit	W.L. 72	'. Chem on flour	ical anal ide (1.3	Used 100 cubic yas ORMATION-Pumping Test. Qu VSIS was made & contas PPM) Ph = 74	rd of gravel.		Bolids.
GP	: W.L. 72 tle high 4 w/55'	'. Chem on flour DD	ical anal ide (1.7 500	Used 100 cubic yas ORMATION-Pumping Tout Qu VSIS was made & contas PPM) Ph = 7+ CPM w/ 129' DD	rd of gravel.		solids.
it GPI	: W.L. 72 tle high 4 w/55' " 90'	'. Chem on flour DD	ical anal ide (1.7 500 640	Used 100 cubic yar ORMATION-Pumping Test, Qu /Sis was made & contar /PPM) Ph = 74 CPM w/ 129' DD " 166' UD	rd of gruvel. Milty of Water, Etc. Ined 446 PPM	total dissolved	eolids.
it GPI	: W.L. 72 tle high 4 w/55' " 90'	'. Chem on flour DD	ical anal ide (1.7 500	Used 100 cubic yar ORMATION-Pumping Test, Qu /Sis was made & contar /PPM) Ph = 74 CPM w/ 129' DD " 166' UD	rd of gravel.	total dissolved	eolids.
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T.T. DATA WELL & FACILITY $\cdot \cdot \cdot$ LOCATION _ · Nellis AFB DATE DRILLED 1963 DEPTH Pat Themason PHELPS PAMP & EQUIP. CO. LAS VEL DRILLER BOTTOM ELEVATION INS' TOP 1870 1813 WELL DIAMETER 28" CASING DIAMETER 14" GRAVEL PACK Yes 274' to 574' CASING PERFORATIONS_ 6* GAGE LINE NO COLUMN SIZE 220 ' PUMP SETTING PUMP STAGES 7: PUMP: MANUFACTURER_ Johnson Turbing SERIAL # TU 2255 TYPE SHAFT LUBRICATION_ Of MOTOR: MANUFACTURER U.S Metors HP AND VOLTAGE 40 220-440 TRANSFORMER CAPACITY AUXILIARY ENGINE: DES CRIPTION None WELL HOUSED IN BUILDING DITTAL PRODUCTION; 6PM _____ 840 __1963 LATEST PRODUCTION .. 282 - 191

WATER LEVEL CODING FORM (6-76) PERIODIC MEASUREMENTS \bigcirc 12 Project MP description and sketch: Station ID (lat-long) 3. 5 14 . - 1 2 WATER LEVEL, IN FT DATE BELOW (mo/dav/year) HOLD BELOW LSD REMARKS 3/0/ /1977 11.2 121 s 7.2 77 .4 2/ 1/19-14 • ,' 11.1 27.81 TK 0.1-26/1979 11 0 8.39 101.66 100.66 S Du ut 02/26/1980 92.15 Du 217 73 02/26/19 81 131.0 32.07 98.93 97 1 5 Pu 10:0 12.6 17.103/1982 92.24 DW/LS we oil do 5 hm /19 91.2. S /19 /19 /19 /19 /19 /19 /19 /19 /19 /19 /19 1 /19 1 /19 /19 /19 1 119 /19 /19 14 1.8.51 ଚ ଥି 1972 ۲ 0 KEY PUNCHING INSTRUCTIONS: Duplicate col. 5-33 for all cards R=234#T=A#235# #238= 0 #239= 4 56 hн Цġ 61 62 .150 D-drv F-flowing B-obstruction nearby. recently Location sketch: ۲-PUMPIAG recentiv Pumped Pumped P --G-mearby. flowing M-mearby. recently flowing V-foreles substance X-mrface water offacts Z-other C Site Status marby. Pumplag s Method A-siriise R-resorted De of C-calibrated S-steel tape ment siriine T-electric tase Z-ether Punched Entered Checked Local Well No. -, -. 5 37:31

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•	•• ** •• •• •			Log No.
WEL			REPORT TO THE STATE	Rec19.00
	E	ENGINE	ER OF NEVADA	Permit No.
- 12 F	PLEAS	E COMPLE	TE THIS FORM IN ITS ENTIRETY	Do wet fill in
	lis Air	Force Ba	be Driller Phelps Pur	p & Equipment Co.
Address Nel	lis AFB.	Nevada	Address 400 E. Co	N. Las Vegas, Liege Ave. Lie No
			9 	
		•	517, E656 939 G.S. Elev. 1812.00	
			ic	
			t) & 28½" Weight of casing per li	-
			Temp. of water	
Diameter and	length of c	Casing 14'	" 1D Single wall 2' above G.S. to 12" in diameter and under give inside diameter; cast	694' below G.S. .ng 12" in diameter give outside dia
If flowing wel	l] give flow	in c.f.s. or	g.p.m. and pressure	
If nonflowing	well give d	lepth of star	nding water from surface	
If flowing we	ll describe	control wor	ka	•
		F	(Type and size of val	
Date of comm	encement	of well <u>5</u>	Nov. 1962 Date of completion of	
				well 16 Dec 1962
		led w/ro	Nov. 1962 Date of completion of	well 16 Dec 1962 able tool.
		led w/ro	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C	well 16 Dec 1962 able tool.
Type of well From feet	rigDril To feet 171	led w/ro LOG	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft	well 16 Dec 1962 able tool. Water-bearing Formation, Cus Perforations. Etc. Chief aquifer (water-bearing
Type of well From feet	rig Dril To feet	Led W/ro LOG Thickness feet	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limeston	well 16 Dec 1962 well tool. Water-bearing Formation, Cus Perforations. Etc. Chief aquifer (water-bearing formation)
Type of well From feet	rigDril To feet 171	Led w/ro LOG Thickness feet 17 7	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limestone gravel to:2" Caliche: white to buff, firm	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations, Etc. Chief aquifer (water-bearing formation) from 664 to 694
Type of well From feet 0']7' 24' 40'	rigDril To feet 17' 24'	Led <u>W/ro</u> LoG Thickness feet 17	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limestone gravel to:2" Caliche: white to buff, firm	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations, Etc. Chief aquifer (water-bearing formation) from 664 to 694
Type of well From feet 0']7' 24'	rigDril To feet 17 ' 24 ' 40 '	Led w/ro LOG Thickness feet 17 7 16	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L () OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Clay: Tan & soft gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;
Type of well From feet 0' 17' 24' 40' 80'	rigDril feet 17' 24' 40' 80' 90'	Led w/ro LOG Thickness feet 17 7 16 40 10	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L () OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Clay: Tan & soft Claiche w/gravel: White, limestone gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;
Type of well From feet 0' 37' 24' 40' 80' 90'	rigDril feet 17' 24' 40' 80' 90'	Led w/ro LOG Thickness feet 17 7 16 40 10	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L (C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Clay: Tan & soft Galiche w/gravel: White, limestone gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;
Type of well From feet 0' 17' 24' 40' 80'	rigDril feet 17' 24' 40' 80' 90'	Led w/ro LOG Thickness feet 17 7 16 40 10	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limeston gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;
Type of well From feet 0' 37' 24' 40' 80' 90' 100'	rig.Dril feet 17' 24' 40' 80' 90' 100' 150'	Led w/ro Log Thickness feet 17 7 16 40 10 10 50	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L (C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Clay: Tan & soft Galiche w/gravel: White, limestone gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;
Type of well From feet 0' 17' 24' 40' 80' 90' 100' 150'	rig.Dril To feet 17' 24' 40' 80' 90' 100' 150' 315'	Led w/ro Log Thickness feet 17 7 16 40 10 10 50 165	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L (OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limeston gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: Tan, soft & indurated.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105;
Type of well From feet 0' 37' 24' 40' 80' 90' 100' 150' 315' 330'	rig.Dril To feet 17' 24' 40' 80' 90' 100' 150' 315' 330' 375'	Led w/ro Log Thickness feet 17 7 16 40 10 10 50 165 15 45	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limeston gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: Tan, soft & indurated. Clay: Tan, soft & indurated. Clay w/gypsum: Firm & soft, brn, gypsum is sugary. Clay: Gray brn. Soft.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforatious. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105; 605 to 610
Type of well From feet 0' 17' 24' 40' 80' 90' 100' 150' 315' 330' 375'	rig Dril To feet 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385'	Led w/ro Log Thickness feet 17 7 16 40 10 10 50 165 15 45 10	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limeston gravel to 2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: Tan, soft & indurated. Clay w/gypsum: Firm & soft, brn, gypsum is sugary. Clay: Gray brn. Soft. Silt: Gray brn, soft.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations, Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105; Other aquifers 78 to 105; First water at 78! 4
Type of well From feet 0' 17' 24 ' 40' 80' 90' 100' 150' 315' 330' 375' 385'	rig.Dril To feet 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410''	Led w/ro Log Thickness feet 17 7 16 40 10 10 50 165 15 45 10 25	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limeston gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: Tan, soft & indurated. Clay w/gypsum: Firm & soft, brn, gypsum is sugary. Clay: Gray brn. Soft. Silt:Gray brn, soft. Sandy silt: Tan, soft & indurated Sand is fine.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations, Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105; Other aquifers 78 to 105; First water at 78! 4
Type of well From feet 0' 17' 24' 40' 80' 90' 100' 150' 315' 330' 375'	rig Dril To feet 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385'	Led w/ro Log Thickness feet 17 7 16 40 10 10 50 165 15 45 10	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L C OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limeston gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: tan, soft & indurated. Clay: Tan, soft & indurated. Clay w/gypsum: Firm & soft, brn, gypsum is sugary. Clay: Gray brn. Soft. Silt:Gray brn, soft. Sandy silt: Tan, soft & indurated Sand is fine. Sandy clay w/gypsum: Gray brn,	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations, Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105; Other aquifers 78 to 105; First water at 781 f
Type of well feet 0' 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410'	rigDril feet 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410'' 436'	Led w/ro Log Thickness feet 17 7 16 40 10 10 50 165 15 45 10 25	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L (OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limestone gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: Tan, soft & indurated. Clay: Tan, soft & indurated. Clay: Gray brn. Soft. Silt:Gray brn. soft. Sandy silt: Tan, soft & indurated Sand is fine. Sandy clay w/gypsum: Gray brn, soft & indurated. Sand is fine, sugary gypsum.	well 16 Dec 1962 well 16 Dec 1962 water-bearing Formation, Cus Perforations, Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105; Other aquifers 78 to 105; 605 to 610 First water at 78 f
Type of well From feet 0' 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410' 436'	rigDril feet 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410'' 436' 445'	Led w/ro LoG Thickness feet 17 7 16 40 10 10 50 165 15 45 10 25 26 9	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L (OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limestone gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: Tan, soft & indurated. Clay: Tan, soft & indurated. Clay: Gray brn. Soft. Silt:Gray brn. soft. Silt:Gray brn. soft. Sandy silt: Tan, soft & indurated Sand is fine. Sandy clay w/gypsum: Gray brn, soft & indurated. Sand is fine, sugary gypsum. Clay: Brn, soft & indurated.	well 16 Dec 1962 well 16 Dec 1962 water-bearing Formation, Cus Perforatious. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105; Other aquifers 78 to 105; 605 to 610 First water at 78! f Casing performed
Type of well feet 0' 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410'	rigDril feet 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410'' 436'	Led w/ro LoG Thickness feet 17 7 16 40 10 10 50 165 15 45 10 25 26	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L (OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limestone gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: Tan, soft & indurated. Clay: Tan, soft & indurated. Clay: Gray brn. Soft. Silt:Gray brn. soft. Sandy silt: Tan, soft & indurated Sand is fine. Sandy clay w/gypsum: Gray brn, soft & indurated. Sand is fine, sugary gypsum.	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cua Perforations. Etc. Chief aquifer (water-bearing formation) from 664 to 694 Other aquifers 78 to 105; Other aquifers 78 to 105; Other aquifers 78 to 105; First water at 78 to 105; Casing perforated from 274' to 674' Size of perforations Horizontal Louvier
Type of well From feet 0' 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410' 436'	rigDril feet 17' 24' 40' 80' 90' 100' 150' 315' 330' 375' 385' 410'' 436' 445'	Led w/ro LoG Thickness feet 17 7 16 40 10 10 50 165 15 45 10 25 26 9	Nov. 1962 Date of completion of tary rig(mud type); swabbed w/36L (OF FORMATIONS of Well "B" Type of material Clay: Tan & soft Caliche w/gravel: White, limestone gravel to:2" Caliche: White to buff, firm Clay & Caliche: White & tan, soft Clay w/gypsum: Tan, soft sugary gypsum. Clay: tan, soft. Caliche: White & buff, soft. Clay: tan, soft & indurated. Clay: Tan, soft & indurated. Clay: Tan, soft & indurated. Clay: Gray brn. Soft. Silt:Gray brn, soft. Sandy silt: Tan, soft & indurated Sand is fine. Sandy clay w/gypsum: Gray brn, soft & indurated. Sand is fine, sugary gypsum. Clay: Brn, soft & indurated. Sandy Silt: Gray brn, soft; sand	well 16 Dec 1962 well 16 Dec 1962 Water-bearing Formation, Cus Perforations, Etc. Chief aquifer (water-bearing from 664 to 694 Other aquifers 78 to 105; Other aquifers 78 to 105;

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~			1	LOG OF FORMAT	FIONS-Continued 13
.an Joet	To feet	Thickness			Type of material
560'_ 620' 650' 680' 700'	- 120' 650' 680' 700' 1000'	60 30 30 20 300	Silt & Clav: L Clay: L Clay w/ clay st 694' to	clay: Brn & t gray & tan t gray, soft gypsum: Gray reaks are ve 1000' only	. gray streaks, soft gray, soft. Silt is brn & classfray & front tre , soft. & indurated Streaks. Well completed @ 694'. & greenish gray, soft & indurated streaks, s ry lean. Gypsum if of the Selenite (platy) va opened by drilling 124" pilot hole. Not opene h water from gypsum as shown by electric log.
				CASING F	RF(()P1)
Diam. casing	From	To feet	Length		"Remarks"—Seals, Grouting, Etc.
30"	2'above G.S.		52 '	Surface	casing grouted entire depth.
14"	2' above . G.S.	694'	69v'	Cravel p	ed from 274' below G.S. to 675' below G.S. Jacked well using 3/8" max. gravel cubic yard of gravel.
					mping Test. Quality of Water, Etc.
·····	c W.L. 72				le & contained 446 PPM total dissolved molids
	<u>tle high</u> M w/55'		<u>ide (1.7</u> 500	<u> </u>	
360 "	" 90 '	ħ	640	" "_166'	
420 "	" 97 '	- 11	740	" " 196'	DD, Sauding condition
This we above i belief.	ell was dril	led under	TATEMENT my jurisdict my best info	ion and the prmation and	(Not to be filled in by Driller)
		7	Well Driller	<u>nent Co</u> ,	DECEIVED -
	Ву			B	MAR 26 1963
Dated.	Mari				DIV, OF WATER RESOURCES

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•	WELL DATA
/ELL #B	FACILITY # 1713
OCATION Nellis AFB	
ATE DRILLED 1963	DEPTH697'
RILLER Pet Thompson PHELPS	PUMP REQUIP. CO., LAS VEGNO
OTTOM ELEVATION 1116' TOP 197	28" 28"
	CASING DIAMETER 14"
ASING PERFORATIONS 274' to 5	
COLUMN SIZE 6"	GAGE LINE NO
UMP SETTING 220'	PUMP STAGES 7
	ohnson Turbine
ERIAL # TU 2255	
YPE SHAFT LUBRICATION OIL	
MOTOR: MANUFACTURER U.S M	
IP AND VOLTAGE 40 220-440	TRANSFORMER CAPACITY 3-18 KVA 14
UXILIARY ENGINE: DES CRIPTION	None
VELL HOUSED IN BUILDING No	nø
	1963 LATEST PRODUCTION 282 December 1971
WILDE FROIDE CLION, OF M	LEGEMDER INCLUSION 604 DECEMDER 19/1

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•	Project3	WATER LEVEL C PERIODIC MEA	SUREMENTS	Local (1) Number $\frac{2}{3}$ (3) $\frac{20}{1}$ E (22) $\frac{1}{8}$ $\frac{1}{5}$	
	Name		·	MP:1.0	ft above LSD
			tion and sketc		
	Station ID (lat	-long)			- 1
	2. 1. 1		2 2	2	
	5	19 WATER LEV	EL, IN FT	5	
	DATE	BELOW		BY REMA	DKC
	(mo/day/year) 3/0//1977	HOLD WET THE BE		77.	
	3/ 1/19-1		. 7.87		·
	. / / 19 > 1	110 3.34 101.16	100.66 5	S DW Not among &	Stada
	52/26/1980	115 -1.55 93.95	92.95 5	DW last and	The ZITL .
	02/26/1981	131.0 32.07 98.93	97.93 5	Dw rooil intope	· · · · ·
	12.10211982	10°.0 12.6 10°.0 12.6 12.7 92.74	 _ _		
	/ /19	15: 5 13: 92 74	91.14	S DW/15 no oil of	5 hours
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	/ /19	┥ - ┝	╶┈───┼──┨┠╼┨┠╸	-{	
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	<u> </u>		<u> </u>	3	
	KEY PUNCHING	INSTRUCTIONS: Duplica	itë col. 5-33 f	or all cards	and the second
		R=234*T=A*23	35# (1) #237	7= ③ * 238= ④	*239= 0
	5	19 20	34 44	49 56 61	62 67.WBET
	D-drv F-flow	B-obstruction T-nea ing P-pumping fec	rby. ently pumped	Location sketch	1. 2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
	C Site G-near C Site fior	by. R-recently - V-for	elan substance		
	L'status H-near rece		face water ects		
	flow	ing 2000		1	
	Method A-alr DD of c-call	ilne R-reported T-e brated S-steel tape Z-o llne	lectric tape	· ·	
	measure-alr ment	line 		J	
<u></u>	Punched	EnteredC	hecked		
	Local Well No.			1	
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WE		C-AND		Log No
	i	ENGINE	ER OF NEVADA $\#/4$	Well Ne
	PLEA	AB COMPLE	TE THIS FORM IN ITS ENTIRETY	De une All in
	Nellis A	FB	Driller Phelps Put	mp & Equipment Co.
	Neilis A	FB, Nevad	Address 400 E. Co	11ege Ave. N. Las Vegas, Ne
Location of		4.SH 1/ 5		•
Army	Coordin	ates: NS3	4, 991.66 E 654, 108.48 G.S. Elev.	1826.6'
Water will 1	e used for.	Domes	ticTotal depth	of well650 '
Size of drill	ed bole_1	21 (pilot	.) & 285" Weight of casing per l	linear foot
				74 ^{0 F}
		casing 14'	1 1D Single wall 2' above G.S. to	650' below G.S.
•	-		•• ••	د چې د کې وې وې د مېلې کې د وې وې وې وې وې وې وې وې وې وې وې وې وې
If soafewin	g well give	depth of star	nding water from surface. 70' below G.S.	•
If flowing w	wil describe	control wor	ta(Troe sad size of Y	alve. etc.)
Date of com	un en cement	of well		f well 29 Jan. 1963
Type of we	N rig. Drij	led w/ro	tary (mud) rig; swabbed w/36 L cabl	le tool rig.
		LOG	OF FORMATIONS of Well " A "	
From fast	To	Thickness feet	Type of material	Water-bearing Formation, Casing Perforations, Etc.
0' 25'	25' 40'	25 15	Clay & Caliche: Tan, firm Sand, gravel & clay:Tan, limeston gravel to 1% " size.	E 4 0 4 0 1
40 '	100'	60	Clay w/Caliche: Tan & buff, soft	
100'	120'	20	Caliche: Buff, indurated.	Other squifers 188' to 210'; 292' to 316'
120'	430 '	310		434' to 470'
430 '	5301	100	Clay w//gypsum streaks: Brn, soft	4851 4- 5301
530'	560'	30	Clay: Lt brn, soft to indurated.	, 110 A
200.	595	35	gray, soft w/indurated streaks.	First water at feet
5951	620'	25	Clay: Brn, greenish, gray, soft,	1
		{	wood.	Casing perforsted
				Bise of perforations Horizontal Louvier 1/8"x3
·				staggered rows 7-2/3" ap
		1		
			(0123)	111 m
	Oversion of Addreen Location of or <u>Arwy</u> Water will 1 Sine of drill Thickness of Diameter an If Sowing will forwing will forwing will forwing will forwing will forwing will forwing will forwing will forwing will forwing will	PIEA Owner: Nellis A Address Neilis A Address Neilis A Location of well: SH. SH. or Army Coordin Water will be used for. Size of drilled hole. Thickness of casing Diameter and length of If Sowing well give flow If somforwing well give flow If somforwing well give flow If somforwing well give flow If somforwing well rig. Diate of commencements Type of well rig. Drill Prom Too 100' 100' 120' 430' 430' 530' 560' 595'	ENGINE PLEASE CONFLE DIEASE CONFLE Neilis AFB Addreen Neilis AFB, Nevad Location of well: SH 45 SH 44 S or Army Coordinates: N53 Water will be used for Domes Size of drilled hole. 12% (pilot Thickness of casing 4" Diamster and length of casing 14' (Casing If flowing well give flow in e.f.a. or If souther well gi	WELL LOG AND REPORT TO THE STATE ENGINEER OF NEVADA #/4 PLEASS CONFLETE NEW FORM IN ITS ENTIRETT PLEASS CONFLETE NEW FORM IN ITS ENTIRETT Owner Hellis AFB Driller Pheips Pu Address CONFLETE NEW FORM IN ITS ENTIRETT Meiner Pheips Pu Main Millis AFB Driller Pheips Pu Address Conflicters: N534, 991.66 E 654, 108.48 C.S. Elev. Clark Army Coordinates: N534, 991.66 E 654, 108.48 C.S. Elev. Total depth Vase will be used for Domestic Total depth Sise of drilled bole. 121 (Dilot) & 284" Weight of casing per 1 Thickness of casing 4" Tamp. of water Total depth Dimester and length of casing 14" D Single wall 2' above G.S. tr (Casing U' is depth of sampling water from marian. 70' below G.S. If Soving well give dow is cla or gp.m. and pressure

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	To	Thickness		G OF FORMATIONS-Constance	-
				the second second second second second second second second second second second second second second second se	. 4
620'	635'	15	Clay v	w/gypsum: Brn, & lt gray, soft; Gypsum Mas sugary textu	
530'	703-		<u>Clay:</u> soft;	Lt. greenish gray, becoming darker w/depth; lean clay, only opened full size (283") hole to depth of 650'.	
	[•	
ļ			Botton	π υζ 28 ¹ 2" hole = 650'	
	ĺ			" 124" (pilot) hole = 703'	
]			<u> </u>	
				CABING RECORD	_
	frum (set	To feet	Length	"Remerks"Besis, Grouting, Etc.	
30"	2' ve G.	50'	52'	Surface casing grouted entire depth.	
14"	2'	6501	u52 '	Perforated from 200' to 630' below G.S.	
m D O	ve G.	P.		Gravel packed well using 3/8" max. gravel. Used 89. yards of gravel.	.2 Cu
		1	1		
			1		
			 		_
			-	FORMATION-Pumping Test, Quality of Water, Stc.	_
	-	lysis at	this tim	me. Conductance \$80 micromhos = approx 440 PPM	_
45 GPH w	/249'	lysis at DD - S	this tim anding co	me. Conductance 580 micromhos = approx 440 PPM ondition (fine gray)	_
45 GPM w 425 " "	-	lyeis at DD - S " - S	this tim	me. Conductance 580 micromhos = approx 440 PPM ondition (fine gray)	
45 GPH w 425 " " 50 " "	/249'	lyeis at DD - S " - S "	this tin anding co and free	me. Conductance 580 micromhos = approx 440 PPM ondition (fine gray)	
45 GPM w 425 " " 50 " " 15 " " 75 " "	<pre>/249* 249* 249* 249* 203* 203* 174* 164*</pre>	lysis at DD - S " - S H H	this tim anding co and free n " n "	me. Conductance 580 micromhos = approx 440 PPM ondition (fine gray)	
45 GPM w 425 " " 50 " " 15 " " 75 " "	<pre>/249* / 249* / 203* / 203* / 174* / 164* / 125*</pre>	lysis at DD - S " - S " "	this tim anding co and free n n n n	me. Conductance \$80 micromhos = approx 440 PPM ondition (fine gray)	
45 GPM w 425 " " 50 " " 15 " " 75 " " 75 " " 15 " WE WE	<pre>/249' ' 249' ' 203' ' 174' ' 164' ' 125' ELL DR mm drill</pre>	lysis at DD - S " - S " " " " " " " " " " " " " " " " " "	this tim anding co and free """ """ TATEMENT my jurisdic	T (Not to be filled in by Driller)	
45 GPM w 425 " " 50 " " 15 " " 15 " " 15 " " WE This well w bays inform	<pre>/249' ' 249' ' 203' ' 174' ' 164' ' 125' ELL DR mm drill</pre>	lysis at DD - S " - S " " " " " " " " " " " " " " " " " "	this tim anding co and free """ """ TATEMENT my jurisdic	T (Not to be filled in by Driller)	
45 GPM w 425 " " 50 " " 15 " " 15 " " 15 " W WE This well w above inform belief.	v/249' ' _ 42' ' 203' ' 174! ' 174! ' 164' ' 125' EIL DR mation I	lysis at DD - S " - S " " " " " " " " " " " " "	this tim anding co and free """ """ TATEMENT my juriadic sy best info & Equipt	T (Not to be filled in by Driller)	
45 GPH w 425 " " 50 " " 15 " " 15 " " 15 " " 15 " " 15 " " WE This well w above inform bellef. Sign	v/249' ' _ 42' ' 203' ' 174! ' 174! ' 164' ' 125' EIL DR mation I	lysis at DD - S " - S " " " " " " " " " " " " "	this tim anding co and free """ """ TATEMENT my jurisdic sy best info	T (Not to be filled in by Driller)	
45 GPM w 425 " " 50 " " 15 " " 15 " " 15 " W WE This well w above inform belief.	v/249' ' _ 42' ' 203' ' 174! ' 174! ' 164' ' 125' EIL DR mation I	lysis at DD - S " - S " " " " " " " " " " " " "	this tim anding co and free """ TATEMENT my jurisdic ay best info & Equipr Well Driller	T (Not to be filled in by Driller)	
45 GPM w 425 m m 50 m m 15 m m 75 m m 15 m m WE This well w ubove inform bellef. Sign By	<pre>v/249' ' 142' ' 203' ' 174.' ' 104' ' 125' ELL DR 'as drill nation I ''' '''' '''''''''''''''''''''''''''</pre>	Licens	this tim anding co and free """ TATEMENT my juriadic ay best info & Equipr Yell Driller	me. Conductance \$80 micromhos = approx 440 PPM ondition (fine gray) T (Not to be filled in by Driller) ction and the formation and ment Co. 99 MAR 25 1963	
45 GPM w 425 " " 50 " " 15 " " 75 " " 15 " " WE his well w bove inform sellef. Sign By	v/249' ' _ 42' ' 203' ' 174! ' 174! ' 164' ' 125' EIL DR mation I	Licens	this tim anding co and free """ TATEMENT my juriadic ay best info & Equipr Yell Driller	me. Conductance \$80 micromhos = approx 440 PPM ondition (fine gray) T (Not to be filled in by Driller) ction and the formation and ment Co. DECIVENT 99 MAR 25 1963 19.63 Construction RESOURCE	
45 GPM w 425 m m 50 m m 15 m m 75 m m 15 m m WE This well w ubove inform bellef. Sign By	<pre>v/249' ' 142' ' 203' ' 174.' ' 104' ' 125' ELL DR 'as drill nation I ''' '''' '''''''''''''''''''''''''''</pre>	Licens	this tim anding co and free """ TATEMENT my juriadic ay best info & Equipr Yell Driller	me. Conductance \$80 micromhos = approx 440 PPM ondition (fine gray) T (Not to be filled in by Driller) ction and the formation and ment_Co. 99 MAR 26 1963	
45 GPM w 425 " " 50 " " 15 " " 75 " " 15 " W WE This well w above inform belief. Sign By	<pre>v/249' ' 142' ' 203' ' 174.' ' 104' ' 125' ELL DR 'as drill nation I ''' '''' '''''''''''''''''''''''''''</pre>	lysis at DD - S " - S " " " " " " " " " " " " "	this tim anding co and free """ TATEMENT my juriadic ay best info & Equipr Yell Driller	me. Conductance \$80 micromhos = approx 440 PPM ondition (fine gray) T (Not to be filled in by Driller) ction and the formation and ment Co. Image: Condition of the filled in t	
45 GPM w 425 " " 50 " " 15 " " 75 " " T5 " " WE This well w ubove inform bellef. Sign By	<pre>v/249' ' 242' ' 203' ' 174.' ' 104' ' 125' ELL DR mation i mation i mation i said Phe 3/19</pre>	lysis at DD - S " - S " " " " " " " " " " " " "	this tim anding co and free """ TATEMENT my juriadic ay best info & Equipr Yell Driller	me. Conductance \$80 micromhos = approx 440 PPM ondition (fine gray) T (Not to be filled in by Driller) ction and the formation and ment Co. 99 19.63 BIV. OF WATER RESOURCE BIANCH CEPTCE BIV. OF WATER RESOURCE BIV. OF WATER RESOURCE BIV. OF WATER RESOURCE	

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WATER LEVEL CODING FORM (6-76) PERIODIC HEASUREMENTS Project L SD MP description and sketch: Station ID (lat-long) 201253 52 512 310 WATER LEVEL. IN FT DATE BELOW (mo/dav/vear) BELOW LSD HOLD BY VET TK NOW 22 112,73 130 <u>' 12:42</u> 16-3/(1/1976 . 1 7. . 1 1. 41 42.00 ТΚ 100 13.87 86,13 89.24 5 52/20/19 29 لنط 84.83 كاعسا 02/26/19 80 41.49 88.51 126/19 81 87.21 S Dw Elec fape mes = 90, 8 tap ; oil 1:0 22 1:0 81.50 82.70 S Durks off 1 month 1 11/19 -= /19 /19 /19 /19 /19 /19 1 /19 1 1 /19 /19 1 /19 /19 /19 1 /19 /19 /19 1 /19 /19 /19 /19 ତ୍ର ଚ 0 0 KEY PUNCHING INSTRUCTIONS: Duplicate col. 5-33 for all cards R=2344T=A235# 0 #237= 0 #238= 0 #239= 0 # 20 34 44 49 56 61 62 67 68 Ħ 61 62 68 D-drv F-flowing Location sketch: B-obstruction T-marby, recently pumped P- pump | ne V-forelen substance X-gurface weter effects Z-other R-recently summed G-marby. flowing ok for QW Estatus H-nearby recently flowing 5. marby. Pumping R-reported T-alectric tape S-steel tape Z-other Method A-biriine of C-calibrated leasure airline ment . Checked Punched Entered___ Local Well No. -- / 0-4 202 L 4.4

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WE	1	ENGINE	REPORT TO THE STATE ER OF NEVADA #/4	Log No
	Nellis Al	FB	Driller Phelps Pur	mp & Equipment Co.
drem	Neilis A	FB, Nevad	a Address 400 E. Co.	N. Las Vegas, N. Lic No.
cation of	well: SH			Cc
Army	Coordin	ates: N53	4, 991.66 E 654, 108.48 G.S. Elev.	1826.6'
ster will h	e used for	Domes	tic	of well
) & 28½" Weight of casing per 1	inear foot
				0 F
			g.p.m. and pressure	
flowing	vell describe	e control wor	ts(Type and size of ve	la eta)
late of cor	nmencement	ofwell	19 Dec. 1962 Date of completion of	
		. UI WCII		wc11
when of we	Il rie Dril	lled w/ro	tary (mud) rig; swabbed w/36 L cabl	le tool rig.
ype of we	ll rig Dril		tary (mud) rig; swabbed w/36 L cabl	le tool rig.
ype of we	To feet		tary (mud) rig; swabbed w/36 L cabl of formations of Well "A" Type of material	Water-bearing Formation, Caming Perforations, Etc.
From	To	LOG Thickness	OF FORMATIONS of Well "A" Type of material <u>Clay & Caliche</u> : Tan, firm <u>Sand, gravel & clay</u> :Tan, limeston	Water-bearing Formation, Casin; Perforations, Etc. Chief aquifer (water-bearing formation)
From feet	To feet 25'	LOG Thickness feet 25	OF FORMATIONS of Well "A" Type of material <u>Clay & Caliche</u> : Tan, firm <u>Sand, gravel & clay</u> : Tan, limeston gravel to l_2^{\pm} " size.	Water-bearing Formation, Casin, Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621
From feet 0' 25' 40'	To feet 25' 40' 100'	LOG Thickness feet 25 15 60	OF FORMATIONS of Well "A" Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to 1 ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated.	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210';
From feet 0 ' 25 '	To feet 25' 40'	LOG Thickness feet 25 15	OF FORMATIONS of Well "A" Type of material Clay & Caliche: Tan, firm Sand, gravel & clay:Tan, limeston gravel to 1 ¹ / ₂ " size. Clay w/Caliche:Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche:Tan, white & buff,	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210'; 292' to 316'
From feet 0' 25' 40' 100'	To feet 25' 40' 100' 120'	LOG Thickness feet 25 15 60 20	OF FORMATIONS of Well "A" Type of material Clay & Caliche: Tan, firm Sand, gravel & clay:Tan, limeston gravel to 1 ¹ / ₂ " size. Clay w/Caliche:Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche:Tan, white & buff, soft to indurated.	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers 188' to 210'; 292' to 316' 434' to 470'
From foot 0' 25' 40' 100' 120' 430'	To feet 25' 40' 100' 120' 430' 530'	LOG Thickness feet 25 15 60 20 310 100	OF FORMATIONS of Well " A " Type of material Clay & Caliche: Tan, firm Sand, gravel & clay:Tan, limeston gravel to 1½ " size. Clay w/Caliche:Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche:Tan, white & buff, soft to indurated. Clay w//gypsum streaks: Brn, soft to indurated. Sugary texture gyps	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210'; 292' to 316' 434' to 470'
From feet 0' 25' 40' 100' 120'	To feet 25' 40' 100' 120' 430'	LOG Thickness feet 25 15 60 20 310	OF FORMATIONS of Well "A" Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to l ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche: Tan, white & buff, soft to indurated. Clay w/gypsum streaks: Brn, soft to indurated. Sugary texture gyps Clay: Lt brn, soft to indurated. Clay w/gypsum: Brn & 1t greenish	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210'; 292' to 316' 434' to 470' 485' to 530'
From foot 0' 25' 40' 100' 120' 430' 530' 560'	To feet 25' 40' 100' 120' 430' 530' 530' 560' 595'	LOG Thickness feet 25 15 60 20 310 100 30 35	OF FORMATIONS of Well "A" Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to l ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche: Tan, white & buff, soft to indurated. Clay w/gypsum streaks: Brn, soft to indurated. Sugary texture gyps Clay: Lt brn, soft to indurated. Clay w/gypsum: Brn & lt greenish gray, soft w/indurated streaks. Gypsum has a sugary texture.	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210'; 292' to 316' 434' to 470' 485' to 530' Im. First water at
From foot 0' 25' 40' 120' 430' 530'	To feet 25' 40' 100' 120' 430' 530' 560'	LOG Thickness feet 25 15 60 20 310 100 30	OF FORMATIONS of Well " A " Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to 1 ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche: Tan, white & buff, soft to indurated. Clay w/gypsum streaks: Brn, soft to indurated. Sugary texture gyps Clay: Lt brn, soft to indurated. Clay w/gypsum: Brn & 1t greenish gray, soft w/indurated streaks. Gypsum has a sugary texture. Clay: Brn, greenish, gray, soft, clay, some decayed pieces of blace	Water-bearing Formation, Casing Perforationa, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210'; 292' to 316' 434' to 470' 485' to 530' m. First water at
From foot 0' 25' 40' 100' 120' 430' 530' 560'	To feet 25' 40' 100' 120' 430' 530' 530' 560' 595'	LOG Thickness feet 25 15 60 20 310 100 30 35	OF FORMATIONS of Well "A" Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to l ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche: Tan, white & buff, soft to indurated. Clay w/gypsum streaks: Brn, soft to indurated. Sugary texture gyps Clay: Lt brn, soft to indurated. Clay w/gypsum: Brn & lt greenish gray, soft w/indurated streaks. Gypsum has a sugary texture. Clay: Brn, greenish, gray, soft,	Water-bearing Formation, Casing Perforationa, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210'; 292' to 316' 434' to 470' 485' to 530' m. First water at
From foot 0' 25' 40' 100' 120' 430' 530' 560'	To feet 25' 40' 100' 120' 430' 530' 530' 560' 595'	LOG Thickness feet 25 15 60 20 310 100 30 35	OF FORMATIONS of Well " A " Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to 1 ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche: Tan, white & buff, soft to indurated. Clay w/gypsum streaks: Brn, soft to indurated. Sugary texture gyps Clay: Lt brn, soft to indurated. Clay w/gypsum: Brn & 1t greenish gray, soft w/indurated streaks. Gypsum has a sugary texture. Clay: Brn, greenish, gray, soft, clay, some decayed pieces of blace	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210'; 292' to 316' 434' to 470' 485' to 530' m. First water at. 70' fee: ean Casing perforated
From foot 0' 25' 40' 100' 120' 430' 530' 560'	To feet 25' 40' 100' 120' 430' 530' 530' 560' 595'	LOG Thickness feet 25 15 60 20 310 100 30 35	OF FORMATIONS of Well " A " Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to 1 ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche: Tan, white & buff, soft to indurated. Clay w/gypsum streaks: Brn, soft to indurated. Sugary texture gyps Clay: Lt brn, soft to indurated. Clay w/gypsum: Brn & 1t greenish gray, soft w/indurated streaks. Gypsum has a sugary texture. Clay: Brn, greenish, gray, soft, clay, some decayed pieces of blace	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers. 188' to 210': 292' to 316' 434' to 470' 485' to 530' Im. First water at
From foot 0' 25' 40' 100' 120' 430' 530' 560'	To feet 25' 40' 100' 120' 430' 530' 530' 560' 595'	LOG Thickness feet 25 15 60 20 310 100 30 35	OF FORMATIONS of Well " A " Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to 1 ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche: Tan, white & buff, soft to indurated. Clay w/gypsum streaks: Brn, soft to indurated. Sugary texture gyps Clay: Lt brn, soft to indurated. Clay w/gypsum: Brn & 1t greenish gray, soft w/indurated streaks. Gypsum has a sugary texture. Clay: Brn, greenish, gray, soft, clay, some decayed pieces of blace	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers 188' to 210'; 292' to 316' 434' to 470' 435' to 530' m. First water at 70' fee: ean Casing perforated from 290' to 630' Size of perforations Horizontal Louvier 1/8"x:
From foot 0' 25' 40' 100' 120' 430' 530' 560'	To feet 25' 40' 100' 120' 430' 530' 530' 560' 595'	LOG Thickness feet 25 15 60 20 310 100 30 35	OF FORMATIONS of Well " A " Type of material Clay & Caliche: Tan, firm Sand, gravel & clay: Tan, limeston gravel to 1 ¹ / ₂ " size. Clay w/Caliche: Tan & buff, soft & indurated. Caliche: Buff, indurated. Clay & Caliche: Tan, white & buff, soft to indurated. Clay w/gypsum streaks: Brn, soft to indurated. Sugary texture gyps Clay: Lt brn, soft to indurated. Clay w/gypsum: Brn & 1t greenish gray, soft w/indurated streaks. Gypsum has a sugary texture. Clay: Brn, greenish, gray, soft, clay, some decayed pieces of blace	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 562 to 621 Other aquifers 188' to 210'; 292' to 316' 434' to 470' 435' to 530' m. First water at 70' fee: ean Casing perforated from 290' to 630' Size of perforations Horizontal Louvier 1/8"x:

				G OF FORMATIONS-Continued
1000. 111	To feet	Thickness		Type of material
620	635'	15	Clay w/	gypsum: Brn, & lt gray, soft; Gypsum Mas sugary texture.
6301	703 '		Clay: L	t. greenish gray, becoming darker w/depth; lean clay.
			soft; o	mly opened full size (282") hole to depth of 650'.
				r
			Buttom	of $28\frac{1}{2}$ " hole = 650'
			"	" $12\frac{1}{2}$ " (pilot) hole = 703'
				- ·• / · · · · · · · · · · · · · · · · ·
				CASING RECORD
Diam. casing	From feet	To feet	Leugth	"Remarks"—Seals, Grouting, Etc.
30"	2' above G.	50'	52*	Surface casing grouted entire depth.
14"	2' above G.	650'	6521	Perforated from 200' to 630' below G.S. Gravel packed woll using 3/8" may gravel Mood 80.2 Cur
				Gravel packed well using 3/8" max. gravel. Used 89.2 Cu yards of gravel.
	i 	<u></u>		
		G:	ENERAL INFO	ORMATION—Pumping Test, Quality of Water, Etc.
		Jucio		Conductore 500 -tomotor - 440 TOM
				e. Conductance 580 micromhos = approx 440 PPM
445 GP	M w/249	DD - S		e. Conductance 580 micromhos = approx 440 PPM ndition (fine gray)
445 GP	M w/249	' DD - S ' .'' - S	anding con	
445 GP 425 " 350 " 315 "	M w/249 " 242 " 203 " 174	DD - S S 	anding con and free """	
445 GP 425 " 350 "	M w/249 " 242 " 203 " 174 " 164 " 125	DD - S 	anding con and free """ """	ndition (fine gray)
445 GP 425 " 350 " 315 " 275 " 215 "	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D	DD - S S 	anding con and free """ """ STATEMENT	(Not to be filled in by Driller)
445 GP 425 " 350 " 315 " 275 " 215 " This we above it	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D cell was dri	DD - S '_'' - S '''' ''' ''' RILLER'S S Illed under	anding con and free """ """	(Not to be filled in by Driller)
445 GP 425 " 350 " 315 " 275 " 215 " This wo	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D cell was dri information	DD - S ' '' - S ' '' ' '' RILLER'S S lled under is true to	anding con and free """ """ STATEMENT my jurisdiction my best infor	on and the rmation and
445 GP 425 " 350 " 315 " 275 " 215 " This we above it	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D cell was dri information	DD - S ' '' - S ' '' ' '' RILLER'S S lled under is true to	anding con and free """ """ """ STATEMENT my jurisdictio	on and the rmation and
445 GP 425 " 350 " 315 " 275 " 215 " This we above it	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D ell was dri information Signed Ph	DD - S -	anding con and free """ """ """ """ """ """ """ """ """	on and the mation and ent Co.
445 GP 425 " 350 " 315 " 275 " 215 " This we is	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D cell was dri information Signed Ph By	DD - S -	anding con and free """" """" STATEMENT my jurisdiction my best infor SEQUIPMENT Well Driller	on and the rmation and ent Co. 99 MAR 26 1963
445 GP 425 " 350 " 315 " 275 " 215 " This we is	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D ell was dri information Signed Ph	DD - S -	anding con and free """ """ """ """ """ """ """ """ """	(Not to be filled in by Driller) on and the rmation and ent Co. 99 MAR 25 1963 MAR 25 1963
445 GP 425 " 350 " 315 " 275 " 215 " This we above is belief.	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D cell was dri information Signed Ph By	DD - S -	anding con and free """" """" STATEMENT my jurisdiction my best infor SEQUIPMENT Well Driller	on and the rmation and ent Co. 99 MAR 26 1963
445 GP 425 " 350 " 315 " 275 " 215 " This we above is belief.	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D cell was dri information Signed Ph By	DD - S -	anding con and free """" """" STATEMENT my jurisdiction my best infor SEQUIPMENT Well Driller	on and the rmation and ent Co. 99 63 BIV: OF WATER RESOURCES reanich GFRICE
445 GP 425 " 350 " 315 " 275 " 215 " This we above is belief.	M w/249 " 242 " 203 " 174 " 164 " 125 WELL D cell was dri information Signed Ph By	DD - S -	anding con and free """" """" STATEMENT my jurisdiction my best infor SEQUIPMENT Well Driller	(Not to be filled in by Driller) on and the rmation and ent Co. 99 MAR 26 1963 BIV: Of WATER RESOURCES PRANCH CEFICE LAS VEGAS, NEYMAA

0	WATER LEVEL C PERIODIC MEA	SUREMENTS	Local Cell Number	(6-
Project			1.2 (S.2) E. (0.2 - C 1.A. Se 	City 2
Name/		- · · ·	HP:F	t above LS
		tion and sket		
Station ID (lat-long)			t
2012 50 523	10.1	s	8	
5	19 WATER LEV	EL, IN FT	ethod	
DATE (mo/day/year) <u>HQL</u>	WET HP BI			KS
1-119-7 1-1	11-22 12,73	112.42	TK FUE been	the near
3/11/1975	7.11.1 -			
02/26/19 80 100	<u>) 13.87 86.13</u>	84.83	5 <u>m</u>	
126/1981	<u>41.49</u> 88.51		S DW Electope meas= 90.	8 bmp; oil
0:1:19-2			S DUILS off 1 month	
/ /19				;
/ /19			┝-┥ <i>──</i> ·──	
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34 3 44		49 <u>56</u> 61	67	
· · · · · · · · · · · · · · · · · · ·			والمستقاعات والمراكبة الأركام والتشاعية والمجرو والمعاوي	
······································	RUCTIONS: Duplica			
<u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u>	R=234*T=A*2	35# (2) *2: 34 44	<u>37=</u> ③ <u><u>*</u>238= ④ 49 56 61</u>	<u> :239=</u> 62 67
D-dry g	Fobstruction T-nea	rby.	Location sketch:	· · ·
F-flowing F	-pumping fec	ently pumped elen substanc		
Estatus flowing	pumped X-sur S-nearby, efi	face water lects		
flowing	pumping Z-oth		_	
Method A-airline E of C-Calibrate	R-reported T-e d S-steel tape Z-o	isciric tape ther		
measure- airling ment	- 3 3 9 9 7 7 7 1 6 P C 2 9		_ .	
		hecked	= ·	
Local Well No.	- 4 1021			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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WELL LOG AND REPORT TO THE STATE ENGINEER OF NEVADA

Dest Mailia Air Force Pase	Drille Allen Mater Mell	SErvice Co.
Adama I an Vinna Vievada	Addres 211 Maryland Pky.	Lie. No. 40
ocetion of well: II. 4.33.4 Sec. 3., T. 20N/S, R.62.E.	ia	Coast
1		
Water will be used for - QUASI-MUNICIPAL	Total depth of well	
size of drilled hole. 20"	wight of cosing per linear foot 47.7	

1747

Permit No.

9/2/2

13765

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Diameter and length of casing 20" T. D. 09: with 12" machine cerforeted liner from top to botter (Casing 12" in diameter and under give inside diameter; casing 12" in diameter give outside diameter.

If flowing well give flow in c.f.s. or g.p.m. and pressure.

7/76"

Think

m of a

(Type and size of valve, etc.)

Date of completion of well 117 5 1051 Date of completion of well 107, 2, 1051

Type of well rig. Stan 72 Snuddan

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		LOG	OF FORMATIONS	
From	To	Thickness feet	Type of material	Perforations. Etc.
Ç	~	7	ion soil	
7	£3	61	clrv	Chief aquifer (water-bearing
KA .	~∠	~		formation)
74	-			tron 120 to 125 rt
77	- <u>26</u>	.2c	jel ny	
105	110	L.	glay A -powel	Other aquifers 128 - 116
יוכ	115		water crowel	100 - 107 - 004 - 209
115	11=1	42		
1=:	1125			215 - 250 2/5 - 265
12=	202	1 5	21-7	
רסר	67	7	Water Tanens J	
107	,204	7	[*1 * 7	
204	229	Ŀ	weter merel	
3C.c	1370	72	1-1-2-4	First water at 42 feet
240	572		alen a momole	
245	250	=	inton mercal	
350	26=	i e	111rw	Casing perforated
	540	7	wator meno]	tron 120 to 300 t
263	573	10	01er	ITTER
279	252	4	wator merel)
26?		13	clev	Size of perforations
50E	202	7	water kravel)	
50 -	1300	2	clev N	7/16 × 1 1/4 77/2"
			1	
		ſ	1	between powe
	C7 74 77 1017 11707 2004 2004 2007 2007 2007 2007 2007 2	finit finit C 7 7 63 74 77 74 77 76 110 110 116 111 116 112 177 100 106 101 177 102 204 204 210 204 210 204 210 204 210 204 210 204 210 204 210 205 240 240 240 250 240 264 278 265 268 268 278 269 265 262 265 265 265 265 265 265 265	Twit Soit Left C 7 7 7 7 4.3 61 61 7.4 77 7 6 7.4 77 7 6 7.4 77 7 6 7.6 20 110 4 110 116 6 116 114 117 42 1 127 177 100 10 107 201 7 202 107 201 7 202 210 7 202 204 212 7 202 204 212 7 202 244 250 7 10 245 245 12 12 263 273 10 263 263 273 10 265 265 265 13 205 205 205 205	Number Fail Annual 0 7 7 for soil 7 63 61 olry 74 77 7 eningel 77 76 20 eline 74 77 7 eningel 77 76 20 eline 106 110 4 eline 111 110 4 eline eline 112 110 4 eline eline 116 117 12 eline eline 117 100 107 eline eline 107 201 7 eline eline 202 210 7 eline eline 204 240 240

	•		LOG OF FORMATI	ONB-Continued	
From	To	Thickness		Type of material	
	_				
					(
·				•	
	l	· ·	Ŀ		
•			-		
					•
			CAEDIG 2	BCORD	•
Diam. casing 20" 2"	Prom Sec C 3	80 300	Cash 08 207 1/4" 3/16" 3/	Tennin frein, Greing En. ented in place with 100 sects streigh & 3 wards of ceme	nt geme mt ero
				· · · · · · · · · · · · · · · · · · ·	
		1		· · · · · · · · · · · · · · · · · · ·	. (
		GE	NERAL INFORMATION Pure	ping Test, Quality of Water, Ste.	. `
		، دور م	/a" - 1/4" -marel	to with in 20 feet of the ton.	
	<u> </u>				-
				· · · · · · · · · · · · · · · · · · ·	-
			· · · · · · · · · · · · · · · · · · ·	····	•
·					-
	WELL D	RILLERS ST	TATEMENT	(Not to be filled in by Driller)	
This w	ell was dri	illed under a	my jurisdiction and the		-
			t information and belief.		-
	Signed -	El.	Balle_		-
	-	Well	Drifler		-
	By			•	-
			No. 4C		-
atod	ive. Po		ISET DEFICE	· · · · · · · · · · · · · · · · · · ·	- ,
				· · · · · · · · · · · · · · · · · · ·	_ (
			25 25 51		-
			RECEIVED		:
			Celve D.	,	

in Se -.

WELL LOG AND REPORT TO T ENGINEER OF NEVAL	-	KOE AQ 747 Re: 727 Well No. 314 Permit No. 1765 Do not All in
Owner Malling 14 n Jonna Baso	Driller 17 cn liste	on voll convine to
Address 101 Varia Verrada	Address 221 Yanyla	Lic. No. 40
Location of well: NZ14 SZ 14 Sec. 3, T 20.N/S, R 62.1	E, in	
OT		
Water will be used for - 2uasi-municipal	Total depth of w	rell
Size of drilled hole. ? C "	Weight of casing per linear	foot <u>1</u> ,7
Thickness of casing 7/76"	Temp. of water	· · · · · · · · · · · · · · · · · · ·

Diameter and length of casi	ng 20" -	<u>- c3! :</u>	<u>.1+> 12"</u>	<u>mantine</u>	renfor	ten linen	from tor
th Sotter -	(Casing 12" in	diameter and	under give in	side diameter;	casing 12"	in diameter give o	outside diameter.
If flowing well give flow in	- fo						
It nowing wen give now in	. c.i.s. or g.p.m.	and pressure					

If flowing well give flow in c.f.s. or g.p.m. and pressure
If nonflowing well give depth of standing water from surface -17!
If flowing well describe control works
(Type and size of valve, etc.)

Date of commencement of well

Type of well rig Stor 20 Snuddon

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•		LOG	OF FORMATIONS	
From feet	To feet	Thickness feet	Type of material	Water-bearing Formation, Cosing Perforations, Etc.
•	-	-	~~ ~~ ~	
• .	17			Chief aquifer water-beating
. 1	- -	2	ar 1 a 5	formation
7 L	~~		-merej	from to f
~	• - 2	<u> </u>	07	 I
122		<u>/</u>		Other aquifers ->F 6
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0			the former of the second second second second second second second second second second second second second se	nn
200		70		First water at
_^	~ -	, ר	Contraction -	i Flist water at this intert.
2-	~ ~ ~	-	the the second second second second second second second second second second second second second second second	
5 -		<u>`</u>	07 4 **	Casing perforated
c -	1 D A D	i -	···nten -ne····?	
6 T.	:	1 -] e - •	from
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20	- 0 C E	7 2	ojev j	Size of perforations
c,∝	1305	7	L'ar with the second of the second	
o F	700	i,	0107	- /- / · · · / /0"
	1			
	T	i	'	
	* 1	s L	4	
	1	4	1	
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			() (327 ())	

]	LOG OF FORMATION	IS-Continued			
From feet	To	Thickness			Type of material			
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		-						-
	1							
	ļ							
		<u> </u>		CASING BEC				
Diam.	From	To	Length		"Remarks"-Seals, (Groating. Etc.		
casing	feet	feet C-F	c =	7/16" 10-00	ter in nices w	· + '] []	سم ما به کم فام سبا م	• •
0"	! -	700	207	1/4"		6 7 vener of	<u>acrori</u> an	
		1	1					
	i		1					
							(9
					g Test, Quality of Water			<u> </u>
incre]					g Test, Quality of Water		{	1
increl	<u></u>						(1
::::::::::::::::::::::::::::::::::::::					- 118+5 - 20 00 4		(
					- 118+5 - 20 00 4		(
::::::::::::::::::::::::::::::::::::::					- 118+5 - 20 00 4		(11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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This w	WELL D	RILLERS ST	TATEMENT	n / ½ " → → → → →	- ,,+++, +,		(
	WELL D well was dr	RILLERS ST	TATEMENT my jurisdic	tion and the	- ,,+++, +,		······································	
	WELL D well was dr rmation is t	RILLERS ST illed ender 1 rue to my bes	FATEMENT my jurisdic gt informatic	n / ½ " → → → → →	- ,,+++, +,	be filled in by Driller)		
	WELL D well was dr	RILLERS ST illed ender 1 rue to my bes	TATEMENT my jurisdic	tion and the	(Not to b	be filled in by Driller)		
	WELL D well was dr rmation is t	RILLERS ST illed ender a rue to my bes Fell	TATEMENT my jurisdic at informatic Drifler	tion and the	(Not to b	be filled in by Driller)		
	WELL D well was dr rmation is t Signed	RILLERS ST illed ender a rue to my bes Fell	TATEMENT my jurisdic at informatic Drifler	tion and the	(Not to b	be filled in by Driller)		
ove info	WELL D well was dr rmation is t Signed	RILLERS ST illed under i rue to my bes Well Liceh	TATEMENT my jurisdic at informatic Drifler	tion and the	(Not to b	be filled in by Driller)		
ove info	WELL D rell was dr rmation is t Signed By	RILLERS ST illed under i rue to my bes Well Liceh	TATEMENT my jurisdic at informatic Drifler se No.	tion and the	(Not to b	be filled in by Driller)		
ove info	WELL D rell was dr rmation is t Signed By	RILLERS ST illed under i rue to my bes Well Liceh	TATEMENT my jurisdic at informatic Drifler se No.	tion and the	(Not to b	be filled in by Driller)	· · · · · · · · · · · · · · · · · · ·	
ove infor	WELL D rell was dr rmation is t Signed By	RILLERS ST illed under i rue to my bes Well Liceh	TATEMENT my jurisdic at informatic Drifler se No.	tion and the	(Not to b	be filled in by Driller)		
ove infor	WELL D rell was dr rmation is t Signed By	RILLERS ST illed under i rue to my bes Well Liceh	TATEMENT my jurisdic at informatic Drifler se No.	tion and the	(Not to b	be filled in by Driller)		

Owner.	a fed	31010	Gir Force Dille	Do not 18 in
Address	1017	Terrs S	treet 1125	13 Street
Location o	e - i , N M	- Yolal Y	Sm.3., T2C,X/S, 162E, b	2
			<u>rse ell' 10</u>	
Water will	be used for.	<u>in si</u>	-muicirel Total dept	of well <u>14971</u>
Size of dri	lled hole	20	inch Weight of cosing per	lieser foot 57 pounds
Thickness	of coming	<u>1/4 - El</u>	1Temp. of webs	72 deg.
Diameter a	and length of	casing	16° - 1397' 20° - 100'	alag 197 in Alexandra alan antaida
			Char and business the stress free stress or theme.	
-	-		nding water from surface	
	well describe		b	
-			(Type and she of v	March 00 1007
	Researched t		8/13/56Data of completion of	will March 28, 1957
Type of w	ell rigic			
		LOG	OF FORMATIONS	Water-bearing Pormation, Parformtions, Etc.
Prom fast	To Bast	foot	Type of material	
5′	29'	エチ	Beliche	Chief aquifur (water-bear formation)
=9'	75'	66	Blog & Coliche	1020 to 1100
75'	505		Brown + Wh. T- Eluy	Other senttern 420 to 43
	1		Erom + vilete	740 to 755
•	117.66		+ 8109 8/04	1230 to 1230
305			TUP UT	1250 to 1260
305			a set and	
305	1050	5-01	Brown elay with sound	1300 to 1320
305	1050	5-01	Brown Clay W. the sind	1300 to 1320 First water at 68
305' ;000 ;2-5 C'	1050	601 60	Brown Clay W. the sind Brown Clay Band White + Blue Elay	
305'	1050	601 60	Brown Clay With End Brown Clay Baind White + Blue Elay Blue Elay Brown	First water at <u>68</u> Casing performined from <u>100</u> to <u>600</u>
305' ;000 ;2-5 C'	1050	601 60	Brown Clay W. the sind Brown Clay Band White + Blue Elay	First water at <u>68</u> Casing performed

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ona To st Shot Ti	hiernes .	Type of material	
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				CARING RECORD
Diam. ensing	From fast	To fast	Langth	"Bemarks"-Seals, Growting, Be.
16" 20"	100	1497	1397 100	Grouting from 0 to 100'

GENERAL INFORMATION-Pumping Test, Quality of Water, Etc.

Test, Pumping- Bowl setting 350"

Gals. per minute pumped - 400

Pumping Test - 93 hours

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WELL DRILLER'S STATEMENT

This well was drilled under my jurisdiction and the above information is true to my best information and belief.

Sig Dema £15 295 19-58

(Not to be filled in by Driller)
OFFICE STA E ENGINEER
1958 JAN 22 AM 10 55
1926 JAN 22 AN U 37

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	ELL LO		D REPORT TO THE STATE	Rec. 104 22. 196 Well No.
ARTI		ENGIN	EER OF NEVADA	Permit No. 14 936
	i. to d	Stote	: 411 Force	Do not fill in
Owner			Driller	
Address		<u></u>	Address	Lic. No
Location o	f well;NM	HALLY	Soc. 2. , T24 N/S, R62 E, in	C
			<u></u>	
			Total dept	
			.i.c.:	
			Temp. of water	
	-		-	
Diameter a	nd length of	casing	16" - 1397" 20" - 100" 12" in diameter and under give inside diameter; co	asing 12" in diameter give outside diame
If flowing	well give flow		g.p.m. and pressure	
-	-		nding water from surface	
II nowing	well describe	CONTOL MO	rks(Type and size of v	ralve, etc.)
Date of con	mmencement	of well	3/13/56 Date of completion of	well March 22, 1957
Type of w	ell rig	otary		
	<u> </u>	LOG	OF FORMATIONS	
	To	Thickness	Type of material	Water-bearing Formation. Casing Perforations, Etc.
From		feet		
feet	feet		و با ته	
	reet			Chief aquifer (water-bearing formation)
feet	Itel	,ž 7	بعد میں توقع بعد ایک رہم عبر ہوارم	formation)
feet	1.1.2	27 6-6	· · · · · · · · · · · · · · · · · · ·	formation) from 1020 to 1100
feet		27 66 38-1	Energy WI To Com-	formation)
		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755
		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755
feet		27 66 752	Energy WI To Com-	formation) from 1020 to 1100 Other aquifers 420 tc 430 740 to 755 1220 to 1230 1250 to 1260 1300 to 1320 First water at 65° feet. Casing perforated from 100 to 800 1000 to 1497 ft. Size of perforations
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 tc 430 740 to 755 1220 to 1230 1250 to 1260 1300 to 1320 First water at 65 feet. Casing perforated from 100 to 800 1000 to 1497 ft.
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 to 430 740 to 755 1220 to 1230 1250 to 1260 1300 to 1320 First water at 65 feet. Casing perforated from 100 to 800 1000 to 1497 ft. Size of perforations
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 tc 430 740 to 755 1220 to 1230 1250 to 1260 1300 to 1320 First water at 65 feet. Casing perforated from 100 to 800 1000 to 1497 ft. Size of perforations
feet		27 66 752	En 1 4 11 T. C. 1-	formation) from 1020 to 1100 Other aquifers 420 tc 430 740 to 755 1220 to 1230 1250 to 1260 1300 to 1320 First water at 65 feet. Casing perforated from 100 to 800 1000 to 1497 ft. Size of perforations

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rom ieet	To feet	Thickness		Type of material		۰.	•
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		<u></u>		CASING RECORD	_		
m. ng	From feet	To feet	Length	"Remarks"—Seals, Grouting, Etc.			
	100	1497	1397	Grouting from 0 to 100'			
	C	100	100	•			<u>.</u>
		•					
			1			-	
						•.	
	:				- ,	•. •.	
				MATION—Pumping Test, Quality of Water, Etc.	- (۰. ۲. ۲.	
t Pr	unping- E	GE		MATION—Pumping Test, Quality of Water, Etc.	- (
5. J	per minut	Bowl pett	ing 350'	NATION—Pumping Test, Quality of Water, Etc.	- (1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
5. j		Bowl pett	ing 350'	MATION—Pumping Test, Quality of Water, Etc.	- (-		
s. j	per minut	Bowl pett	ing 350'	MATION—Pumping Test, Quality of Water, Etc.	- (- (
s. j	per minut	Bowl pett	ing 350'	MATION—Pumping Test, Quality of Water, Etc.			
5 . j	per minut F Test -	Nowl pett	ing 350' - 400				
3. <u></u>	per minut F Test - WELL DR	NULLER'S ST	2ng 350' - 400 FATEMENT	(Not to be filled in by Driller)			
s. ping ping wel	per minut F Test - WELL DR	NULLER'S ST	ing 350' - 400	(Not to be filled in by Driller)			
s. ping ping welve in ef.	per minut F Test - WELL DR WELL DR Il was drill oformation i	Nowl pett 6 pumped 93 hours RILLER'S ST led under m 15 true to m	Ang 350 - 400 TATEMENT ny jurisdictio y best inform	and the ion and CEFTCE			
wel	per minut F Test - WELL DR WELL DR Il was drill oformation i	Nowl pett a pumped 93 hours RILLER'S ST led under m s true to m	Ang 350 - 400 TATEMENT ny jurisdictio y best inform Driller	and the ion and CEFTCE CETTCE CEFTCE			
well well well well sf.	per minut F Test - WELL DR WELL DR Il was drill oformation i	Nowl pett a pumped 93 hours RILLER'S ST led under m s true to m	Ang 350 - 400 TATEMENT ny jurisdictio y best inform	and the ion and CEFTCE			
wel wel	p≠r minut F Test - WELL DR Il was drill offormation i Signed	Sowl pett se pumped 93 hours RILLER'S ST led under m s true to m Well Well	Ang 350 - 400 TATEMENT ny jurisdictio y best inform Driller	(Not to be filled in by Driller) and the tion and CEFTCE STREEK 1958 JAN 22 AM 10 55			
wel wel e in f. B	p≠r minut F Test - WELL DR Il was drill offormation i Signed	ke pumped 93 hours RILLER'S ST led under m s true to m Well License	Ang 350' - 400 CATEMENT ay jurisdictio y best inform Driller	(Not to be filled in by Driller) and the tion and CEFTCE SULTEENSINEER 1958 JAN 22 AM 10 55			
wel wel	p≠r minut F Test - WELL DR Il was drill offormation i Signed	ke pumped 93 hours RILLER'S ST led under m s true to m Well License	ADDING 350'	(Not to be filled in by Driller) and the tion and CEFTCE STREEK 1958 JAN 22 AM 10 55			
wel wel f. B	p≠r minut F Test - WELL DR Il was drill offormation i Signed	ke pumped 93 hours RILLER'S ST led under m s true to m Well License	ADDING 350'	(Not to be filled in by Driller) and the tion and CEFTCE SULTEENSINEER 1958 JAN 22 AM 10 55			

Off-Base Well Records

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WEL	L LOG		PORT TO THE STATE ENGINEER of Nevada	R Log No
	PLE	ASE COMPLE	TE THIS FORM IN ITS ENTIRETY	Permit No Do not fill in.
			Driller	
			LaneAddress1042_5	•
			с.21, Т.2N/S, R2.E, in	-
			i.c	
			0f.t.,10!!to?00.Weight of casing pe	
		-		-; = -
		•		
			E	
•	-		g.p.m. and pressure	
			anding water from surface	
			Type and size	
Date of con	nmencemer	nt of well. <u>1</u> .	-19-67 Date of completion	of well $1 - 25 - 67$
			ie 24 L.S.udder	
ype of wel	1 rig	LOC		
ype of wel	l rigRuc To feet	LOG Thickness feet	ie24L.S.udder OF FORMATIONS Type of material	
From feet 0 2	To feet 2 4	LOC Thickness feet 2 4	ie 24. L. S. udder OF FORMATIONS Type of material topsoil clay	
From feet 0 2 6 10	To feet 2 16 60	LOC Thickness feet 2 4 10 44	ie 24. L.S. udder OF FORMATIONS Type of material topsoil clay graveley clay graveley clay	Water-bearing Formation, Casing Perforations, etc.
From feet 0 2 6 1 6 9 0 9 0	To feet 2 16 60 90 100	LOC Thickness feet 2 4 10 44 30 10	ie 24.1.5.udder OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation
From feet 0 2 6 1 6 1 6 0	To feet 2 16 60 90 100 140	LOC Thickness feet 2 4 10 44 30	ie 24.1.5.udder OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from1.20
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from1.20
From feet 0 2 6 16 60 90 130 140	To feet 2 16 60 90 100 140 150	LOC Thickness feet 2 4 10 44 30 10 40 10	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay standy white clay water	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from 1.20 to 200 Other aquifers 1.40 to 1.20 C0 to 1.00
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from120
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from120
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from120
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from1.20
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from100
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from 1.00 to 200 Other aquifers 140 to 100 Other aquifers 140 to 100 First water at CC First water at CC Casing perforated
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from
From feet 0 2 6 16 60 90 130 140 150	To feet 2 16 60 90 100 140 150 190	LOC Thickness feet 2 4 10 44 30 10 40 10 40 10 40	OF FORMATIONS Type of material topsoil clay graveley clay graveley clay clay graveley clay water white clay sandy white clay water clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation from

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 •				L	DG OF FORMAT	FIONS-Continued		<u>بت</u> ۲	لهنمز الم
	From teet	To feet	Thickness			Type of material			
								<u>.</u>	
							•	7.	
							1		
									
				,					
	 _			<u></u>	CASING	RECORD		•	
	Diam. casing	From feet	To feet	Length		REMARKS—Seals, Grouting, etc.	·		
з С	5/3	0	200	200	8 inch c 2½ yards	asing cemented down to 50 ft with well grout.	ė	b =	
					<u> </u>		:	F	F
· ===		<u> </u>				umping Test, Quality of Water, etc.	I	B eat	
-		Ba	lifed 60	G . P . in: .	FRCM 86 f	t			
								8 .⊄ I=-1	
	<u>.</u>								
							-		
	١	WELL DR	ILLER'S S	TATEMEN	Г	(Not to be filled in by Driller)		—	•
	This wel above int belief.	l was drille formation is	d under my true to my	jurisdiction best informa	and the and			•	
	S	igned	H. McKi we	INCY &	ons., Inc.		į		
	E	ly							
				104 <u>5</u>			•		
	Dated	2-1-67		, 19					· · · · ·
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		. <u></u>						• •	

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		ENGIN	EER OF NEVADA	Well No
	PLEA	ASE COMPL	ETE THIS FORM IN ITS ENTIRETY	Permit No Do not fill in
Owner	James R.	& Ida	M. Black Driller Effin	nger Drill & Pump Serv.
	4068 Ju		Address. Box	
			Sec. 21., T. 22. N/S, R. 2. E. in Clar	
or			Lot-12, Blk-2 Meikle Kan	
Water wil			estic	
			inch	
			6	
			ID 200 feet g 12" in diameter and under give inside diameter	
-			g.p.m. and pressure	
lf flowing	well describe	e control wo	ks(Type and size	of valve, etc.)
Date of co	mmencement	of well	gust 1, 1963 Date of completi	August 5, 1963 on of well
Type of v	vell rig	₩a	lker-Neer 31"	
		LOG	OF FORMATIONS	Water backs The set
From feet	To feet	Thickness feet	Type of material	Water-bearing Formation, Casing Perforations, Etc.
0 15	15 19	15	Brown Sandy Clay Gravel	Chief aquifer (water-bearing
19 26	26	7	Decomposed Lime	formation)
45	45	19 7	Brown Sandy Clay White Clay	from
52	56	4	Decomposed Lime	Other aquifers
50 64	64 69	5	White Clay Decomposed Lime (Water)	76-81 64-69
56 64 76 81 87 93 102	76	8 5 7 5 6 6	Brown Sandy Clay	64-69
76 81	81 87	2	Decmoposed Lime (Water) Brown Clay	
87	93	6	Decmoposed Lime (Water)	
93	102	9	Brown Clay	64
115	115	13 20	Sand & Lime (W _n ter) White Clay	First water atfeet.
135	148	13	Brown Clay	
148 161	161	13 19	White Clay Brown Sandstone (Water)	Casing perforated 100 190
180	200	2p	White Sandy Clay	from
				Size of perforations
				Size of perforations 1/8" X 12" Torch
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Press 7.0 Thicksee Type of material CASING RECORD Casing Prom Prom 7.0 Length Casing Prom Prom 7.0 India Prom Prom 7.0 India Prom Prom 7.0 India Text Length "Itemarks"-Secie Growther, Bit. India O 200 200 200 200 Cemented from 0 to 50 feet If JD 0 200 200 Cemented from 50 to 190 feet If yards of cement GENERAL INFORMATION-Pumping Test. Quality of Water, Etc. GENERAL INFORMATION-Pumping Test. Quality of Water, Etc. WELL DRILLER'S STATEMENT Well DRILLER'S STATEMENT The well was drilled under my juridiction and the belief. Signed Signed Effinger Drill & Pup. By Licens No. 212 Dured August 5,19.63.				I 	OG OF FORMATIONS-	-Uonintuea	· .	
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		ENGIN	EER OF NEVADA	. Well No Permit No	
	PLE.	ASE COMPL	ETE THIS FORM IN ITS ENTIRETY	Do not fill in	<u></u>
Owner	illiam H	I. Vells	Driller	ger Drilling a Fump	
Address	2052 Chr	isty La	ne Address Box 5	79 City Lic. No. 2	12
Location of	of well: <u>S.W</u>	1 1/ NE 1/2	Sec. 21, T.20N/S, R/2E, in Clark	Со	unti
	2052 Chr				
			Domestic Total d		
Size of dri	illed hole		12 inch	•1414	
			10 Guage		
			811TD 200 feet		
Diameter a	and length of	Casing	g 12" in diameter and under give inside diameter	; casing 12" in diameter give outside diamet	ter.)
If flowing	well give flo	w in c.f.s. or	g.p.m. and pressure		
		-	nding water from surface		
If flowing	well describe	e control wo	rks(Type and size (· ··· ·
			_		
Date of co	mmencement		Date of completion	on of well August 0, 1909	
Type of w	ell rig	",,a	ilker-Neer" 31		
R		LOG	OF FORMATIONS	8	
·				Water bearing Termetics Cast	1
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From feet	To feet	Thickness feet	Type of material	Perforations, Etc.	
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Address. E. H. C Location of w or Water will be Size of drille Thickness of Diameter and If flowing we If nonflowing If flowing we Date of comm	e used for. e used for. ed hole.].; casing d length of ell give flor g well give ell describe mencement	Lonest Linest Lonest 2"	Address. 194 Sec. 2.L., T. 2C.N/S, R/YE, inGl., pk 510 Total 5.ft. 2	depth of well <u>j.gof.t.</u> ; ; per linear foot22 <u>j.b.</u> er; casing 12" in diameter give outside diameter.
Location of w or Water will be Size of drille Thickness of Diameter and If flowing we If nonflowing If flowing we Date of comm	well: ⁴ / <u>Wi</u> e used for. ed hole.].; casing d length of ell give flor g well give ell describe mencement	Lozet 2"to55 5/16 casing	Sec. 21., T. 22. N/S, R/2. E, in Clarrie 51.0	depth of well ; per linear foot28 er; casing 12" in diameter give outside diameter.
Water will be Size of drille Chickness of Diameter and If flowing we If nonflowing If flowing we Date of comm	e used for. ed hole.].; casing d length of ell give flo g well give ell describe mencement	Lowest 2"	Total 5.1.0	depth of well <u>1.36ft</u> ; ; per linear foot23 <u>1.5.</u> er; casing 12" in diameter give outside diameter.
bize of drille Chickness of Diameter and If flowing we If nonflowing If flowing we Date of comm	ed hole.].; casing d length of ell give flo g well give ell describe mencement	2"	5ft	; per linear foot231.b.; er; casing 12" in diameter give outside diameter.
Thickness of Diameter and If flowing we If nonflowing If flowing we Date of comm	casing I length of ell give flo g well give ell describe mencement	5.4.1.6 casing	Temp. of water. 12" In diameter and under give inside diameter g.p.m. and pressure	er; casing 12" in diameter give outside diameter.
Diameter and f flowing we f nonflowing f flowing we Date of comm	l length of ell give flo g well give ell describe mencement	casing	12" In diameter and under give inside diamet g.p.m. and pressure	er; casing 12" in diameter give outside diameter.
if flowing we if nonflowing f flowing we Date of comm	ell give flo g well give ell describe mencement	w in c.f.s. or e depth of st e control wor t of well	g.p.m. and pressure anding water from surface4.2f.t ks	e of valve, etc.)
f nonflowing f flowing we Date of comm	g well give ell describe mencement	e depth of st e control wor t of well	anding water from surface.4.2ft	e of valve, etc.)
f flowing we	ell describe mencement	e control wor t of wellNo	ks(Type and size) 	e of valve, etc.)
Date of comm	mencement	of wellLo		
Date of comm	mencement	of wellLo		
	TR. DU.C.			
			OF FORMATIONS	
From feet	To feet	Thickness feet	Type of material	Water-bearing Formation, Casing Perforations, Etc.
0 5 8	5 8 24	5 3 16	Soil Soft caliche Brown clay	Chief aquifer (water-bearing formation)
24 60	60 73	36 13	Light brown clay Water Sandy brown clay	from
73	150	27	White sandy clay Water	Other aquifers
				First water at <u>42</u> ft. feet.
				Casing perforated
				from NORE to
				Size of perforations

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			LOG OF FORMATION	S-Oontinued		Ĺ
rom	To feet	Thickness		Type of material		
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			CASING REC	ORD	-	ĺ
Diam.	From feet	To feet	Length	"Remarks"-Seals, Grouting, Etc.	•_•	
I.D.	0	61' 7"	61' 7" Cemented 8	" down to 55 ft with 12 yds concrete		
	<u></u>					
	<u></u>	GEN	TERAL INFORMATION-Pumping	; Test, Quality of Water, Etc.	•	
Ee	110à 5	C.P."	<u>lowered witer love</u>	1 to for ft.		
	<u></u>				\$ 24	
	<u></u>	<u> </u>			<u>.</u>	•
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	WELL D	RILLERS ST	ATEMENT	(Not to be filled in by Driller)	-	
This well	l was dr	illed under n	ny jurisdiction and the			•
ve inform	nation is t	rue to my best	information and belief.			
S	igned.	Well	Driller		•	•
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WE	ELL LO	Log No		
Owner Bi	ll Ayer	5	Driller S.R.	
			Perk (36) L.V. Hovaddress 1042 5	
			Sec. 21, T.20.N/S, R.62.E, in Clark	
			omostic	
			10" to 100" Weight of casing per	
Discut		¢n	Se Temp. of water	
			I.D. 50 100? 12" in diameter and under give inside diameter; o	
-	-		g.p.m. and pressure	
		-	nding water from surface	
If flowing w	ell describe	e control wor	ks(Type and size of	valve, etc.)
			ay 21, 1955 Date of completion o	
Type of we	ll rig	Speed S	tar, Spudder	
2				
		LOG	OF FORMATIONS	Water hearing Formation Contact
From Seet	To feet	LOG Thickness feet	OF FORMATIONS Type of material	- Water-bearing Formation, Casing Perforations, Etc.
	feet 7	Thickness feet 7	Type of material Brown Clay	Chief aquifer (water-bearing
Seet	feet 7 23 54	Thickness	Type of material Brown Clay Gravel	Chief aquifer (water-bearing formation)
Seet 0 7 23 54	feet 7 23 54 58	Thickness feet 7 16 31 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water	Chief aquifer (water-bearing formation) from 87 to 91 ft
Seet 0 7 23 54 58 73	teet 7 23 54 58 73 77	Thickness feet 7 16 31 4 15 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water	Perforations, Etc. Chief aquifer (water-bearing formation) from 87 to 91 ft Other aquifer73=77 541 to 581
seet 0 7 23 54 58 73 77 87	feet 7 23 54 58 73 77 87 91	Thickness feet 7 16 31 4 15 4 10 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water WXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Chief aquifer (water-bearing formation) from 87 to 91 ft Other aquifer7.3=7.7
Seet 0 7 23 54 58 73 77	teet 7 23 54 58 73 77 87	Thickness feet 7 16 31 4 15 4 10	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water Workershawkowsk Brown clay	Perforations, Etc. Chief aquifer (water-bearing formation) from 87 to 91 ft Other aquifer73=77 541 to 581
seet 0 7 23 54 58 73 77 87	feet 7 23 54 58 73 77 87 91	Thickness feet 7 16 31 4 15 4 10 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water WXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Perforations, Etc. Chief aquifer (water-bearing formation) from 87 to 91 ft Other aquifer73=77 541 to 581
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seet 0 7 23 54 58 73 77 87	feet 7 23 54 58 73 77 87 91	Thickness feet 7 16 31 4 15 4 10 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water WXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Perforations, Etc. Chief aquifer (water-bearing formation) from 87 to 91 ft Other aquifer 7.3 = 7.7 54° to 58° First water at 54 feet.
seet 0 7 23 54 58 73 77 87	feet 7 23 54 58 73 77 87 91	Thickness feet 7 16 31 4 15 4 10 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water WXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Perforations, Etc. Chief aquifer (water-bearing formation) from 87 91ft Other aquifer 7.3=7.7 54° to 58° First water at54fcet. Casing perforated
seet 0 7 23 54 58 73 77 87	feet 7 23 54 58 73 77 87 91	Thickness feet 7 16 31 4 15 4 10 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water WXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Perforations, Etc. Chief aquifer (water-bearing formation) from 87 to 91 ft Other aquifer 7.3 = 7.7 54° to 58° First water at 54 feet.
seet 0 7 23 54 58 73 77 87	feet 7 23 54 58 73 77 87 91	Thickness feet 7 16 31 4 15 4 10 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water WXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Perforations, Etc. Chief aquifer (water-bearing formation) from <u>87</u> <u>91</u> ft Other aquifer 7.3=7.7 54 ¹ to 58 ¹ First water at 54 feet. Casing perforated from <u>60</u> to 100 ft.
seet 0 7 23 54 58 73 77 87	feet 7 23 54 58 73 77 87 91	Thickness feet 7 16 31 4 15 4 10 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water WXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Perforations, Etc. Chief aquifer (water-bearing formation) from <u>87</u> to <u>91</u> ft. Other aquifer 73 =7.7 54° to 52° First water at <u>54</u> feet. Casing perforated from <u>60</u> to <u>100</u> ft.
seet 0 7 23 54 58 73 77 87	feet 7 23 54 58 73 77 87 91	Thickness feet 7 16 31 4 15 4 10 4	Type of material Brown Clay Gravel Brown Clay Brown Sand Water Brown Clay White Sand Water WXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	Perforations, Etc. Chief aquifer (water-bearing formation) from <u>87</u> <u>91</u> ft Other aquifer 7.3=7.7 54 ¹ to 58 ¹ First water at <u>54</u> feet. Casing perforated from <u>60</u> <u>100</u> ft. Size of perforations

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am.	From	To feet	Length		"Remarks"—Seals, Grouting, Etc.	
ing D	feet	100	100	GT ensing	cemented down to 50 ft. with 12 yds.	
D.	0	100	100	concrete.	Cementes, down to jo it. with 12 yas.	
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			NEPAL IN	COBMATION Du	mping Test, Quality of Water, Etc.	
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ief. Si	was dril ormation gned S.	led under m is true to m R. McKir Well 1 License	y jurisdict y best info ney & Driller No. 45	ion and the rmation and Son		`.,

W	ELL LO		REPORT TO THE STATI ER OF NEVADA	E Log No Rec
Owner Pla	az Conner	•		
		_	as Vegas Nev. Address 2020	
Location o	f well:	1/4 N. 5/4 Se	c. 21, T. 20 N/S, R ⁶² E, in Clark	Cour
Water will	be used for	Domestic	Z	pth of well
Size of dri	lled hold	ft.10 inch.	.60 ft.8 inch.hole Weight of casing p	per linear foot
Thickness o	of casing	10 gaug	ge	
Diameter a	and length of	casing8ir	nch.o.d.pipe 40 ft. " in diameter and under give inside diameter;	- agging 19" in diamatan sina autrida diamata
			o.m. and pressure	
			ing water from surface	
		-	(Type and size o	
		June	(Type and size of 24, 1953) Date of completion	of valve, etc.) June 25, 1953
	ell rig			·····
From	ell rig		F FORMATIONS	Water-bearing Formation, Casing Perforations, Etc.
From feet O	To feet 2	LOG O Thickness feet 2	F FORMATIONS Type of material silt	Water-bearing Formation, Casing
From feet 0 2 30	To feet 2 30 38	LOG O Thickness feet 2 28 8 8	F FORMATIONS Type of material silt brown clay gravel	Water-bearing Formation, Casing
From feet O 2	To feet 2 30	LOG O Thickness feet 2 28	F FORMATIONS Type of material silt brown clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing
From feet 0 2 30 38	To feet 2 30 38 50	LOG O Thickness feet 2 28 8 12	F FORMATIONS Type of material silt brown clay gravel gray clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation)
From feet 0 2 30 38	To feet 2 30 38 50	LOG O Thickness feet 2 28 8 12	F FORMATIONS Type of material silt brown clay gravel gray clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from
From feet 0 2 30 38	To feet 2 30 38 50	LOG O Thickness feet 2 28 8 12	F FORMATIONS Type of material silt brown clay gravel gray clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 50 to 100 ft. Other aquifers
From feet 0 2 30 38	To feet 2 30 38 50	LOG O Thickness feet 2 28 8 12	F FORMATIONS Type of material silt brown clay gravel gray clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 50 to 100 ft. Other aquifers
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From feet 0 2 30 38	To feet 2 30 38 50	LOG O Thickness feet 2 28 8 12	F FORMATIONS Type of material silt brown clay gravel gray clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 50 to 100 ft Other aquifers First water at 50 feet. Casing perforated from from
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From feet 0 2 30 38	To feet 2 30 38 50	LOG O Thickness feet 2 28 8 12	F FORMATIONS Type of material silt brown clay gravel gray clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 50 to 100 ft Other aquifers First water at 50 feet. Casing perforated from from

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from feet	To feet	Thickness			Type of material	
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Dlam. casing	From feet	To feet	Length		"Remarks"—Seals, Grouting, Etc.	
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		GE	NERAL INFO	ORMATION-Pum	ping Test, Quality of Water, Etc.	-
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	WELL DE	RILLER'S ST	TATEMENT		(Not to be filled in by Driller)	
This wel	l was dril	led under n	ay jurisdictio	on and the		
above in	formation i	is true to m	y best infor	mation and		
belief.	~	^		i		
S	igned	C-LCCA	7 Ever	1.24		
n	Loui	s F.Evans	•	{		
D	y			1		
			No. 117	1		
	July 11		., 19.53			
Dated						
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Dated						•

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DIVISION OF WATER RESOURCES STATE OF NEVADA OFFICE USE ONLY **DIVISION OF WATER RESOURCES** Log No Permit No. WELL DRILLERS REPORT Basin..... Please complete this form in its entirety 1. OWNER Will L. & Mary N. Dodge ADDRESS 2101 Linn Lane 2. LOCATION SE 1/4 NE 1/4 Sec 21 T. 20 N/S R. 62 E Clark County PERMIT NO. Lot. 8, Block 3, Neikle Manor Tract #1 TYPE OF WORK PROPOSED USE 5. TYPE WELL 4 3. New Well Recondition Domestic Irrigation Test Cable 🔽 Rotary 🛛 Other Municipal Industrial Stock Other Deepen LITHOLOGIC LOG 8 WELL CONSTRUCTION 6. Thick-Material Water From То Casing record 6.5/8 Weight per foot 8.58 Thickness •1 Well drilled by others. Thickness •134 Diameter To From Decomposed Line W 100 120 20 6.5/8 inches 90 feet Brown Clay 120 140 20inchesfeetfeet Decomposed Lime & Gravel W 140 200 60inchesfœt feetinchesfcetfeet feet Surface seal: Yes 🗌 No 🗌 Туре.... Gravel packed: Yes 🔲 No 🗍 Gravel packed from feet to feet Perforations: Type perforation Torch Field

RECEIVED	From
	From feet to feet to feet
Div. of Vistor Requires Branch Office - Las Verus, Ney	9. WATER LEVEL Static water level
	10. DRILLERS CERTIFICATION

Date started	September	219	
			, 19.76

7.	WELL '		
Pump RPM	G.P.M.	Draw Down	After Hours Pump
			······································
	BAIL	ER TEST	
G.P.M.	•••••••••••••••••••••••••••••••••••••••	Draw down	feet
G.P.M.		Draw down	feet

Draw down.....

..feet

G.P.M.

Address Box 579	City
Nevada contractor's license r	umber
Nevada driller s license num	212
signed TOP	

Name Effincer Drilling & Pump Service

This well was drilled under my supervision and the report is true to

Size perforation 1/8" X 15" Four Rows

September 28, 1975 Date

the best of my knowledge.

USE ADDITIONAL SHEETS IF NECESSARY

hours

DIVI 'ON OF WATER RESOURCES STATE OF NEVADA OFFICE USE ONLY **DIVISION OF WATER RESOURCES** Log No. Permit No. WELL DRILLERS REPORT Basin..... Please complete this form in its entirety 1. OWNER Samuel A. Shannon Jr. ADDRESS 217 North 9th Apt. 3. Las Vegas, Nevada 2. LOCATION SW 1/4 NE 1/4 Sec. 21 T. 20 N/S R. 62 E. Clark County PERMIT NO. TYPE WELL TYPE OF WORK PROPOSED USE 5. 3. Cable 🔟 Rotary 🗆 🎨 Recondition Domestic 🛛 🛣 Irrigation New Well Ki Test Industrial Other 🗖 Other Municipal Stock П Deepen \square LITHOLOGIC LOG WELL CONSTRUCTION Diameter hole 10" inches Total depth 200 feet Casing record 8 5/8" from 0 to 200 ft Thick-Water Strata Material From То Weight per foot 10 gauge Thickness 0 Surface soil L L white sandy clay 69 65 Diameter From 12" hole inches 0 feet 50 feet 15 brown sandyanaay 69 84 10 10" hole inches 50 feet 200 feet XX 81 94 white sandy clay XX 99 green clay & gravel 94 5 8 5/8" casianes 0 feet 200 feet green sandy clay XX 99 110 11 white graveley clay ## 110 117 7 117 11.5 28 white sandy clay 176 Surface seal: Yes B No D Type Well.grout white graveley clay XX 145 31 $\frac{176}{182}$ white sandy clay white graveley clay 1.82 6 XX 194 12 Gravel packed: Yes
No X 200 194 6 white sandy clay Gravel packed from feet to feet to Perforations: Size perforation 3/16" X 10" From 80 feet to 200 feet From feet to feet From feet to feet JUL301971 From feet to feet DIV. OF WATER RESOURCES ٩ WATER LEVEL BRANCH OFFICE - LAS VECAS NEVADA Flow......G.P.M. Water temperature...... F. Quality..... -----10 DRILLERS CERTIFICATION Date started Jan 27, 1971 This well was drilled under my supervision and the report is true to Date completed Feb. 1, 1971 the best of my knowledge. 7. WELL TEST DATA Name S. R. McKinney & Sons, Inc. Pump RPM G.P.M. Draw Down After Hours Pump Address 1042 S. Main St. Las Veras Nevada contractor's license number 2065 _____ Signed Signed BAILER TEST G.P.M. 45 Draw down to 85 ft. hours G.P.M. Draw down feet hours Date. Feb. 26, 1971 G.P.M. Draw down......feet hours

USE ADDITIONAL SHEETS IF NECESSARY

m	To				Type of material
	feet	Thickness			Type of material
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iam. sing	From feet	To feet	Length		"Remarks"—Seals, Grouting, Etc.
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		•		gravel pa	.ck 200' to 50'
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DIVISION OF W	DIVI		ATE OF N DF WATI	EVADA ER RESOURCES	OFFICE USE ONLY Log No Permit No				
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						DDRESS 2132 Christ			
2. LOCATIO	N NW 14 NE			Те́	20	N/S R. 62 E. C	lark		
3.	TYPE OF WO	RK		4.		PROPOSED USE		5. TYPE WE	
New W Deepen		econdition ther			mestic 🛣	Irrigation 🗆 Test Industrial 🗇 Stoc		Cable K Rota Other	ury 🖵
6.	LITHOLO	OGIC LOC	3				CONSTRUCT		
	Material	Water Strata	From	То	Thick- ness	Diameter hole		-	
	ndy clay	XX	135	160	_25_	Weight per foot 10 gai			
	<u>avele clay</u>	<u> </u>	160		22	Diameter	From	To	
white sau	ndy clay aveley clay	XX	<u>182</u> 186	<u>186</u> 198	12	Had 8" inches 6 5/8 inches	05 YMM	feet 100	feet
	ndy_clay_			210	12				
	aveley clay	XX		235	25	8" hole inches			
					<u> </u>]	inches			
						inches			
					┼───╢	Surface seal: Yes No			•
						Depth of seal Gravel packed: Yes D			ieet
						Gravel packed from		to	fec
						Perforations:			•
					┼╢	Type perforationTo1	rah		-
						Size perforation	16" X 10)11	
	·					From 135	feet to	.23.5	feet
-+D)5(C						From			
		· · · · · · · · · · · · · · · · · · ·				From	feet to		fe
		+			┤────┨	From From			
Jt	15, 19, 1						Icel (0		
DIV. OF V	VATER RESOURCES	5				9. WA	TER LEVEL		
	NCH OFFICE					Static water level82	Feet belo	w land surface	
LAS V	EGAS, NEVADA					Flow			
						Water temperature	F. Quality		
	Feb. 1, 1971						S CERTIFICA		•
Date started	Feb. 2, 197	71				This well was drilled under n the best of my knowledge.	ny supervision	and the report is	true
7.	WELL TI	EST DAT	۹			Name.SR	ney…&…So	ns Inc.	•
Pump RPM	G.P.M.	Draw Dov	n A	fter Hours	Pump	Address 1042 S. Maj	-	•	•
				· ··		Nevada contractor's license n	umber2	065	·····. ^*- .
						Nevada driller's license numb	per 45	7	.
C D M EO	BAILE	R TEST Draw down	to 97	/_ft.		Signed		find	<i>k</i> -
		Draw down Draw down			hours	Date	נ ר ב		
		Draw down Draw down			11	Date	₽.ℓ.⊥	••••••••	••••••
	·····								

USE ADDITIONAL SHEETS IF NECESSARY

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4	DIVISION OF WATER RESOURCES		DIVIS			NEVADA ER RESOURCES		FFICE USE ONLY	
\sim	Ĺ						•		
- ×. 	r		WB	ELL D	RILLE	RS REPORT	Basin		
,	DEEPENING		Ple	ase comp	lete this f	orm in its entirety			
	1. OWNER Peggy Newman	1			A	DDRESS 2100 Linn	Lan d La	s Vegas, Nev	
			•••••		•••••				••••
	2. LOCATION SW 1/4 NE PERMIT NO.			T.	20	N/SR. 62 E. Cla	rk	Count	ty
	3. TYPE OF WOR	<u>к</u>		4.		PROPOSED USE		5. TYPE WELL	
	New Well 🔲 Re	condition		Dor	nestic 🕅	Irrigation 🔲 Test		Cable 🙇 Rotary [
	Deepen 🗹 Ot	her		Mu	nicipal 🗆] Industrial 🔲 Stoci	k □	Other	
	6. LITHOLO	GIC LOC				8. WELL O Diameter hole. 10 to 8	CONSTRUCT		
	Material	Water Strata	From	То	Thick- ness	Casing record 6 5/8 f	rom 0 to	200	et
	Sandr X& XODEXX			(XIXSOX		Weight per foot 10 gai	uge	Thickness	••••
	ysand & Gnavel	XXX				Diameter casing 6.5/8 OD inches			et(
	White Sand	XXX	100	<u>_100</u> 130					
	Red Clay Gravel		130	145					- 1
	White Clay Gravel		145	165	20				et
	Whate Sand Clay	XXX	165	200	35	inches		feet	et
						Surface seal: Yes No			••••
						Depth of seal Gravel packed: Yes 🗌 N			et
						Gravel packed from	_	tofee	et
						Perforations:			
	DEGEL					Type perforationTOP	ch cut		
						Size perforation 3/16	"X10"		•••••
						From 140	feet to 20	DO fee	
	DIV. OF WATER					From			
	DIV. OF WHICH CT					From	•	fee	
	LAS VIGAS, N	NADA				From		fee	-
			i			9. WA	TER LEVEL		
						Static water level.7.5		w land surface	
		·				Flow			• • • •
						Water temperature°	F. Quality		
		·			<u> </u>	10. DRILLERS	CERTIFIC	ATION	
	Date started 6/17/70 Date completed 7/17/70			, 1	9 9	This well was drilled under m the best of my knowledge.			lo
	7. WELL TE	ST DATA	\			NameS.R. McKinne	y & Son	s Inc.	
	Pump RPM G.P.M. 40	Draw Dow	m Af	ter Hours	Pump	Address 1042 S. Main	n St. L	as Vegas, Nev	v .
	; 					Nevada contractor's license n	200 umber	65	
,		! 				Nevada driller's license numb		45	
	BAILEI	r te st				Signed	////	Unilly.	•
		raw down			hours	- B-11-	40'	. /	
		raw down	fee		hours	Date	1.0		

المتخذ فتحتم والمسترية •••

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ICION OF WATER RESOURCES		ION OF	E OF NEVADA WATER RESOURCES ILLERS REPORT	Log No	USE ONLY
			this form in its entirety		`·
. 0 -		=	•	1. 1. 7	
OWNER Frid J. Ban San Langan Junie LOCATION S W 1/ N.E	89110		ADDRESS <u>کر ج</u> ا کے	enne Groef	9910 -
LOCATION S IN 14 11. L			<u>26 N/S R. 6-2 E. (</u>		
TYPE OF WORK		4.	PROPOSED USE	5.	TYPE WELL
	ondition 🗌	Domes	- · ·	est 🔲 Cable	
Deepen 🗌 Othe	=	Munici	pal 🔲 Industrial 🔲 S	tock 🗌 Other	
LITHOLOGI	C LOG			L CONSTRUCTION	
Material	Water Strata From		hick- Casing record. 3 54 '	inches Total depth	-200 feet
Brann Sende Clerk			Casing record 77 Weight per foot 12	Rold Think	mess 1341 i
groy Ching	41	58	Diameter	From	To
Brunn Sony clay	- 58		16 7540 D inches	feet	Zeo feet
Citzy Send, Clig	- 74	85	11 inches	feet	feet
Bar chard	89	106 1	by inches		feet
Frey Such clay	106	200	94 inches		fecting
			inches		
			Surface seal: Yes 🙇 N		
			Depth of seal 56 M		feet
			Gravel packed: Yes 🛛	No []	200 6
				Icet to	leet
			Perforations:	+ /	-
			Type perforation	Toxet	· · · ·
			From	feet to	feei
			From	feet to	feet
			From		
			From		•
			From	Icet to	teet
			9.	WATER LEVEL	
		{	Static water level	Feet below land	surface
			Flow		
			water temperature	F. Quality	, ·
. 4.1. 17			7/ 10. DRILL	ERS CERTIFICATION	1
te started. Feb. 2 C		, 19 19	7/	r my supervision and the	e report is true training
			the best of my knowledge.		
WELL TES	Γ DATA		Name	t. linne	
Pump RPM G.P.M. 1	Draw Down Aft	er Hours Pun			/
			Address 3012 C	ativel north	
			Nevada contractor's license	number	
				- 1411061	، بې ۲. د
	· · · ·		Nevada driller's license nu	mber	•••
	TEST		Signed Force	70	
	w downfeel	th	Signed OTALL	1. Letuila	C
	w downfeel			4.5.3 -197	6
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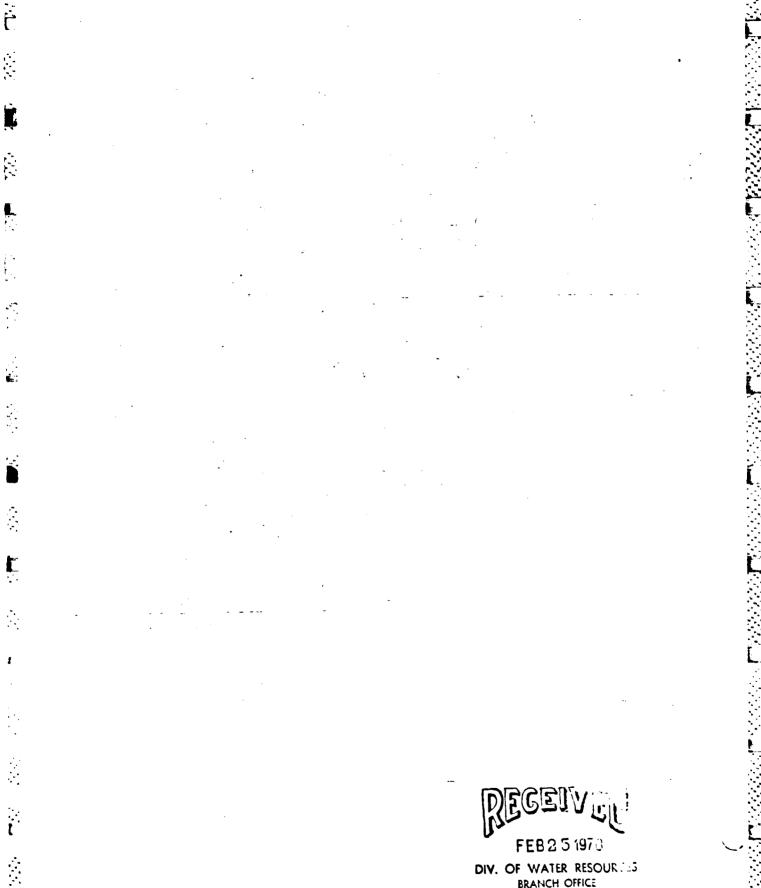
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DIV. OF WATER RESOUR 123 BRANCH OFFICE EAS VEGAS, NEVADA

WF	LLIO	G ΑΝΓ	REPORT TO	THE STATE		
** 1			EER OF NEVAL		Well No	
			TE THIS FORM IN ITS I		Permit No	<u> </u>
All			rbell			not fill in Pump Servic
			ne			. •
			Sec. 21, T20N/S, R/2			
		isty La		·······	٠.	-
			Domestic			
			8 inch			
nickness of	casing		.156	Temp. of water		
iameter and	length of o		6"ID 185']		•	
flowing we	ll give flow		g.p.m. and pressure			•.*
			nding water from surface			
			ks			
				Date of completion o		
pe of well	rig	₩a.	lker-Neer 31" OF FORMATIONS			
From feet	rig To feet	₩a.	lker-Neer 31" OF FORMATIONS Type of m Well was drill	naterial Led to 75 feet	Water-bearing) Perfora	Formation, Casing tions, Etc.
From feet 75	To feet 95	Thickness feet	lker-Neer 31" OF FORMATIONS Type of m Well was drill Driller unknow Decomposed lim	naterial Led to 75 feet wegled	Water-bearing) Perfora Chief aquifer form	Formation, Casing tions, Etc. (water-bearing ation)
From feet 75 95 108	To feet 95 108 112	Thickness feet 20 13 4	lker-Neer 31" OF FORMATIONS Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat	naterial Led to 75 feet weded ne	Water-bearing D Perfora Chief aquifer form 185	Formation, Casing tions, Etc. (water-bearing ation) to 198 ft
From feet 75 95 108 112 128	To feet 95 108 112 128 136	Thickness feet 20 13 4 16 8	lker-Neer 31" OF FORMATIONS Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat	naterial Led to 75 feet weded ne ter)	Water-bearing D Perfora Chief aquifer form from 185 Other aquifers	Formation, Casing tions, Etc. (water-bearing ation) to 198 ft
From feet 75 95 108 112 128 136 155	To feet 95 108 112 128 136 155 167	"Wa LOG Thickness feet 20 13 4 16 8 19 12	lker-Neer 31" OF FORMATIONS Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat	naterial Led to 75 feet weded ne ter) ter)	Water-bearing D Perfora Chief aquifer form from 185 Other aquifers	Formation, Casing tions, Etc. (water-bearing ation) to 198 to ft. 55-167 28-136 08-112
From feet 75 95 108 112 128 136 155 167 185	To feet 95 108 112 128 136 155 167 185 198	"Wa LOG Thickness feet 20 13 4 16 8 19 12 18 13	lker-Neer 31" Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat White Clay Limestone (Wat	naterial Led to 75 feet weged ne ter) ter) ter)	Water-bearing 1 Perfora Chief aquifer form from 185 Other aquifers	Formation, Casing tions, Etc. (water-bearing ation) 198 to 198 to 55-167 28-136 08-112
From feet 75 95 108 112 128 136 155 167	To feet 95 108 112 128 136 155 167 185	"Wa LOG Thickness feet 20 13 4 16 8 19 12 18	lker-Neer 31" Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat white Clay	naterial Led to 75 feet weged ne ter) ter) ter)	Water-bearing 1 Perfora Chief aquifer form from 185 Other aquifers	Formation, Casing tions, Etc. (water-bearing ation) 198 to 198 to 55-167 28-136 08-112
From feet 75 95 108 112 128 136 155 167 185	To feet 95 108 112 128 136 155 167 185 198	"Wa LOG Thickness feet 20 13 4 16 8 19 12 18 13	lker-Neer 31" Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat White Clay Limestone (Wat	naterial Led to 75 feet weged ne ter) ter) ter)	Water-bearing) Perfora Chief aquifer form from 185 Other aquifers	Formation, Casing tions, Etc. (water-bearing ation) 198 to 198 to 55-167 28-136 08-112
From feet 75 95 108 112 128 136 155 167 185	To feet 95 108 112 128 136 155 167 185 198	"Wa LOG Thickness feet 20 13 4 16 8 19 12 18 13	lker-Neer 31" Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat White Clay Limestone (Wat	naterial Led to 75 feet weged ne ter) ter) ter)	Water-bearing) Perfora Chief aquifer form 185 Other aquifers Differ aquifers First water a	Formation, Casing tions, Etc. (water-bearing ation) to 198 ft 55-167 28=136 .08-112
From feet 75 95 108 112 128 136 155 167 185	To feet 95 108 112 128 136 155 167 185 198	"Wa LOG Thickness feet 20 13 4 16 8 19 12 18 13	lker-Neer 31" Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat White Clay Limestone (Wat	naterial Led to 75 feet weged ne ter) ter) ter)	Water-bearing) Perfora Chief aquifer form 185 Other aquifers Differ aquifers First water a	Formation, Casing tions, Etc. (water-bearing ation) to 198 ft 555-167 28=136 08-112 7 ft feet.
From feet 75 95 108 112 128 136 155 167 185	To feet 95 108 112 128 136 155 167 185 198	"Wa LOG Thickness feet 20 13 4 16 8 19 12 18 13	lker-Neer 31" Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat White Clay Limestone (Wat	naterial Led to 75 feet weged ne ter) ter) ter)	Water-bearing 1 Perfora Chief aquifer from 185 Other aquifers	Formation, Casing tions, Etc. (water-bearing ation) to 198 ft 55-167 28=136 08-112 7 ft. feet. perforated to 195 ft. erforations
From feet 75 95 108 112 128 136 155 167 185	To feet 95 108 112 128 136 155 167 185 198	"Wa LOG Thickness feet 20 13 4 16 8 19 12 18 13	lker-Neer 31" Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat White Clay Limestone (Wat	naterial Led to 75 feet weged ne ter) ter) ter)	Water-bearing 1 Perfora Chief aquifer from 185 Other aquifers 1 Other aquifers 1 First water a Casing 1 from 135	Formation, Casing tions, Etc. (water-bearing ation) to 198 ft. 555-167 28=136 08-112 7 ft. feet. perforated to 195 ft. erforations
From feet 75 95 108 112 128 136 155 167 185	To feet 95 108 112 128 136 155 167 185 198	"Wa LOG Thickness feet 20 13 4 16 8 19 12 18 13	lker-Neer 31" Type of m Well was drill Driller unknow Decomposed lim calichie Limestone (Wat Brown Clay Limestone (Wat brown Clay Limestone (Wat White Clay Limestone (Wat	naterial Led to 75 feet weged ne ter) ter) ter)	Water-bearing 1 Perfora Chief aquifer from 185 Other aquifers 1 Other aquifers 1 First water a Casing 1 from 135	Formation, Casing tions, Etc. (water-bearing ation) to 198 ft. 555-167 28=136 08-112 7 ft. feet. perforated to 195 ft. erforations

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		1		LOG OF FORMATIONS—Contin		
from feet	To feet	Thickness		Туј	pe of material	
-						
			1			
			,		·····	
				CASING RECORD		
Diam. casing	From feet	To feet	Length	"Rem	arks"—Seals, Grouting, Etc.	
"ID		185	185	Perforated liner	in 8" well	
<u> </u>						
		GE	NERAL IN	FORMATION—Pumping Test, Qu	ality of Water, Etc.	
					·	
						_
				····		
	. <u>.</u>					
<u> </u>			·			
<u></u>						
		RILLER'S ST		1	(Not to be filled in by Driller)	
his well bove in	l was dril formatio <mark>n</mark>	led under m is true to m	y jurisdic by best info	ion and the prmation and the prmation and the prmation and the prmation and the prmaticular terms of terms of term		
oelief.						
	oignedEf	ringer "	en Driffer	Pump-Serv.	(DD -	
В	y //		inci		PEGENZED	
		License	No	2	Jan Collin	•••••
Dated 🖡	iarch 2	0,			MAR 2.0 1964	
		÷	·		BRANCH CEFICE	(
					BRANCH OFFICE LAS VEGAS, NEVADA	
						
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Same and the second

				Log No
WE	LL LOG	AND RE	PORT TO THE STATE ENGINEER	
			OF NEVADA	Well No
	PLEA	ASE COMPLE	TE THIS FORM IN ITS ENTIRETY	Permit No Do not fill in.
Owner	Gu	s Bushon	gDrillerPatr:	
			eberry Lane L.V. Address Las	
			c21., T. 20\$N/S, R62.E, in	
			, , , , , , , , , , , , , , , , , , , ,	
			stic	
			-	
			50-125 10" Weight of casing pe	
			e	
Diameter	and length o	of casing	Diameter - 8 5/8" Length (Casing 12" in diameter and under give inside diameter;	1 - 126
lf Acuina	wall give flo	win of som	g.p.m. and pressure	
			anding water from surface	_
If flowing	well describe	e control wor	ks(Type and size	o of valve, etc.)
Date of co	mmenceme	nt of well	5-18-64 Date of completion	of well
			Tool	
-71				
		LOG	OF FORMATIONS	T
From	To feet	LOG Thickness feet	OF FORMATIONS Type of material	Water-bearing Formation, Casing Perforations, etc.
feet 0 75		Thickness	Type of material Drilled by Others	Water-bearing Formation, Casing
feet 0 75 85	feet 75 85 95	Thickness feet 75 10 10	Type of material Drilled by Others Brown Clay Limestone - Water	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation)
feet 0 75 85 95 110	feet 75 85 95 110 115	Thickness feet 75 10	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water	Water-bearing Formation, Casing Perforations, etc.
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from 85 to 95 ft
feet 0 75 85 95 110	feet 75 85 95 110 115	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) ====================================
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) ====================================
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from 85 to 95 Other aquifers 110-115 0-75 Unknown First water at Unknown feet. Casing perforated First water
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) == from
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from 85 to 95 Other aquifers 110-115 0-75 Unknown First water at Unknown feet. Casing perforated First water
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from 85 to 95 ft Other aquifers 110–115 0-75 Unknown First water at Unknown feet. Casing perforated from 75 125 ft. Size of perforations
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from 85 to 95 ft Other aquifers 110–115 0-75 Unknown First water at Unknown feet. Casing perforated from 75 125 ft. Size of perforations
feet 0 75 85 95 110 115	feet 75 85 95 110 115 122	Thickness feet 75 10 10 10 15	Type of material Drilled by Others Brown Clay Limestone - Water Brown Clay Limestone and Water Brown Clay	Water-bearing Formation, Casing Perforations, etc. Chief aquifer (water-bearing formation) from 85 to 95 ft Other aquifers 110–115 0-75 Unknown First water at Unknown feet. Casing perforated from 75 125 ft. Size of perforations

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m To			Type of material
m To at feet	Thickness	1	Type of material
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; ; ;	<u> </u>		
		CASING	RECORD
m. From ing feet	To feet	Length	REMARKS—Seals, Grouting, etc.
5/8 Plus 1	125	126 Grouted	to 50'
9			
	1	i i	
	G	ENERAL INFORMATION-P	umping Test, Quality of Water, etc.
Bailed		ENERAL INFORMATION-P M. from 85'	umping Test, Quality of Water, etc.
Bailed			umping Test, Quality of Water, etc.
Bailed			umping Test, Quality of Water, etc.
Bailed			umping Test, Quality of Water, etc.
Bailed		M. from 85'	umping Test, Quality of Water, etc.
Bailed		M. from 85'	
	40 G.P.!	M. from 85'	
WELL E	PRILLER'S	M. from 85' STATEMENT	
WELL E is well was dri ove information	PRILLER'S	M. from 85'	(Not to be filled in by Driller)
WELL E is well was dri ove information ief.	PRILLER'S Uled under n is true to n	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and	(Not to be filled in by Driller)
WELL E is well was dri ove information ief.	PRILLER'S Uled under n is true to n	M. from 85' STATEMENT	(Not to be filled in by Driller)
WELL D is well was dri ove information ief. Signed	PRILLER'S Ued under n is true to n	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and	(Not to be filled in by Driller)
WELL D s well was dri ve information ef. Signed	PRILLER'S Wed under n is true to n	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and Well Driller	(Not to be filled in by Driller)
WELL D is well was dri ove information ief. Signed By	PRILLER'S Wed under n is true to n Licens	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and Well Driller see No.	(Not to be filled in by Driller)
WELL D is well was dri ove information ief. Signed By	PRILLER'S Wed under n is true to n Licens	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and Well Driller see No.	(Not to be filled in by Driller)
WELL D is well was dri ove information ief. Signed	PRILLER'S Wed under n is true to n Licens	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and Well Driller see No.	(Not to be filled in by Driller)
WELL D is well was dri ove information ief. Signed By	PRILLER'S Wed under n is true to n Licens	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and Well Driller see No.	(Not to be filled in by Driller)
WELL D is well was dri ove information ief. Signed By	PRILLER'S Wed under n is true to n Licens	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and Well Driller see No.	(Not to be filled in by Driller)
WELL D is well was dri ove information ief. Signed By	PRILLER'S Wed under n is true to n Licens	M. from 85 ¹ STATEMENT my jurisdiction and the ny best information and Well Driller see No.	(Not to be filled in by Driller)

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1. . . .

WE	LL LOG		PORT TO THE STATE ENGINEER Of Nevada	Well No.
	PLEA		TE THIS FORM IN ITS ENTIRETY	Permit No
OwnerRa	y Fruto	r	Driller	• • • • • • •
	•		LaneAddress_1042_S	-
			c21, T20N/S, R62E, inClark	
				•
			Lic	
				-
			uge	
Diameter a	and length o	of casinggu	(Casing 12" in diameter and under give inside diameter;	encine 197 in diamage of the second second
			g.p.m. and pressure	
			nding water from surface	·
			(Type and size	
			(Type and size .7./14/64	•
			rus-Eric	•
		······································	***************************************	je
		LOG	OF FORMATIONS	
From feet	To feet	LOG Thickness feet	OF FORMATIONS Type of material	Water-bearing Formation, Casing Perforations, etc.
feet O 3	feet 3 30	Thickness feet B 27	Type of material soil ~ clay	
feet 0 3 30 45	feet 3 30 45 55	Thickness feet 27 15 10	Type of material soil ~ clay clay white clay	Perforations, etc.
feet 0 30 45 555 2 70	feet 3 30 45 55 70 75	Thickness feet 27 15 10 15 5	Type of material soil ~ clay white clay white & brown clay white clay little water	Perforations, etc. Chief aquifer (water-bearing formation) from13.5to1.50ft. Other aquifers
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from13.51.50ft. Other aquifers
feet 0 30 45 555¥ 70 75	feet 3 30 45 55 70 75 90	Thickness feet 27 15 10 15 5 15	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay whited	Perforations, etc. Chief aquifer (water-bearing formation) from13.5to1.50ft. Other aquifers
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from13.51.50ft. Other aquifers
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from1.3.5to1.50ft Other aquifers
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from135150ft Other aquifers
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from135150ft. Other aquifers
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from13.5to1.50ft Other aquifers70to ÷0 First water at701 feet. Casing perforated
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from135150to150tt Other aquifers70to ÷0 First water at701 feet. Casing perforated from. ÷0ftto 150 ft.
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from135150ft. Other aquifers
feet 0 30 45 555¥ 70 75 90	feet 30 45 55 70 75 90 110	Thickness feet 27 15 10 15 5 15 20	Type of material soil ~ clay white clay white & brown clay white day little water white sandy clay waTER white clay	Perforations, etc. Chief aquifer (water-bearing formation) from135150ft. Other aquifers

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৩m et	To feet	Thickness		Type of material	
	1001	i 			
1		: :			
	<u></u>	<u></u>			
				CASING RECORD	
am. sing	From feet	To feet	Length	REMARKS—Seals, Grouting, etc.	
"ID	0	150'	150'	Companied cosing in place at 501 ith 2	
	U	1,0		Cemented casing in place at 50' ith 2 yds. of cement.	
			•		
	<u> </u>				
. <u></u>		GE	NERAL INFO	ORMATION—Pumping Test, Quality of Water, etc.	
F	ailtos	ted 100-	gal. per	r-min. 4t 83 ft.	
			<u> </u>		
		RILLER'S S			
nis well ove inf	was dril ormation	lled under m is true to my	y jurisdiction best inform	n and the nation and	
lief.			,		
S	ignedS	R. Acki	nney. & S Well Driller	Sons, Inc.	
	y 10	7 5) "	Time .	NECOLO VEU	
-		J.L. ciii	NGCY J	JUL 2 4 1964	
•		Liceuse	10	E.V. OF WATER RESOURCES	
atead.	urieÇ		, 19. 64 .	SHANCH CFFICE	
				L'S TAS, NEVADA	
				· ···· · ·····	

** 1			D REPORT TO THE STATE EER OF NEVADA	Well No	
			ETE THIS FORM IN ITS ENTIRETY	Permit No Do not fill in	
vner Har	TY F/ F	'ade r	Driller Effing	•	نت سي
			Address Box 57		
			Sec. 21, T. 20N/S, R. 62E, in Clark		_ (```
	-				-
			omestic		12.2
			inch		
			"OD		• •
			"OD 140 feet g 12" in diameter and under give inside diameter;		
					• •
			g.p.m. and pressure		•
			rks(Type and size of		
ate of com	mencement (of wellFe	ebruary 4, 1964 Date of completion	of well February 5, 1964	
			"72 Speedstar"		_
					r.
		LOG	OF FORMATIONS		
From feet	To feet	LOG Thickness feet	OF FORMATIONS Type of material	Water-bearing Formation, Cusing Perforations, Etc.	
		Thickness	OF FORMATIONS	Water-bearing Formation, Cusing Perforations, Etc.	
feet 100	feet 147	Thickness feet	OF FORMATIONS Type of material Well Drillled by Effinger January 29, 1953. Red Sticky Clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation)	
feet 100 147 155	feet 147 155 171	Thickness feet 47 8 16	OF FORMATIONS Type of material Well Drillled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 to 200 ft.	
feet 100 147	feet 147 155	Thickness feet 47 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water)	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 to 200 ft. Other aquifers	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft Other aquifers	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 to 200 ft. Other aquifers	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft Other aquifers	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 to 200 ft. Other aquifers	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft. Other aquifers. 147-155	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft. Other aquifers 147-155	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 to 200 ft. Other aquifers	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft. Other aquifers. 147-155 Other aquifers. 147-155 First water at feet. Casing perforated 120 200 from to ft. Size of perforations Size of perforations Size of perforations	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Cusing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft. Other aquifers 147-155	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft. Other aquifers. 147-155 Other aquifers. 147-155 First water at feet. Casing perforated 120 200 from to ft. Size of perforations Size of perforations Size of perforations	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft. Other aquifers. 147-155 Other aquifers. 147-155 First water at feet. Casing perforated 120 200 from to ft. Size of perforations Size of perforations Size of perforations	
feet 100 147 155 171	feet 147 155 171 179	Thickness feet 47 8 16 8	OF FORMATIONS Type of material Well Drilled by Effinger January 29, 1953. Red Sticky Clay Decomposed Lime (Water) Yellow Sticky Clay Red Sticky Clay	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 179 200 ft. Other aquifers. 147-155 Other aquifers. 147-155 First water at feet. Casing perforated 120 200 from to ft. Size of perforations Size of perforations Size of perforations	

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r.m.	To	Thickness		LOG OF FORMATION	Type of material	
fect	feet	THICKNESS			The or material	
					· ·	
		!	 			-
lam. Ising	From	To	Length	CASING RECO	"Remarks"—Seals, Grouting, Etc.	
	feet	feet	6			
"ID	# 60	200	140	6"ID perfora	ated liner in weil	
		J				
	<u> </u>	GE	NERAL IN	FORMATION—Pumping	g Test, Quality of Water, Etc.	
						=
				1		_
				·		_
						_
						-
		RILLER'S ST		J	(Not to be filled in by Driller)	
nis well ove inf	l was drill formation i	led under n is true to m	ny jurisdict 1y best info	ion and the mation and		····
lief.			_ 4 7 7 4			
5	bigned EII	111	~			
В	y	1. Cf/u	n g l	2	DECE	
		License	No.212			
ated F	ebruary	5.	, 19	64	FEB 1.0 1964	
					DIV. OF WATER RELOURCES	 (·
					ERANCA GIARE	
						•••
<u></u>						

				Log No
WE	LL LC		D REPORT TO THE STATE	Rec19 Well No
			EER OF NEVADA	Permit No.
			ETE THIS FORM IN ITS ENTIRETY	Do not fill in
			Driller	
			NE LAS VEGAS, N.V. Address 2020 CA	
Location of	well: 9	2/4 1/4	Sec. 21, T.20.N/S, R62.E, in. CLARK	Cour
or				
Water will	be used for.	DONE	STIC	th of well190 ft.
Size of drill	ed hole		Weight of casing per	linear foot9-56
Thickness o	f casing		10. ga	
Diameter an	d length of	casing	6.5/8".0.0.155! g 12" in diameter and under give inside diameter; c	
-	-		g.p.m. and pressure	
		-	nding water from surface	
If flowing w	vell describe	control wo	rks(Type and size of	valve, etc.)
Date of con	mencement	of well	May.14,1963Date of completion	of well
Type of we	ll rig	KEYSTO	NE. CABLE. TOOL	
		LOG	OF FORMATIONS	
From feet	To feet	Thickness feet	Type of material	Water-bearing Formation, Casing Perforations, Etc.
			Type of material DEEPENED	
			DEEPENED WELL FIRST DRILLED FOR HERSCHEL	Perforations, Etc. Chief aquifer (water-bearing
			DEEPENED	Perforations, Etc. Chief aquifer (water-bearing formation)
feet	feet	feet	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6, 1952 BY LOUIS	Chief aquifer (water-bearing formation) from
			DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water)	Perforations, Etc. Chief aquifer (water-bearing formation) from
feet 70 116 131	feet 116 131 152	feet	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water)	Perforations, Etc. Chief aquifer (water-bearing formation) from 173 to 181 ft. Other aquifers 70 to 116 131 to 152
feet 70 116 131 152 173	feet 116 131 152 173 175	feet 46 15 21 21 21 2	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay gray clay gravel(water)	Perforations, Etc. Chief aquifer (water-bearing formation) from
feet 70 116 131 152	feet 116 131 152 173	feet 46 15 21 2 1	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay	Perforations, Etc. Chief aquifer (water-bearing formation) from
feet 70 116 131 152 173 175	feet 116 131 152 173 175 181	feet 46 15 21 21 2 6	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay gravel(water) gray clay (water)	Perforations, Etc. Chief aquifer (water-bearing formation) from 173 to 181 ft. Other aquifers 70 to 116 131 to 152 First water at feet.
feet 70 116 131 152 173 175	feet 116 131 152 173 175 181	feet 46 15 21 21 2 6	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay gravel(water) gray clay (water)	Perforations, Etc. Chief aquifer (water-bearing formation) from 173 to 181 ft. Other aquifers 70 to 116 131 to 152
feet 70 116 131 152 173 175	feet 116 131 152 173 175 181	feet 46 15 21 21 2 6	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay gravel(water) gray clay (water)	Perforations, Etc. Chief aquifer (water-bearing formation) from 173 to 181 ft. Other aquifers 70 to 116 131 to 152 First water at feet. Casing perforated
feet 70 116 131 152 173 175	feet 116 131 152 173 175 181	feet 46 15 21 21 2 6	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay gravel(water) gray clay (water)	Perforations, Etc. Chief aquifer (water-bearing formation) from 173 to 181 ft. Other aquifers 70 to 116 131 to 152 First water at feet. Casing perforated from 35 to 190 ft. Size of perforations
feet 70 116 131 152 173 175	feet 116 131 152 173 175 181	feet 46 15 21 21 2 6	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay gravel(water) gray clay (water)	Perforations, Etc. Chief aquifer (water-bearing formation) from 173 to 181 ft. Other aquifers 70 to 116 131 to 152 First water at feet. Casing perforated from 35 to 190 ft.
feet 70 116 131 152 173 175	feet 116 131 152 173 175 181	feet 46 15 21 21 2 6	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay gravel(water) gray clay (water)	Perforations, Etc. Chief aquifer (water-bearing formation) from 173 to 181 ft. Other aquifers 70 to 116 131 to 152 First water at feet. Casing perforated from 35 to 190 ft. Size of perforations
feet 70 116 131 152 173 175	feet 116 131 152 173 175 181	feet 46 15 21 21 2 6	DEEPENED WELL FIRST DRILLED FOR HERSCHEL F.CHRISTY MAY 6,1952 BY LOUIS F.EVANS. gray sandy clay (water) gray clay gray sandy clay(water) gray clay gravel(water) gray clay (water)	Perforations, Etc. Chief aquifer (water-bearing formation) from 173 to 181 ft. Other aquifers 70 to 116 131 to 152 First water at feet. Casing perforated from 35 to 190 ft. Size of perforations

from feet	To feet	Thickness		Type of material
		}		
			•	
				CASING RECORD
Diam. casing	From feet	To feet	Length	"Remarks"—Seals, Grouting, Etc.
5/8"	35	190	155	
		GE	NERAL INFORM	ATION—Pumping Test, Quality of Water, Etc.
				· · · · · · · · · · · · · · · · · · ·
			<u> </u>	· · · · · · · · · · · · · · · · · · ·
	WELL DR	ILLER'S ST	ATEMENT	(Not to be filled in by Driller)
his well pove int	l was drill formation i	ed under m s true to m	y jurisdiction a best informatio	nd the on and
lief.	;		7 E 12 12	
		W	ell Driller	
5		F. DVANS		MAV 27 1953
5	yIOUIS			
B			No. 117	
B			No <u>117</u> , 19.63	
B				ERANCH CTRICE
S				ERANCH CFFICE

	PLEA	ENGIN	D REPORT TO THE STATE EER OF NEVADA ETE THIS FORM IN ITS ENTIRETY Driller LOUIS F.	Log No
	well:	N NE 24 No 1/4	LAS VEGAS, NEV. Address 2020 CAH Sec. 21, 27 20 N/S, R 62 E, in CLARK	
ter will			DMESTIC	¢.
			5.5/8". ØZ/0.D	
			g.p.m. and pressure	
			nding water from surface	•
flowing v	vell describe	e control wo	rks(Type and size of v	alve, etc.)
te of con	amencement	of well	APRIL 18, 1963	of well APRIL 23, 1963
pe of we	ll rigK	EYSTONE (CABLE TOOL	
		LOG	OF FORMATIONS	Water bearing Famotian Guden
From feet	To feet	Thickness feet	Type of material	Water-bearing Formation, Casing Perforations, Etc.
			DEEDENED WELL FIRST DRILLED FOR HERCHEL F. CHRISYY JULY 19,1955,BY LOUIS	Chief aquifer (water-bearing formation) from 80 to 123 ft.
			F.EWANS.	trom
80 123 144	123 144 160	43 21 16	gray sandy clay (water) brown clay gray sandy clay (water)	· · · · · · · · · · · · · · · · · · ·
		10	gray sainty cray (water)	
				First water atfeet.
				Casing perforated
				from
				Size of perforations
	1			<u>‡" wide 6"long</u>
				(-
			(0723)	- 919 -

	To feet	Thickness			Type of material	
					•	
	-					
	-	-				
<u></u>			<u>,</u>			-
Diam.	From	To		CASING RECO		=
casing	feet	feet	Length		"Remarks"Seals, Grouting, Etc.	
5/8"	75	160	85			
						=
		GE	NERAL INF	ORMATION-Pumping	Test, Quality of Water, Etc.	=
		GE	NERAL INF	ORMATION—Pumping	Test, Quality of Water, Etc.	-
		GE	NERAL INF	ORMATION—Pumping	Test, Quality of Water, Etc.	-
		GE	NERAL INF	ORMATION—Pumping	Test, Quality of Water, Etc.	a
		GE	NERAL INF	ORMATION—Pumping	Test, Quality of Water, Etc.	=
				ORMATION—Pumping	•	= - - -
		RILLER'S ST	ATEMENT		Test, Quality of Water, Etc.	-
This well above inf belief.	was dril ormation i	RILLER'S ST led under m is true to my	ATEMENT by jurisdicti y best infor	on and the	•	
This well above inf belief.	was dril ormation i	RILLER'S ST led under m is true to m	ATEMENT by jurisdicti y best infor 7	on and the	(Not to be filled in by Driller)	
This well above inf belief. S	was dril ormation i igned	RILLER'S ST led under m is true to m is true to m is wa	ATEMENT by jurisdicti y best infor 7 E ell Driller	on and the mation and	•	
This well above inf belief. S	was dril ormation i igned	RILLER'S ST led under m is true to m is true	ATEMENT by jurisdicti y best infor Z E ell Driller	on and the mation and	(Not to be filled in by Driller)	
This well above inf belief. S By	was dril ormation i igned	RILLER'S ST led under m is true to m is true	ATEMENT ay jurisdicti y best infor Z E ell Driller iS No117.	on and the mation and	(Not to be filled in by Driller)	
This well above inf belief. S By	was dril ormation i igned	RILLER'S ST led under m is true to my is true to my is F.EVAN License	ATEMENT ay jurisdicti y best infor Z E ell Driller iS No117.	on and the mation and	(Not to be filled in by Driller)	
This well above inf belief. S By	was dril ormation i igned	RILLER'S ST led under m is true to my is true to my is F.EVAN License	ATEMENT ay jurisdicti y best infor Z E ell Driller iS No117.	on and the mation and	(Not to be filled in by Driller) (Not to be filled in by Driller) MAY 2.4 1953 Liv. OF WATER RESOURCES ERATICH CENCE	
This well above inf belief. S By	was dril ormation i igned	RILLER'S ST led under m is true to my is true to my is F.EVAN License	ATEMENT ay jurisdicti y best infor Z E ell Driller iS No117.	on and the mation and	(Not to be filled in by Driller) (Not to be filled in by Driller) MAY 2.4 1953 Liv. OF WATER RESOURCES ERATICH CENCE	-

	PLE.	ENGINI	Well No Permit No Do not fill in	
OwnerB	k. M	ugleston	Drill & Pump Serv.	
Address2	2011, Chi	risty La	ne AddressBox57	9Lic. No. 212
Location of	well: Sn	1/4 11 E 1/4	Sec. 21., T.Z.Q.N/S, R. & 2E, in	Coun
or2	014-Gh	risty…La	ne	
Water will 1	be used for		Domestic	of well
Size of drill	ed hole		8.1nchWeight of casing per	linear foot
Thickness of	f casing		•156	
Diameter an	d length of	casing	6"ID 192 feet liner g 12" in diameter and under give inside diameter; ca	sing 10" in diameter gine outside diameter
			g.p.m. and pressure	
			nding water from surface 49 $feet$	
			ks(Type and size of v	
		-	tember 7, 1962 Date of completion o	• • • •
Type of we	ll rig	<u>"71 Spe</u>	edstar ⁿ	
··				
From	То		OF FORMATIONS	Water-bearing Formation, Casing Perforations Fre
From feet	To feet	LOG Thickness feet	OF FORMATIONS Type of material Depth of well 78 feet	Water-bearing Formation, Cusing Perforations, Etc.
		Thickness	Type of material	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation)
feet 78 110	feet 110 160	Thickness feet 32 5()	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water)	Perforations, Etc.
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation)
feet 78 110 160	feet 110 160 185	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water)	Perforations, Etc. Chief aquifer (water-bearing formation) from
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from 110 to 185ft. Other aquifers
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from 110 to 185ft. Other aquifers
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from 110 to 185 rt. Other aquifers.
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from 110 to 185 ft. Other aquifers. First water at feet. Casing perforated from 85 to 200 ft.
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from 110 to 185 ft. Other aquifers. First water at feet. Casing perforated from 85 to 200 ft. Size of perforations
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from 110 to 185 ft. Other aquifers. First water at feet. Casing perforated from 85 to 200 ft.
feet 78 110 160 185	feet 110 160 185 200	Thickness feet 32 50 25	Type of material Depth of well 78 feet Drilled by others. Gray shale Decomposed limestone (Water) Sand & Gravel (Water) Sandy Shale	Perforations, Etc. Chief aquifer (water-bearing formation) from 110 to 185 ft. Other aquifers. First water at feet. Casing perforated from 85 to 200 ft. Size of perforations

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From	To feet	Thickness		Type of material	
feet	feet				
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			2		
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				CASING RECORD	
Diam. casing	From feet	To feet	Length	"Remarks"—Seals, Grouting, Etc.	
6"ID	15	205	192	Perforated 6" liner	
		<u> </u>			
		GE	ENERAL INF	ORMATION-Pumping Test, Quality of Water, Etc.	
				•	•
					_
	·····			[
	WELL DR	ILLER'S ST	FATEMENT	(Not to be filled in by Driller)	
his well	was drill	led under n	ny jurisdicti 1y best info	on and the mation and	
elief.					
S	igned Eff	inger D	rill &	Pump Serv.	
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Ву	1	· · · · ·	e No. 212		
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Dated	ptembe	<u></u>	, 19	<u>62</u>	
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•	PLE	ENGINE	REPORT TO THE STATE EER OF NEVADA TE THIS FORM IN ITS ENTIRETY	Well No Permit No Do not fill in
Address20	095 Lin well: SW	n Lane, 14 NE 14 S	"Driller Phelps N.L.V	College Ave.NLV Lic. No. 98
Size of drill Thickness o Diameter ar	be used for led hole f casing nd length of	Domes 15" 10 Ga casing 8 (Casing	tic	pth of well 200 ¹ er linear foot 12.24
If flowing v Date of con	well describe nmencement	e control wor	iding water from surface	f valve, etc.) a of well
From feet 0 20 75 78 85 90 110 125 135 165 180 185 195	To feet 20 75 78 85 90 110 125 135 165 180 185 195 200	LOG Thickness feet 20 55 3 7 5 20 35 10 30 15 5 10 5 10 5	OF FORMATIONS Type of material Soil Clay Sandy clay (water) Clay & sand strata white shale sandy shale (water) clay sandy shale (water) white shale sandy shale (water) white shale sandy shale (water) white shale	Water-bearing Formation, Casing Perforations, Etc. Chief aquifer (water-bearing formation) from 125 to 195 ft. Other aquifers. 75 - 78 85 - 90 First water at 70 feet. Casing perforated from 60 to 200 ft. Size of perforations torch 6 (1/8" x 7" horizonts; perforations per ft.
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United States Department of the Interior

Central Laboratory U.S. Geological Survey, WRD 5293 Ward Road Arvada, Colorado 80002

September 28, 1976

Headquarters Department of the Air Force USAF/PREEU Washington, D.C. 20333

Dear Sir:

Enclosed are the results of the chemical analysis of nineteen water samples submitted by your installation. Further distribution of these results is being made as indicated below.

ALV Russell L. MdAvoy Chief, Central Laboratory

RLM/mc Enclosure

141721-141739

cc:

Department of the Air Force TAC Langley AFB VA, 23665

Department of the Air Force 57 CES Nellis AFB NV. 89191

Chief, Boiler Water Laboratory

District Chief, WRD, Carson City, NV.

U.S. GEOLOGICAL SURVEY CENTRAL LABORATORY DENVER, COLORADO BOUDZ

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S7 CIVIL EURIFERING S0 (TAC)+ ATTEN DEOU+ NELLIS AFB+ NEVADA 89191 Coll Site---kell o Fac 00490 nellis AFB Nev - Date---750507 TV E---1)00 -----

FESULTS OF AMALYSIS

HAJOR LONS

CATIONS	467L	4E/L	4N10NS	MG∕L	HE7L
0 NLC 7014	34	1.097	HICARBUNATE	224	3.571
1345513	25	2.057	CARBONATE	ū	0.00
SHAT LEAR	;5	3.047	SULFATE	200	4.154
3. Tassie	7 . J	0.179	CHEURICE	(ے	u • 3.54
			FLUORIDE	3.3	0.047
			102 + 103 45 N	0.47	0.033

			DISSOLVED SOLIDS		
SILICA	13/L	29	FESIQUE AT 140 C	1471	545
I-0.	MISZL	0.63	CALCULATED (SUM)	5 7 X L	513
AN BANESE	437L	0.93	HARDNESS AS CACUS		
00L0K		0	TOTAL	Mo/L	1 <i>≠</i> 0
3-		7.9	NON-CARBONATE	45/L	4
SPECIFIC CONNUC	TANCE		ALKALINITY AS CACU3	MOL	154
IN 10415 .7 25	С	5JZ	CARBON UIDXIDE (CALC)	43/L	4,5
			SOULOW ADSORP. RATLD		2.7
			LANGELIER INDER	25 C	+ Ù , Ŭ

NATER ANALYSIS ID # 141730

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57 CIVIL ENGINEERING SQ (TAC); ATTEN DEOU; NELLIS AFB; NEVADA 89191 COLL SITE---WELL 7 FAC 00489 NELLIS AFB; NEV DATE---750507 TI4E---1055

RESULTS OF ANALYSIS

MAJOR IONS

CATIONS	MG/L	ME/L	ANIONS	MG/L	ME/L
CALCIUM	27	1,347	SICARBONATE	256	4.196
MAGNESIUM	32	2,632	CARBONATE	Û	0.000
500 IU-4	16	0.690	SULFATE	27	0.6)4
POTASSIUM	3.4	0.037	CHLORIDE	8 . 3	0.2+0
			FLUGPIDE	C • Ú	0.026
			N 24 EON + 50V	1.20	0.086

		•	DISSOLVED SOLIDS		
SILICA	MG/L	33	RESIDUE AT 185 C	:46/L	294
TSUM	467L	0.10	CALCULATED (SUM)	467L	251
MANGANESE	MG/L	0.00	HARDNESS AS CACOB		
COLOP		0	TOTAL	M3/L	200
P H		7.8	NON-CARBONATE	MG/L	J
SPECIFIC CONDUCT	ANCE		ALKALINITY AS CACO3	MG/L	615
IN UMHOS AT 25	С	496	CARBON DIOXIDE(CALC)	MG/L	6.5
			SUCIUM ADSORP. RATIO		Û.5
			LANGELIER INDEX	25 C	+0.0

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NATER ANALYSIS ID # 141731

57 CIVIL ENGINEERING SQ (TAC), ATTEN DEOU, NELLIS AFO, NEVADA 39191 Coll Site---Well 11 FAC 01011 Nellis AFO, NEV Date---760507 TIME---1035

RESULTS OF ANALYSIS

MAJOR IONS

CATIONS	MGZL	ME/L	ANIONS	146/L	ME/L
CALCIUM	20	0.998	BICARBONATE	257	4.212
MAGNESIU-	35	2.979	CARBONATE	0	0.000
SONIUM	25	1.083	SULFATE	37	0.770
POTESSIUM	4.7	0.125	CHLORIDE	5.2	0.147
			FLUORIDE	0.9	0.047
			N 24 EON + 500	ú.31	550.0

			DISSOLVED SOLICS		
SILICA	MGZL	51	RESIDUE AT 160 C	MGZL	322
I-Dit	MG/L	0.11	CALCULATED (SUM)	MGZE	307
MANGINESE	-467L	0,00	MARDNESS AS CACOS		
COLOR		0	TOTAL	167L	190
Ч.С.		7.8	NON-CARBUNATE	4GZL	L C
SPECIFIC CONDUCT			ALKALINITY AS CACO3	MG/L	211
IN UTHOS AT 25	С	515	CARBON DIOXIDE(CALC)		6.5
			SOUIUM ADSORP. RATIO		ປ. ຢ
			LANGELIER INDEX	25 C	-0.2

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WATER ANALYSIS IO # 141732

57 CIVIL ENGINEERING SQ (TAC), ATTEN DEOU, NELLIS AFB, NEVADA 39191 COLL SITE---#ELL 12 FAC 01711 NELLIS AFB, NEV DATE---760507 TIME---1045

RESULTS OF ANALYSIS

MAJOR IONS

CATIONS	MG/L	ME/L	ANIONS	MG/L	ME/L
CALCIUM HAGNESIUM	20 33	0.998	BICARBONATE Carbonate	233 0	3.819 0.000
50010M POTASSIU (18 4.5	0.733 0.115	SULFATE Chloride Fluoride No2 + No3 AS N	28 5.2 0.9 0.07	0.533 0.147 0.047 0.045

			DISSOLVED SOLIDS		
SILICA	4G/L	59	RESIDUE AT 180 C	MGZL	306
[004	437L	0.00	CALCULATED (SUM)	MG/L	295
VANGANESE	46/L	0.00	HARCHESS AS CACOB		
COLOR		J	TOTAL	A3/1_	190
0H		7.9	NON-CARBONATE	1913/L	Û
SPECIFIC CONDUC	CTANCE		ALKALINITY AS CACOB	MG/L	191
IN UMHOS AT 25	5 C	453	CARBON DIOXIDE(CALC)	MG/L	4.7
			SODIUM ADSORP. RATIO		0.6
•			LANGELIER INDEX	έS C	-0.1

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417ER ANALYSIS 10 # 141739

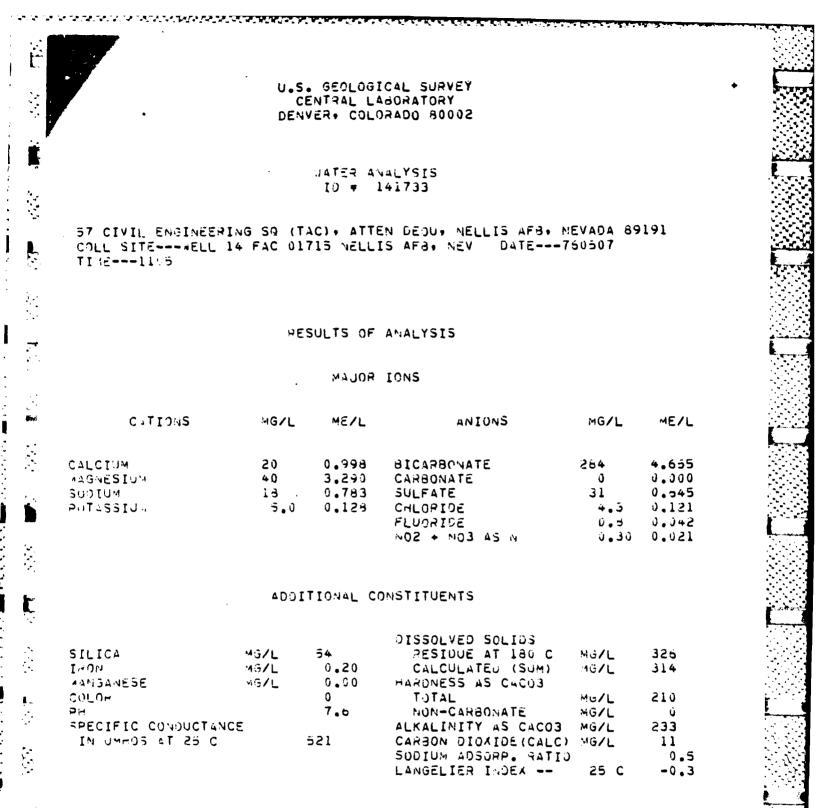
57 CIVIL ELGIDEERING SO (TAC)+ ATTEN DEOU+ NELLIS AFB+ NEVADA 89191 COLL SITE---WELL 13 FAC 01713 NELLIS AFB+ NEV DATE---760507 TIDE---1025

RESULTS OF ANALYSIS

MAJOR IONS

CATIONS	40/L	イミノレ	ANIONS	MG/L	MEZL
CALCIUM	<u>2</u> 0	0.998	BICARBONATE	253	4.147
LIGHESIUH	4ز	2.797	CARBONATE	0	0.00
S 36 F 14	3±	1.653	SULFATE	75	1.562
POTASSIJ.	5.4	0.164	CHLURIDE	11	0 . 310
	•		FLUORIDE	1.2	6eu.U
			N 24 EON + 50M	0.52	0.037

			DISSOLVED SOLIDS		
SILICA	MG/L	78	RESIDUE AT 180 C	MG/L	410
1504	MG/L	0.07	CALCULATED (SUM)	40/L	391
IANGANESE	157L	0.00	HARDNESS AS CACUB		
COLOR		0	TOTAL	MG/L	190
D 1		7.8	NON-CARBONATE	MG/L	Ú
SPECIFIC COMPUCTANCE			ALKALINITY AS CACOB	MG/L	200
TN UMHOS AT 25	5 C	601	CARBON DIOXIDE(CALC)	MG/L	6.4
			SODIUM ADSORP. RATIO		1.2
			LANGELIER INDEX	ci C	-0.2



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APPENDIX B

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LABORATORY AND FIELD INVESTIGATION QUALITY CONTROL PROGRAMS

APPENDIX B

· LABORATORY QUALITY CONTROL PROGRAM

UBTL is an accredited laboratory of the American Industrial Hygiene (AIHA) Association (No. 17) and, as such, participates in an extensive interlaboratory proficiency analytical testing program sponsored by the National Institute for Occupational Safety and Health (NIOSH). In addition, UBTL is currently licensed by the Center for Disease Control (CDC) to perform chemical and clinical analyses of biological specimens and is State of Utah/USEPA approved for environmental analyses. The comprehensive internal quality control program at UBTL is detailed as follows.

INTRODUCTION

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UBTL has implemented an effective system for Quality Control (QC) for samples analyzed from Nellis AFB. Procedures that are employed include:

- 1. Services of a full-time Quality Control/Quality Assurance Section;
- 2. Preparation of internal quality control samples;
- 3. Collection and evaluation of quality control data;
- 4. Generation of quality control charts; and
- 5. Instrument calibration and maintenance.

SAMPLE ANALYSES

At least one blank sample and one reagent blank are included with each set of analyses and processed through the complete analytical procedure in order to detect any contamination in either collection media or reagents. In addition, duplicate analyses are accomplished on a minimum of 10 percent of all samples submitted from the field. Internal quality control samples, generated in the laboratory and containing known quantities of specified analyte(s), are run at the rate of 10 percent of the total field sample workload. At the completion of the analysis of a sample set, each chemist calculates his results and reports the results on the Analytical Report Form. Results for replicated samples and internal quality control samples are reported on the computer-generated Quality Control Data Sheet. Before the results are submitted to the Group Leader, another peer chemist analyst is assigned to

[B-1]

check results for possible errors in the calculations. He must approve results reported on both the quality control sheet and the sample sheet. The Group Leader, after his evaluation of the data, gives the report sheets to the Quality Assurance Specialist (QAS) for his evaluation and implementation of any required action.

Specific steps are followed when any one QC sample result is determined to be out of control in connection with the analysis of a field sample set. QC charts with adjusted control limits of ± 3 standard deviations will generally be used to determine whether a result is out of control. If QC results are in control, the QAS signs off the report. It is then reviewed by the Section Head for accuracy of the results. Upon final approval of the reports by the QAS and the Section Head, the reports are sent to the sponsor.

The paperwork containing the raw data for a sample set (i.e., chart paper, computer readouts, paper tapes, calibration curves, tables of data, etc.) is collected and placed in an $8\frac{1}{2}$ -inch by 11-inch envelope that has been labeled with sample numbers, analyst, date, and other pertinent information. The envelopes are filed by laboratory number for possible future reference and data retrieval. Raw data for each sample analysis are therefore readily available, if needed.

QUALITY CONTROL SAMPLE DATA ANALYSIS

A record of the preparation of internal QC samples is detailed in the QC log book maintained by the QAS. As appropriate, a set of QC samples is distributed to the chemist along with each sample set at an average rate of at least 10 percent of the submitted samples. The analyses and data evaluations are performed for these QC samples, along with the submitted samples, and results are tabulated on the computer-generated Quality Control Data Sheet. At least duplicate results are reported for each internal QC sample.

QC charts are generated for each analyte through the analysis of QC sample results. Each result is divided by the theoretical value to standardize results so that data from all concentrations can be directly compared for accuracy and precision. When a control data set of N sample results has been accumulated, the following statistics are calculated: mean percent recovery, replicate standard deviation, and set standard deviation. These statistics are then used to determine accuracy and precision QC limits.

[B-2]

The control data set is updated after evaluation of 20 successive QC samples and includes data on the 50 most recent results. Any control sample analysis that is beyond accuracy or precision limits is not used in the subsequent determination of new limits.

EXTERNAL QUALITY CONTROL PROGRAMS

In addition to internally generated QC data, other information concerning QC is provided by the participation of UBTL in four interlaboratory QC programs: NIOSH Proficiency Analytical Testing (PAT) Program; two CDC Blood Lead QC Programs; and State of Utah Environmental Quality Control Program. The PAT Program and the CDC Blood Lead Programs involve the participation of more than 100 laboratories on a nationwide basis. The PAT Program addresses the analysis of filter samples for lead, cadmium, zinc, free silica, and asbestos and the analysis of charcoal tubes for various organic solvents.

LABORATORY DATA REDUCTION

A significant fraction of the Chemistry Department's work involves data Mathematical models, based upon analysis of standard solutions or processing. samples, are generated in order to determine the quantity of analyte present in the Considerable time and effort are saved by the utilization of automated samples. data processing procedures. Data processing by the computer can include, for example, calculations, generation of standard calibration curves, mathematical modeling of standard curves, statistical analyses, and the generation of hard copy output. Advantages intrinsic to the use of an automated system include more accurate calculations, immediate and accurate generation of data plots, fewer transcription errors, and no calculation errors after programs have been verified and documented. In general, the types of data that are processed are those derived from the following techniques: atomic absorption and flame emission spectroscopy, gas and liquid chromatography, optical absorbance spectrophotometry, specific ion electrode, fluorescence spectroscopy, and wet chemistry determinations. Similar functions are employed for QC data. In addition, the data system is utilized to store QC data, provide statistical analyses, and generate and update QC charts. The advantage of the provision for statistical analyses and the production of QC charts by automation is that the charts may be easily updated with minimal effort. QC data and any required action may, therefore, be provided on a daily basis.

REPORTING PROCEDURES

The analytical data are reported to the sponsor at the completion of each sample set. The report includes the following items:

- 1. A memorandum describing the sample set; the condition and appearance (i.e., homogeneity, integrity, etc.) of the samples upon receipt at UBTL; the method, equipment, and technique used in the determination; any interferences that were observed; and any unusual circumstances that may have occurred during the analysis. [The limit(s) of detection are also reported.]
- 2. UBTL Analytical Report Form, including field ID number, laboratory ID number, identification of the analytes, results of each determination, limit(s) of detection, and comments.
- 3. Other items, such as copies of strip chart recorder output, computer printout sheets, and other raw data (to be included as required).

INSTRUMENTATION

Each major equipment item at the UBTL Chemistry Department undergoes a routine preventive maintenance check on a regular schedule. This check is accomplished by a trained engineer. In addition, performance checks are made by the analyst prior to the analysis of each set of samples. This involves the analysis of one or more standards and a comparison of the values obtained with previous results and conditions. This information is recorded in an instrumentation log.

When an instrument or apparatus malfunctions and the problem is not readily corrected, the appropriate Section Head is notified. If it is determined that a visit by the service representative is required, a service call is scheduled and the QAS is notified. Action by the service representative is recorded by the QAS in the Instrument Maintenance Log, and the appropriate customer field and service order forms are filed, by instrument, in the Instrument Maintenance Log Supplement File. In an effort to monitor and maintain instrument specifications, logs for each of the AA spectrophotometers, the gas chromatographs (GC), the X-ray degractometer (X-ray), and the mass spectrometers (MS) have been provided for the analytical chemists' use each time an analysis is performed. The AA instrumentation logs contain entries for date, analyst, lamp number (if more than one lamp is available), standard concentration (recommended in manual), reading in milliabsorbence units, and a column for when instrumental parameters differ from the recommended conditions listed in the manual. The GC, X-ray, and MS logs contain entries for date, time, analyst, set identification number, and comments on parameters or performance.

A comprehensive analytical chemistry equipment list is included at the end of this document.

TRAINING

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UBTL has established a continuing program of training of current personnel with respect to QC procedures. In addition, an intensive program for the training of recently recruited personnel in both analytical methods and techniques and QC policies has been implemented. It is the responsibility of the QAS and the Laboratory Director to train all laboratory personnel.

RESULTS OF THE LABORATORY QC PROGRAM

The results of the QC analyses for soil and ground water samples are listed in Tables B-1, B-2, and B-3.

Soil Analyses

The laboratory QC program for soil samples included analyses of three duplicates and three spiked samples. Table B-1 lists the results of the spiked sample analyses. No listing of the duplicate sample analyses was necessary because the concentrations of each constituent in all the duplicates and original samples were below detection limits. Two spike concentrations were used: 0.01 and 0.025 μ g/l. Recovery of the 0.01 μ g/l spikes was generally poor, averaging about 71 percent. The recoveries were low because the 0.01 μ g/l spike was the same concentration as the detection limit. Recovery of the 0.025 μ g/l spike was satisfactory, averaging about 100 percent.

Ground Water Analyses

The laboratory QC program for ground water samples included a single duplicate sample and one spiked sample. Table B-2 summarizes the analyses of spiked samples. The overall average was 113 percent, although it was 100 percent

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for pesticides alone. This indicates that the reported concentrations of halocarbons and aromatics may be up to 30 percent above the actual sample concentration. Thus, the analyses probably overestimate the amount of contaminants present in ground water samples. Table B-3 summarizes the analyses of duplicate samples. In general, there was satisfactory agreement between replicates of the same sample.

FIELD INVESTIGATION QUALITY CONTROL PROGRAM

Quality control of field activities consists of following established procedures during the conduct of the work. In those cases that require the drilling of test borings, installation of piezometers or monitor wells, and taking of soil and water samples, the procedures include the preparation of records to document the compliance with these procedures. These field records include boring logs, monitor well installation records, daily field memoranda, sample shipment and test instruction forms for soil sample testing, and chain-of-custody records for all soil and water samples intended for chemical analyses. The nature of water sample tests was established in advance so that plans could be made to ship samples in an appropriate and timely manner.

The pH and specific conductivity meters used for field water quality measurements (see Table B-4) were calibrated with known standards immediately before the measurements were made. The HNU photoionization detector and explosimeter used to monitor vapors generated while drilling have internal calibration routines that were followed when the meters were turned on. A detailed description of sampling procedures is located in Section III.

TABLE 8-1

SUMMARY OF SPIKE RECOVERY FOR SOIL SAMPLES

CONSTITUENT	LIMIT OF DETECTION (µg/q)	SPIKE CONCENTRATION	% SPIKE RECOVERED	SPIKE CONCENTRATION	% SPIKE RECOVERED	SPIKE CONCENTRATION	% SPIK RECOVER
Purgeable Halocarbons and							
Tromatics							_
		Sample No	. 4258	<u>Sample No</u>	. 4269	<u>Sample No</u>	4275
Chloromethane	0.01	0	0	0	0	0	0
Bromomethane	0.01	0.01	71	0.025	93	0.025	93
)ichlorodifluoromethane	0.01	0	0	0	0	0	0
/inyl Chloride	0.01	0	0	0	0	0	0
hloroethane	0.01	0.01	51	0.025	88	0.025	78
lethylene Chloride	0.01	0	Ō	0	0	0	0
richlorofluoromethane	0.01	õ	ŏ	ŏ	ŏ	õ	ō
.1-Dichloroethene	0.01	0.01	18	0.025	98	0.025	102
1,1-Dichloroethane	0.01	0	0	0	Ő	0	Ō
rans-1,2-dichloroethene	0.01	0	Ö	ň	ŭ	0	Ö
chloroform	0.01	0.01	51	0.025	107	0.025	92
		0.01		0.025	107	0.027	0
,2-Dichloroethane	0.01	-	0	-	-	-	-
,1,1-Trichloroethane	0.01	0	0	0	0	0	0
arbon Tetrachloride	0.01	0.01	37	0.025	100	0.025	128
romodichloromethane	0.01	0	0	Q	0	0	0
,2-Dichloropropane	0.01	0	0	0	0	0	0
rans-1,3-dichloropropene	0.01	0	0	0	0	0	0
richloroethene	0.01	0	0	0	0	0	0
ibromochloromethane	0.01	0	0	0	0	0	٥
.1.2-Trichloroethane	0.01	0.01	71	0.025	92	0.025	99
is-1,3-dichloropropene	0.01	0	0	0	0	0	0
-Chloroethylvinylether	0.01	0	ō	Ō	ō ·	Ō	Ō
Bromoform	0.01	0.01	75	0.025	82	0.025	113
1,1,2,2-Tetrachloroethane	0.01	a a	Ő	0	ō	0	Ō
,1,2,2-Tetrachloroethene	0.01	ŏ	ŏ	õ	ŏ	ŏ	ă
hlorobenzene	0.01	0.01	66	0.025	83	0.025	108
.2-Dichlorobenzene	0.01	0.01	0	0.025	0	0.025	100
	0.01	0	Ö	0	0	0	-
.,3-Dichlorobenzene .4-Dichlorobenzene	0.01	0.01	130	0.025	104	0.025	0 118
y	0.01						
		Sample No	. 4225	Sample No	. 4241	Sample No	4244
thyl Benzene	0.01	0.025	86	0.025	130	0.025	114
Benzene	0.01	0.025	96	0.025	158	0.025	115
oluene	0.01	0.025	86	0.025	127	0.025	īīí
.2-Dichlorobenzene	0.01	0.025	78	0.025	141	0.025	111
,3-Dichlorobenzene	0.01	0.025	75	0.025	132	0.025	110
l,4-Dichlorobenzene	0.01	0.025	72	0.025	152	0.025	110
Chlorobenzene	0.01	0.025	81	0.025	112	0.025	109
		Sample No.	4203 (b)	Sample No.		Sample No.	
Dil and grease	0.05 mg/g	0.51079	61	0.51079	67	0.51079	47

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Notes: (1) All concentrations in μg/g except oil and grease. (2) Initial concentration of each parameter in all above samples was less than detection limits. (3) "O" indicates concentration was below detection limits or no spike was added.

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	TABLE B-2		
SUMMARY OF SP	IKE RECOVERY FOR GRO	UND WATER SAMPLE	<u>15</u>
CONSTITUENT	LIMIT OF DETECTION (µg/l)	SPIKE CONCENTRATIC	% SPIKE ON RECOVERED
urgeable Halocarbons and Aroma			<u></u>
		Sample N	10. 4161 or 4152#
Chloromethane Bromomethane Dichlorodifluoromethane Vinyl Chloride Chloroethane Methylene Chloride Trichlorofluoromethane 1,1-Dichloroethane Trans-1,2-dichloroethene Chloroform 1,2-Dichloroethane 1,1,1-Trichloroethane 2,2-Dichloromethane 1,2-Dichloromethane 2,2-Dichloropropane Trans-1,3-dichloropropene Trichloroethene Dibromochloromethane 1,2-Trichloroethane 2,2-Trichloroethane 2,2-Trichloroethane 2,2-Trichloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2,2-Tetrachloroethane 1,2-Dichlorobenzene 1,4-Dichlorobenzene 1,4-Dichlorobenzene	55555555555555555555555555555555555555	0 2.5 0 2.5 0 2.5 0 2.5 0 2.5 0 0 2.5 0 0 0 0 0 0 0 0 0 0 0 0 0	$ \begin{array}{c} 0\\ 104\\ 0\\ 0\\ 120\\ 0\\ 110\\ 0\\ 117\\ 0\\ 0\\ 116\\ 0\\ 0\\ 132\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 133\\ 0\\ 0\\ 0\\ 111^{*}\\ 13,\\ 105^{*}\\ 126^{*}\\ 121^{*} \end{array} $
pluene esticides (μg/l)	0.5	10#	125*
		Sam	ple No. 4155
ldrin bieldrin hlordane DT isomers ndrin ndrin Aldehyde eptachlor indane	0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01	0.8 0.8 0.8 0.8 0.8 0.8	96 103 111 113 86 93
<u>thers (mg/l)</u> ead itrate (as N) il and grease	0.01 0.02 0.5	0.481 12	102 (QC15994_average) 54
Phenol	0.005		(QC16723 average)

Note: Sample 4152 analyses are designated by an asterisk.

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TABLE B-3

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SUMMARY OF DUPLICATE ANALYSES FOR GROUND WATER SAMPLES

	LIMIT OF DETECTION	SAMPLE	REPORTED	REPLT CATES	TES	SAMPI.E	REPORTED	REPLI	REPLICATES
CONSTITUENT	(µg/1)	NUMBER	CONCENTRATION	-	2	NUMBER	CONCENTRATION	-	2
<u>Pesticides (μg/l)</u>									
Aldrin	0.01	4142	<0.01	<0.01	<0.01	4155	<0.01	<0.01	<0.01
Dieldrin	0.01	4142	<0.01	<0.01	<0.01	4155	<0.01	<0.01	
Chlordane	0.1	4142	<0.1	<0.1	<0.1	ı	ı	I	1
DDT isomers	0.01	4142	<0.01	<0.01	<0.01	4154	<0.01	<0.01	<0.01
Endrin	0.01	4142	<0.01	<0.01	<0.01	ı	1	I	1
Endrin Aldehyde	0.01	5155A	<0.01	<0.01	<0.01	5155S	<0.01	<0.01	<0.01
Heptachlor	0.01	4142	<0.01	<0.01	<0.01	4142	<0.01	<0.01	<0.01
Lindane	0.01	4142	<0.01	<0.01	<0.01	4155	<0.01	<0.01	<0.01
Others (mg/1)									
Lead	0.01	4127	<0.001	<0.001	<0.001	4145	<0.001	<0.001	<0.001
Nitrate (as N)	0.02	4146	0.67	0.667	0.664	QC15994	ı	0.361	0.363
Oil and grease	0.5	QC16723	1	6.4319	6.4319	1	ı	I.	,
Phenol	0.005	4130	<0.005	0.00152	0.00472	4147	0.800	0.798	0.807

TABLE I	B-4
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GROUND WATER QUALITY DATA FOR PARAMETERS MEASURED IN THE FIELD

WELL	DATE	H	SPECIFIC CONDUCTIVITY (µmhos/cm)	TEMPERATURE	CASING VOLUMES PUMPED BEFORE SAMPLING
D M- 1	11-3-83	6.5	1950	21	9.5
DM-2	11-3-83	6.6	1950	21	9.5
DM-3	11-3-83	6.6	1950	21	20
No. 6	11-8-83	7.3	680	21	12.4
No. 11	11-7-83	6.8	500	21.5	17.6
No. 12	11-7-83	7.2	460	21	9-3
No. 13	11-7-83	7.0	500	23	13
No. 14	11-8-83	7.1	520	22	9.9

APPENDIX C

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CHAIN-OF-CUSTODY FORMS

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	-661	ite													Date	\vec{Z}	Date		Date		
OM-37 Menitoring Wells, U.S. Air Force Fi	22-971-6101 .CN dol	Sampling Site	Well Head					Well Head		Well Head					Relinguished hv:		Relinquished by:	5	Relinquished by:		
US, U	~	l Iers	5					.							Time F	160			Tine R		Ĩ.
ring We	is NFB	No. of Containers	Seven					Seven		Jeven					Date	11/2/3	Date	·	Date		
M-3.21 Merila	1/2 - Dell	Sample Type	Grib					Grab	+	040					Received by:	(Signature)	Received by:	(Signature)	kacefved by: (Signature)		
0	Airl		ń	T	T	T		n						1	Time	2:05	Time		Tine		
	U.S.Air	Sample I.D. No.	DM-3					-WQ	S C	7					Date	83	Date		Date		p
Sample Source &	Project Title	Time	10:50					12:00					-+	_	itahed by:	حبر	Kellnquiehed by:	(signature)	linquished by: (Signature)		
Sampl	Projec	Date	11-3-63	T	T	T		-3-23	11-2.47						Relinquished	File	elinqu	ugre)	Relinquished (Signature)		÷

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(Signature)	Romarks () Pense, Lend, Prenol,	Nitrates, Aromatics, Halocarbons				by: Date Time e) //-f.83///.30	by: Date Time e)	by: Date Time
eld Perso	Oil and Grease, Lead	Velatile Aromatics, Volatile Aromatics, Volatile Halocarbon	Same			Time Received by: (Signature)	Time Received by: (Signature)	Time Received by: (Signature)
2015 Job No.1016-179-22	te		head	S		Date	by: Date	Date
3 Production Wells lis AFB Job No.1016-179-22	Sampling Si Well Head		Well he			e Relinquished by: (Signature)	e Relinquished (Signature)	Time Relinquished by: (Signature)
Pruduction AFB No. of	Containers Seven		Seven Seven			: Date Time	: Date Time	Date
AF7 -NU	Grab		Grab			Received by: (\$1gnature)	Réčeived By (Signature)	k⊲ceived by: (Signature)
& Client Ncll's US Air Force Sample	1.D. No. Well#12		Well# 13			Date Time	Date Time	Date Time
Sample Source & Project Tille & Date Time			11-7-83 10:50			Relinquished by: (Signerwire)	Relinquished by/ (Signature)	Relinquished by: (Signature)

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				+ile										•	Time	6.6	Time		Tine		_
	Signature)	J)		Vola	Jatil										Date	6-11	Date		Date		
	ersonnel	gol J. Vue	Remarks	l and grease, volati	arometics, volatile	halocarbons	Same	-							Received by:	(Signature) M.R.L.L.	Received by:	(Signature)	Received by:	(Signature)	
ORD	Fiel		2	0.	ŭ	1 20			-		┨				Tine		Time		Time		
RECO		9-2-6	te					- 1							Date		Date		Date		
MOORE CHAIN-OF-CUSTODY RECORD	AFB. USAF	Job No. 1016-179-22	Sampling Site	Well Head			Well Hend								by:	(Signature)	by:	(Signature)	Time Relinquished by:	(Signature)	
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RE CH	Jells	AFB'	No. of Containers	Э			m				ļ				Date	1350	Date	6-11	Date		
DAMES & MOOF	e Production Wells, Nellis AFB	- 9.		Gurb			Gmb								Received by:	(Signature) Mill (UU)	Received by:	(Signature)	keceived by:	(Signature)	
DA	Base	і Ч Г	e e	# 6			H # H								Time	3.1	Time	10:10 A.M.	Time		
	Client	US Air	Sample I.D. No.	Well #6			Well#								Date	188	Date	1-9	Date		Ľ
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	Sample	Project	Date	11-2-12			11-8-03								Reling		Reling	(51g)	Relinquished		

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11 is PM Time Time Time SMAND SAMPLE TEST SHIPLE 1 2 8/4/n Field Personnel (Signature) Date Date Date Thomas Lee Remarks 124 121 Received by: Received by: Received by: din D. Lealen (Signature) (Signature) (Signature) GELECTED Serected Salevred 2 M Time Time Time 2 Existing Fire Training Ara Job No. 01016-179-22 6 Existing Fire Train NG Date Date Date 2 Sampling Site Relinquished by: Relinquished by: Relinquished Wy: (Signature) (Signature) 512 # 20 Tine 2,22 Time Time 3:00 Mr. No. of Containers 83 4/6/10 Date Date Date 5 Þ Ruce kccelved by: Received by: Received by Orional) 17.4.6.7.96 (Signature) (Signature) Nellis Bir Force Sample Type JAC 3 USAF <u>کر</u> Time Time Date | Time 11/16/ 23:30 514 5/5 5-13 55 Sio 115 Sample I.D. No. -59 **3**S 8.5 57 8152 BH 53 BIS4 BI SI 14/r3 1 Date Sample Source & Client Date 1-2 Ð de To 2 8 5 B Ð de To à Relinguished by: Relinquished by: Relinquished by: et : 3:5 1=30 8:35 23 and b Thomas LEE Time 2 5 z 2 840 (Signature) (Signature) 9258 (Signature) **Project Title** 7:00 212 D Rullin 19/6 Date

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DAMES & MOORE CHAIN-OF-CUSTODY RECORD

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DAMES & MOORE CHAIN-OF-CUSTODY RECORD

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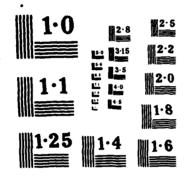
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 NATIONAL BUREAU OF STANDARDS

DAMES & MOORE CHAIN-OF-CUSTODY RECORD

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II FPM Tine Tine 11 ... Selected test small TBST SMIPLE **BITERS** Field Personnel (Signature) Date Date Date 12/4J Thomas LFC Remarks Received by: (Signature) 1221 Received by: Received by: in D. Leulay (Signature) (Signature) SELECTED SELECTBD ME Tine Tine Time 188 1 831 Job No. 01016-179-22 KED ENSING FLEE Date TEMNING ACA Date Date Sampling Site Time Relinquished by: Relinquished by: Ellnquished by: MMA.RY (Signature) (Signature) U.S.KF Time 212 Time 5:00 No. of Containers E $\tilde{\mathscr{S}}$ Date Date Date base Ì Ancinen) icceived by: Received by: Received by (Signature) (Signature) Sample Source & Client Nellis Ar Force Sample Type よう 13" [34 23-20 Tine Time Time U.S.A.F 5-20 S-10 11-3 S-18 61-5 5.9 L'S 5.0 849-6 Sample I.D. No. SA S 200 1:5 ti/ehs Date Date [1] |1/ |1/ Date 8.4 44 84 6-4 48 4 84 2 4 3 **8** \$ 1 I lelinquished by: Relinquished by: Relinquished by: T T 01:11 15:17 ちょう 5230 545 いい 14:30 (:3F 10:01 14:45 2:50 THOMAS LEE Time 5:10 52:51 (Signature) (Signature) (Signature) <u>2</u> 2 - D. Davelen **Project Title** 16/02 Date

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APPENDIX D

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ANALYTICAL DATA

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520 WAKARA WAY - SALT LAKE CITY, UTAH 84108 - 801 581-8267

DAMES & MCGRO

JAN 1 1 1983

Park Ridge, Illine is

January 11, 1984 Refer to: 84C046

UBTL

Dr. Kenneth J. Stimpfl Dames & Moore 1550 Northwest Highway Park Ridge, Illinois 60068

RE: Analytical Services in Support of USAF Contract F3316-83-D-4002 Nellis AFB Survey

Dear Ken:

Enclosed with this letter are the following:

Soil Sample Handling and Moisture Determination Protocols
Chain of Eustody Records for:
 Soil Samples (719 total)
 Water Samples (DM-1,2, & 3)
 Water Samples (Wells 11, 12 & 13)
 Water Samples (Wells 6 & 14)
EPA Comment Sheet for Oil & Grease QC Samples
Analytical Reports for Soil and Water Samples

UBTL has furnished a moisture determination for the soil samples at no additional cost. If that data is useful to you, we would like to add in the cost of a soil moisture determination for future jobs as they are bid. The results of the EPA 601 and 602 analyses were delayed because both allyses had to be done on one instrument; and that instrument developed problems. UBTL has purchased the hardware to equip two gas chromatographs for these analyses. This measure is expected to resolve the problems which delayed the EPA 601 and 602 analyses.

There was some confusion in the laboratory regarding the specific nature of the OC program. This resulted in less than 10% splits and 10% spikes being performed for some analyses. The problem was found and additional samples were requested for the Davis-Monthan AFB work. In some cases EPA QC samples were analyzed with the Nellis AFB samples to compensate.

MEDIC NE + BIGENGINEERING + CHEMISTRY

RESEARCH · DEVELOPMENT · ANAL · SIS

Dr. Kenneth J. Stimpfl January 11, 1984 Refer to: 84C046

recoveries is to be expected.

Sincerely,

Am

Sim D. Lessley, Ph.D. Technical Manager

xc: George Condradt

The results from the EPA QC sample for Oil and Grease did not agree well with the target value. This is attributed to a difference between the

standard used in the analysis and the material used to prepare the QC

sample. A sheet from the EPA which discusses this is enclosed.

samples. The report is included for your reference.

The spikes for the EPA methods 601 and 602 were quite close to the detection limits. At such low levels greater variation in spike

One set of Davis-Monthan AFB samples was analyzed with the Nellis AFB

Page 2

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601 recei 6-6,14,11,12,13 DM 1, 2, >

UBTL

520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

December 23, 1983

ANALYTICAL REPORT

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SUBMITTED TO: George Condradt SUBMITTED BY: James R. Baxter

REFERENCE DATA:

EPA 601 Purgeable Halocarbons Analysis of: 451, 454, 459, 489 Identification No.: Sample(s): 11 Analyses: 319 UBTL Laboratory No .: SA-4139 through SA-4141, SA-4148 through SA-4150, SA-4161 through SA-4162,

The above numbered samples were analyzed using EPA Test Method 601 for purgeable halocarbons. A 5 mL aliquot of sample was purged with helium and any analytes present were collected on a trap consisting of activated charcoal, Tenax, and silica gel. The trap was then heated to 180°C and any analytes were flushed onto an 8' x 2mm I.D. glass chromatographic column packed with 1% SP-1000 on Carbopack B. A thermal program starting at 50°C and proceeding at 8°C/minute to 220°C was used to separate the analytes. A Hall 700A electroconductivity detector in the halogen mode was used for detection and quantification of the analytes.

SA-4426 through SA-4428

Samples SA-4150 and 4427 were analyzed in duplicate and sample SA-4161 was analyzed neat and then reanalyzed with a 2.5 μ g/liter spike containing bromomethane, chloroethane, 1,1-dichloroethene, chloroform, carbon tetrachloride, 1,1,2-trichloroethane, bromoform, chlorobenzene, and 1,4-dichlorobenzene.

The limits of detection for each analyte are as follows:

Analyte	Limit of Detection (µg/liter)
Chloromethane	0.5
Bromomethane	0.5
Dichlorodifluoromethane	0.5
Vinyl Chloride	0.5
Chloroethane	0.5
Methylene Chloride	0.5
Trichlorofluoromethane	0.5
1,1-Dichloroethene	0.1
1,1-Dichloroethane	0.1
Trans-1,2-dichloroethene	0.1
Chloroform	0.1

1,2-Dichloroethane	0.1
1,1,1-Trichloroethane	0.1
Carbon Tetrachloride	0.1
Bromodichloromethane	0.1
1,2-Dichloropropane	0.1
Trans-1, 3-dichloropropene	0.5
Trichloroethene	0.1
Dibromochloromethane	0.5
1,1,2-Trichloroethane	0.1
Cis-1, 3-dichloropropene	0.5
2-Chloroethylvinylether	1.0
Bromoform	0.1
1,1,2,2-Tetrachloroethane	. 0.5
1,1,2,2-Tetrachloroethene	0.5
Chlorobenzene	0.1
1,2-Dichlorobenzene	0.5
1,3-Dichlorobenzene	0.5
1,4-Dichlorobenzene	0.5

The results are tabulated on the following page(s).

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James R. Baxter D. Lessley, PH.D.

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			ANALYTICAL REPORT FORM
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			Received at UBTL November 9, 1983
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Reviewer A Martin	
Laboratory Supervisor	

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

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Field Sample Number W 11 W 12 W 13	UBTL Lab Number SA 4148 SA 4149 SA 4150	Sample Type WATER	Results Mg/liter VOLATILE AROMATICS EPA METHOD 601 all awaytas Joss than LOD 1,1 trichloroethane - 2.5, all other analytes LLOD. all analytes less than LOD.	
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520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

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Telephone

Corporate/Agency Name	Dames & Moore	
Address		<u></u>

Attention _

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Sampling Collection and Shipment

Sampling Site_____ Date of Collection _____ Date Samples Received at UBTL <u>November 4, 1983</u>_____

Analysis

Method of Analysis _____ Hull Dictation Italogen Mole Date(s) of Analysis _____ 12/11-12/13 1883

Analytical Results

Field Sample Number DM 3	UBTL		Results 114	/ litis				
	Lab Number	Sample Type	VOLATILE HALOCARBONS EPA METHOD 601					
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Laboratory Supervisor

520 Wakara Way / Sait Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

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HE/TA 1: 459, 489, 451, 454 UTAH BIOMEDICAL TEST LABORATORY Sequence #:5A 4148-4150 Analytical Laboratory 54 4139-4141 54 4426-4428 Quality Control Data Sheet 39 4161-4162 ADALYRE BROMOMETHANE MATTIX WATER Analyse BAXTER Instrument CH. O Date Analyzed 12/11 - 12/13 Method EPA 661 Results in mg/LITER 'uplicates/Splits Sample # No. 1 No. 3 Range Range/Ave No. 2 No. 4 Average Comment 0 SA 4150 0 0 \mathbf{O} \circ SA 4427 D 6 0 \mathbf{o} 0 Spikes % Spike Initial Conc. Spiked Recovered Comment Sample #] Conc. 2-42.5 SA 4161 104 0 In House Audits Average | Range |Range/Ave | Target |

QC Samp. | No. 1 Comment No. 2 16658 0 0 \mathcal{O} C 0

Checked by: PRM

Reparks:

Limit of Detection: 0.5

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	Diam		Quality (ical Labor Control Da	atory ta Sheet		Sequence	: 459, 489, 451, 45 • :54 4148-4150 54 4139-4141 54 4126-4128 34 4161-4162
			alom Eth Al		Matrix		TER	
Analyst	BAXT	<u>ER</u>				ent		/
Nethod	EPA	601			Date An	alyzed _	R/11-12	/13
			Results	in <u>ma</u>	LITER			
	es/Splits					_		
3		No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
5A 4150	6	<u> </u>			0	<u> </u>		
SA4427	U	6	{		0	0	0	···
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Spikes Sample #	Initial Conc.		Conc. Spiked	1	% Spike Recovered		1 1	Comment
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In House A C Samp.]		No. 2		Average	Range	Range/Av	ej Target	Comment
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enarks:				Milig		SAL		

				al Labora	-	•		: 159,489,451,454 : : : : : : : : : : : : : : : : : : :
Analyte	UINI	YL CHLOR	elpe		Matrix	WA	TER	· · · · · · · · · · · · · · · · · · ·
Analyst	BAXT	tr			Instrum	ent	<u>] H. O</u>	
Nethod	EPA	601			Date Ana	alyzed	12/11 - 12	2/13
			Results	in <u>ng/</u>				
plicates	s/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
A 4150	D	0	9		C	0		
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mple #	Initial Conc.	ţ (Conc. Spiked (% Spike Recovered	ţ	, ı	Comment
A 4161	0		0	· · · · · · · · · · · · · · · · · · ·	0			
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			Analyti	al Labor	atory			e #:5A 4148-4150	-
			Quality Co	ontrol Da	ta Sheet			54 4139-4141 54 4426-4428 54 4161-4162	
Analyte	_CHL	ORO ETH	ANÉ		Matrix	WAT	ER		
						<i>_</i>			
Analyst	<u>Bax</u>	TER			Instrum	ent <u>C</u>	H, 0		
Hethod	EPA	601			Date An	alyzed	12/11-	12/13	_
			Results	in <u>my</u>	LITTER				
Duplicat	es/Splits			-0-					- -
Sample #	No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	-
A 4150	· 0	0		-0-	0	0	0		
A 4427	Ø	0			U	0	0		•
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A 4/6/	0		Spiked		120		+	Conditerre	j es
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n House						-			
C Samp.		No. 2	+	Average		Range/Av	e Target	Comment	
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Analyte	METH	HLENE	CHLOR	•		WA-	TER	34 4920-7420 39 4161-4162
Analyst	BAX	TER			Instru	ent	14. 0	
Nethod	EPA	601			Date A	nalyzed	12/11 - 12	/13
			Results	in				
Juplicate				v		_		-
Sample #	No. 1	No. 2	<u>No. 3</u>	No. 4	Average	Range	Range/Ave	Comment
7A 4150 A 4427	0	0	+	1	0	0	0	
<u>pikes</u>	Initial	_	Conc.		% Spike	J _		6
ample # 4 416/	Conc.		Spiked		Recovered			Comment
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			<u> </u>	<u> </u>			┨───┤	<u> </u>
				_		_	4	
n House A C Samp.		No. 2		Average	Range	IRange /Av	ej Target j	Comment
6458	0	0	1	6	0	0		
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		I		DICAL TEST cel Labor control Da	atory	Y		: 159, 489, 451, 459 59 4148- 4150 59 4139- 4141 59 4426- 4428 39 4161- 4162
Analyte	TRICI	HLOROFL	uo Rometh	IANE	Natrix	WA	TER	
Analyst	BA>	TER			Instrum	ent	. <u>H.</u> O	
Nethod	EPA	601			Date An	alyzed	12/11-1	2/13
			Results	in <u></u>			·	
uplicate	es/Splits	No. 2	No. 3	No. 4	Average	Range		6
+ 4150	0	0	NO. 3	<u>NO. 4</u>	0	O	Range/Ave	Comment
4 44 27	0	0			0	0	0	
		ļ						
		}	<u> </u>					
oikes ample #	Initial Conc.	! !	Conc. Spiked	! {	% Spike Recovered		l	Comment
4 4/6/	0	<u> </u>	6					
			<u> </u>	{			+	
		†	1	<u> </u>				
House		No. 2		Average	Range	Range / Av	ej Target j	Comment
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			DTAH BIOMED Analytic Quality Co	cal Labors	tory ta Sheet		Sequenc	1: 459,489,451,45 2: 54 4148-4150 54 4139-4141 54 4139-4141 54 4120-4128 34 4161-4162
alyte		DICHLUK	OETHENE		Matrix	WATER		·
alyst	BAXI	ER_			Instrum	ient Ét	1.0	
lethod	EPA	501			Date An	alyzed	12/11 - 12	2/13
			Results	in				
<u>licate</u>	s/Splits	No. 2	No. 3	No. 4	Average	Range		Comment
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4.1.27	0	0			0	0	0	
1			1 1					
						{		
kes ple #	Initial Conc.	 	Conc. Spiked		% Spike Recovered	¥		Comment
le #					-	 		Comment
ole #	Conc.		Spiked		Recovered			Comment
	Conc.		Spiked		Recovered			Comment
ole #	Conc.		Spiked		Recovered			Comment
le #	Conc.		Spiked		Recovered			Comment
1e #	Conc.		Spiked		recovered ji7			Comment
le # ////	Conc. U udits No. 1	No. 2	Spiked	Average	Recovered 117 Range	Range/Ave	Target	Comment Comment
le # /(:/	Conc.	No. 2	Spiked	Average C	recovered ji7		Target	
le # /(//	Conc. U udits No. 1		Spiked		Recovered 117 Range	Range/Ave	Target	
e # (/	Conc. U udits No. 1		Spiked		Recovered 117 Range	Range/Ave	Target	
le # ///	Conc. U udits No. 1		Spiked		Recovered 117 Range	Range/Ave	Target	
ole # /////	Conc. U wudits No. 1 U	0	Spiked		Recovered	Range/Ave		Comment
ole # //ני louse A Samp. קא	Conc. U udits No. 1	0	Spiked		Recovered	Range/Ave		Comment

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UTAH BIOMEDICAL	TEST LABORATORY
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Analytical Laboratory Quality Control Data Sheet HHE/TA : 459,489,451,454 Sequence : 5A 4148-4150 5A 4139-4141 5A 4426-4428 3A 4161-4162

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Analyte	1,1 - DICHLOROETHANE	NATTIX (JATER
Analyst	BAXTER	Instrument <u>CH.</u> O
Method	EPA 601	Date Analyzed 12/11-12/13

Results in may / LITER

plicat	es/Splits							
Sample #		No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
5A 4150	0	0			6	0	0	
SA 4427	6	0			0	0	6	
								<u> </u>
<u>Spikes</u> Sample #	Initial Conc.	1	Conc. Spiked	!	% Spike Recovered		.1 1	Comment
SA 4161	6		0					
			· · · · · · · · · · · · · · · · · · ·					
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In House	Audits	-	-					
QC Samp.	No. 1	No. 2	<u> </u>	Average	Range	Range/Av	e Target	Comment
16658	6	0		6	0	0		
							1 1	

Limit of Detection: 0.1 110 ADL

Remarks:

		t	TAH BIOMEI	ICAL TEST	LABORATOR	Ŷ		. 159 , 489, 451,
				ical Labora Control Dat			Sequence	59 4148-415 59 4139-41 59 4426-44 59 4161-410
Analyte	TRAN	15 - 1,2 -	DICHLORi	ETHENE	Matrix	WAT	FER	
Analyst	BA	IXTER			Instrum	ent	H. O	
Nethod	<u>LE PA</u>	601			Date An	alyzed	12/11 - 13	2/13
			Results	in <u>ing/i</u>	ITTE			
Juplicate	s/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
SA 4/150	0	0	Ð		0	Ó	0	
SA 4427	0	D			0	0	0	
		!	<u> </u>					
		<u> </u>						·· <u></u>
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Spikes Sample #	Initial Conc.	1	Conc. Spiked	1	% Spike Recovered	i a	1 1	Comment
A 4161	0		0					
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7707			-	1	t	(
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In House A		No. 2		Average	t Range	Range /Av	Pel Target	Comment
In House A C Samp.	No. 1	No. 2		Average	Range	Range/Av	re Target	Comment
In House A		No. 2		Average			e Target	Comment
In House A C Samp.	No. 1	1					e Target	Comment
In House A C Samp.	No. 1	1					re Target	Comment

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		Ľ	ITAH BIQHED	ICAL TEST	LABORATOR	Y	HHE/TA #	: 159, 489, 45 1,454
			Analytic Quality C	cal Labora ontrol Dat	-			•:5A 4148-4150 5A 4139-4141 5A 4139-4141 5A 4126-4428 5A 4161-4162
Analyte	CHLC	ROFORM	L		Matrix	_WAT	ER	
Analyst	BAXT	ER			Instrum	ent <u>C</u>	н. О	
Hethod	EPA	601	<u></u>		Date An	alyzed	12/11-1	2/13
			Results	in <u></u>	LITER			
	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
5A 4150	0	D			0	0	0	
594427	0	0			0	0	0	
		 	!				┦───┤	
		}			}		<u> </u>	
<u>Spikes</u> Sample #	Initial Conc.	l	Conc. Spiked		Z Spike Recovered	ł	↓↓ ↓↓	Comment
SA 4161	0		\$ 12.5		116			
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		 	<u> </u>			 		
		<u> </u>		 	}	 		
In House		No. 2			Range	 Range/Ave	Target	Comment
QC Samp. 16658	42. 233		1	40. 854		0.067	6146	
		- 1.1/0	1					
	l	l	1	I	l			
Checked b	v:	m	-	. 1	Li	mit of De	tection:	0.1
Renarks:				1.2.9	lo	IN		

	1.2	_	Quality (ical Labor Control Da	atory ta Sheet		Sequence	: 159, 489, 451, 459 : 39 4148-4150 59 4139-4141 59 4426-4428 39 4161-4162
	BAXT		RUETHAN	<u> </u>				
-	EPh						12/11 - 12	/13
	<u></u>		Results	in <u></u>				
plicate		No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
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pikes ample #	Initial Conc.	I	Conc. Spiked	l	% Spike Recovered	'	44 1	Comment
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C Samp.		No. 2	1	Average	Range	Range/Av	ej Target	Comment
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hecked by	: <u>PRN</u>	Λ	-	l	11	uit of De	tection: (9.1
marks:				11.400			tection:(
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Analyst						ent _C	_		
Nethod	EPA	601			Date An	alyzed	12/11 - 1	2/13	
Juplicate				in <u></u>		•	•		
sample *		No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
A 4150 5A 4427	0	0	<u> </u>	-0-	0	0	0		
Spikes	Initial		Conc.		% Spike				
Sample #	Conc.	!	Spiked	1	Recovered	<u> </u>	II	Comment	
517 4161	6		0	 		 			• .
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In House A	udits	ļ	!	↓					.
C Samp.	No. 1	No. 2	 	Average	Range	Range/Ave	Target	Comment	•
166 58		0			<u> </u>	-0-	+		•
6658	12.832	10.882	 	11.157	1.95	0.164	140		•
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hecked by	: <u></u> ?	Λ	-		L	mit of De	tection:	0.1	
eserks:				1.4:4	'a 11		tection:		

			Analytic Quality C	cal Labors ontrol Dat	-		Sequence	0:5A 4148-4150 5A 4139-4141 5M 4426-4428 3M 4161-4162
Analyte	CARI	30N TETRA	CHLORIDE		Matrix	WATE	2	
Analyst	BA	XTER_			Instrum	ent <u>C</u> H	. 0	
Nethod	EPA	601			Date An	alyzed!	2/11-12	/13
			Results	in <u></u>				
uplicate	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range J	lange/Ave	Comment
4150	0	0			U	0	0	
4427	U	D			0	0	0	
		<u> </u>						
<u>ikes</u> mple #	Initial Conc.	<u> </u>	Conc. Spiked		% Spike Recovered	l		Comment
4/6/	b		Spiked		/32			
		<u> </u>						
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House A		No. 2	•	Average	Range	Range/Ave	Target	Comment
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Analyte	BROM	10 DIC HLO <u>R</u>	ome than (Matrix	WAT	ER	
Analyst	<u> </u>	XTER			Instrum	ent _C	4.0	
Nethod	EPA	601			Date An	alyzed _	12/11 - 12/	<i></i>
			Results	in my				
	es/Splits		No. 3	No. 4	A	B an <i>c</i> o	9 0	6
Sample #	No. 1	No. 2		NO. 4	Average	Range	Range/Ave	Comment
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Spikes Sample #1	Initial Conc.	I	Conc. Spiked	ł	% Spike Recovered	 	++ 1 1	Comment
5A 4161	0		0		-			
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			╂────	╂			╉╼──┤	
		1	1	f	[+ - +	<u></u>
In House								
C Samp. 16658	No. 1 9. 8/3	No. 2 8.735	<u> </u>	Average 9.274	Range 1.078	Range/Av	e Target	Comment
vv , v	1.012		1					
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	<u> </u>			L				
hecked by	" _ TRM	· .	-	U.e.	211	nit of De	tection:	0.1

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			-	ical Labor Control Da	atory	(Y		: 159, 489, 451, 454 : SA 4148-4150 54 4139-4141 54 426-4128 34 4161-4162
Analyte	1, 2	- DICHL	OROPR OPAN	E	Matrix	WAT	ER	————————————————————————————————————
Analyst	BAX	TER			Instru	ent	H. 0	
Hethod	EPA	60			Date Ar	alyzed	12/11 - 12/	/3
			Results	in <u>mg/i</u>	<u>-/TER</u>			
sample #	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment
5A 4150	6	0			0	0	0	
5# 4427	0	0			0	0	0	
		<u> </u>		<u> </u>		<u> </u>		
		<u> </u>		<u> </u>				
Spikes Sample #	Initial Conc.	. Ⅰ	Conc. Spiked	¦	% Spike Recovered	<u>ل</u>	Fſ	Comment
544161	0	1.	0				·	
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		<u> </u>	<u> </u>	<u> </u>	<u> </u>		ļ	
				<u> </u>				
In House		I		Į	<u> </u>		↓I	
QC Samp. 16458	<u>No. 1</u>	No. 2		Average	Range U	Range/Ave	larget	Comment
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	BAXT		DICHLOROPR	OPENE		<u>ATE</u> ent <u></u>		
thod							12/11-12	113
			Results	in <u>my</u>	LITER			
	s/Splits No. 1	No. 2	No. 5	No. 4	Average	Range	Range/Ave	Comment
4150	0	0			Ö	0	0	
4427	0	0	╉╼────	 	0	0	0	
			+	<u>+</u>	<u> </u>			
k <u>es</u> ple #	Initial Conc.		Conc. Spiked		% Spike			Comment
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				}		<u> </u>	<u> </u>	
llouse A	udits			+	4	}		
	No. 1	No. 2		Average	Range	Range/Av	e Target	Comment
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Analyte	TRIC	HLORETHE	NE		Matrix	WAT	ER	· <u></u>
Analyst	BAX	TER			Instrum	ent <u>Cl</u>	4.0	
	EPAL						12/11 - 1	2/13
			Results	in <u></u>	LITER		•	
plicat	es/Splits	No. 2	Nc. 3	No.4	Average	Range	Range/Ave	Comment
A 4/50	0	0			0	0	0	
4 44/27	0	0			0	G	6	
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<u>Spikes</u>	Initial		Conc.		% Spike	a		Comment
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C Samp.	No. 1	No. 2	1	Average	Range	Range/Ave	Target	Comment
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Ana 1470	DIBRO	U MOC HLORO N	Analyti Quality C	ICAL TEST	atory a Sheet	RY WATER	Sequence	459,489,451,454 • :59 4148-4150 59 4139-4141 59 4126-4428 39 4161-4162
	BAX					ment		
Nethod	ETA	ç0/			Date A	nalyzed	12/11- 12	13
			Results	in <u></u>				
Duplicate Sample #	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
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ikes	Initial		Conc.		% Spike		!	
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pikes ample # + 4/6	Conc.		Spiked		-			Comment
ample #	Conc.		Spiked		-			Comment
ample #	Conc.		Spiked		-			Comment
mple #	Conc.		Spiked		-			Comment
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House	Conc. C Audits No. 1	No. 2	Spiked	Average	Recovered	d Range/Ave		Comment Comment
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Ple # 4/6 House	Conc. C Audits No. 1		Spiked		Recovered	d Range/Ave		
Ple # 4/6 House	Conc. C Audits No. 1		Spiked		Recovered	d Range/Ave		

			UTAH BIOMED	ICAL TEST	LABORATOR	Y	1847/TA #	: 159 , 489, 451, 454
				cal Labor				1:5A 4148-4150
			Quality C		-			54 4139-4141 54 4426-4428 54 4161-4162
Analyte	1.1.2	- TRICHI	ORGETHANE		Matrix	_WATE	R	34 4101- 4102
						· · · · · · · · · · · · · · · · · · ·		
Analyst	BAX	TER			Instrum	ent <u>C</u>	<u>H. O</u>	
Hethod	EPA	601			Date An	alyzed _	12/11 - 12/	13
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			KESUITS	in <u></u>	LITEL			
Duplicate Sample #		No. 2	No. 3	No. 4	Average	Range	Ratige/Ave	Comment
A 4150	0	D			0	0	0	
A 4427	0	0			0	0	0	
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Spikes	Initial		Conc.	<u> </u>	% Spike	.		
Sample #	Conc.		Spiked	ļ	Recovered	 		Comment
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In House					A Dese	IRanac /t-	vel Target (Comment
C Samp.	No. 1 ()	No. 2		Average O	Range		LE TATREL	Constellt
		+			1			
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hecked by	. PP	Μ			• •	-11 -	etection:	x /

		ı		CAL TEST CEL LEBORI CONTROL DES	tory	RY		: 159,489,451,454 : :5A 4148-4150 :5A 4139-4141 :5A 4126-4428 :5A 4161-4162
Analyte	CIS-	1.3- DI	HLOROPRO	PENE	Matrix	WATE	٤	
Analyst	BAX	TER			Instrue	Bent	t. 0	
Nethod	EPA	601			Date Ar	alvzed	12/11 - 1	2/13
			Results	in nel	/			
plicat	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Pan as / Aus	Comment
A 4/50	0	0			6	O	Range/Ave	Congnerit
4427	0	0			6	0	0	
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<u>ikes</u> mple #	Initial Conc.	l	Conc. Spiked	L	% Spike Recovered		↓↓ ↓↓	Comment
111.1	Û		0			<u> </u>	l	
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House								
House Samp.	No. 1	No. 2		Average		Range/Ave	Target	Comment
House Samp.		No. 2		Average	Range	Range/Ave	Target	Comment
House Samp.	No. 1			1			Target	Comment
House	No. 1			1			Target	Comment

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			-	DICAL TEST Ical Labora Control Day	tory	Ŷ		: 159,489,451,45 • :5A 4148-4150 5A 4139-4141 5A 4126-4428 5A 4161-4162
Analyte	<u>2-</u> C	HLORDEH	NLVINYL	ETHER	Matrix	WATE	R	
Analyst	Ba	XTER			Instrum	ent <u>C</u>	<u> </u>	<u> </u>
Nethod	EPA 6	01				alyzed		/13
			Results	in <u>ma/</u>	LITER			
<u>uplicate</u> Sample #	s/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
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ipikes ample #	Initial Conc.	1	Conc. Spiked	1	% Spike Recovered	¹ 1	1	Comment
A 4161	6		0					
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In House A		• No 0		1 4	• Pa-a-	Range/Ave	I Taraat	Comment
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Analyte Analyst Method Duplicates/Spi Sample No. SA 4/50 O SA 5/50 O	BAXTER PA 601 1 No. 2	Quality C	DICAL TEST	Atory :s Sheet Matrix Instrum Date An	Y UHTI ent alyzed	Sequence	459, 489, 451, 454 •:54 4148-4150 54 4139-4141 54 4426-4428 34 4161-4162
Analyst Method Duplicates/Spi ismple • No. A 4/50 O A 4/77 D D pikes Init ample # Con	BAXTER PA 601 1 No. 2	Results	; in <u>g/</u>	Instrum Date An	ent	н. О	
Method Duplicates/Spi ample No. A 4/50 O 4 4/50 O 4 4/50 O 5 4/50 O 5 4/50 O 5 4/50 O 5 4/50 O 5 4/50 O 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	PA 601	Results	; in <u>g/</u>	Date An			
Duplicates/Spi Sample No. SA 4/50 O A 4/27 O Pikes Init ample # Con	lits 1 No. 2	Results	in <u></u>		alyzed	12/11 -	,
Sample No. Sample No. Sample U Sample O Sample Initianample	1 No. 2	Results	; in <u></u>	l LITEP		10/11 - 1	2/13
Sample No. SA 4/50 O TA 4471 D Spikes Init sample # Con	1 No. 2		11				
A 4450 O A 4427 O pikes Init ample # Con		No. 3	No. 4	Average	Range	Range/Ave	Comment
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ample # Con	0		<u> </u>	0	0	0	·····
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	tial	Conc. Spiked	•	% Spike Recovered		· · ·	Comment
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C Samp. No.			Average	Range	Range/Av	ej Target	Comment
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hecked by:	 PRM	<u>_</u>	L	L	I		0.1
enarks:	1 111 1 1		h 4 'g		nit of De	tection:	

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		1	Analyti	ical Labor	-	Ŷ		: 459,489,451,45 •:SA 4148-4150 5A 4139-4141
		Tet	Quality (Control Da	ita Sheet			519 4426-4428 319 4161-4162
Analyte	<u> , ,</u> 2	, 2 - TET	CHARDE !!	ANENS	Matrix	WA	TER	
Analyst	BAX	TER		/	Instrum	ent(<u>.</u> H. O	
Nethod	EPA	601			Date An	alyzed _	12/11-12	/13
			Results	in <u></u>				
uplicate Sample #	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
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A 44 27	٥	0			0	0	0	
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			<u> </u>	<u> </u>				·
Spikes Sample #	Initial Conc.	ـــــــــــــــــــــــــــــــــــــ	Conc. Spiked	!	% Spike Recovered			Comment
A 4161	0		0					
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		 		<u> </u>				
		<u> </u>					-{}	
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In House			-					
C Samp.	No. 1 5.440	No. 2 5.229		Average 5.334	Range 0.211	Range/Av 0.040	e Target 5.6	Comment
166 58	2.770	5.221	†	<u></u>	0.61		1.0	
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		1	UTAH BIQMED Analyti Quality C	cal Labor	atory	Ŷ		. 159, 489, 451, 454 • :54 4148-4150 54 4139-4141 54 4139-4141
Analyte	TETRAC	HIORD ETH				WAT	TER	39 4161-4162
Analyst	BAX	TER			Instrum	ent _ <u>()</u>	4.0	
Nethod	EPA	001			Date An	alyzed _	12/11 - 12/	/3
			Results	in <u>my</u>	LITER			
<u>plicat</u> Sample #	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
A 4/50	0	D			0	0	0	
A 4427	0	0			0	0	0	
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oikes ample #	Initial Conc.		Conc. Spiked	l	% Spike Recovered	[[Comment
A 4161	0		0	<u> </u>	<u> </u>	ļ	<u> </u>	
				 		 		
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n House		No. 2		+		*Pengo (A)	vel Target	Comment
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				1	1	1		
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hecked b	y: <u>PRM</u>	<u> </u>	-	1 pit in		nit of D 0 ML	etection:	0.5

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UTAH BIOMEDICAL TEST LABORATORY Analytical Laboratory Quality Control Data Sheet HEE/TA 1: 459, 489, 451,454

Sequence : 3A 4148-4150 3A 4139-4141 3A 4426-4428 3A 4161-4162

Analyte	CHLOOBENZENE
Analyst	BAXTER

EPA 60/

Matrix <u>(1) ATER</u> Instrument <u>CH.0</u>

Nethod

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Date Analyzed 12/11 - 12/13

Results in wg/LITER

_plicates/Splits

No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
0	0			U	0	6	
U	0			0	0	0	
	No. 1 0		No. 1 No. 2 No. 3 0 0 0 0 0 0				

<u>Spikes</u> Sample #	Initial Conc.	11	Conc. Spiked	1	% Spike Recovered	1	Comment
GA UII,1	6		3-203.5		/28		

 In House Audits

 QC Semp.
 No. 1
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 Average
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Checked by: PRM

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		1		CAL TEST	story	Y		: 459, 489, 451,45 : 59 4148-4150 59 4137-4141 59 4426-4428 59 4161-4162
Analyte	<u> </u>	PICHLOROL	BENZENE		Matrix	WATE	£	
Analyst	_BAY	TER			Instrum	ent	4. D	
Nethod	EPA	601			Date An	alyzed _	12/11-12/1	3
			Results	in <u>/</u>	ITER			
_uplicate Sample #	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment
5A 4150	6	0	T	Γ	0	0	0	
A 4427	0	0			0	0	0	
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		ļ	<u> </u>	ļ	<u> </u>	ļ	<u> </u>	
Spikes Sample #	Initial Conc.	· ·	Conc. Spiked	 1	% Spike	[<u> </u>	Comment
SA 4161	0	1	0		-		·	
		<u> </u>	<u> </u>	ļ	<u> </u>	<u> </u>	+	
		╂────			╂────	 		<u> </u>
In House	Audits	_		↓	!	ł	4	
C Samp.	No. 1	No. 2		Average			e Target	Comment
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		Ľ	-	ICAL TEST cal Labora ontrol Dat	tory	Ŷ		: 159,489,451,45 : 59 4148-4150 59 4139-4141 51 4426-4428 39 4161-4162
Analyte	1,7-	DICHLOR	POBENZE	16	Matrix	WATE	R	
Analyst	BA	XTER			Instrum	ent <u>Ci</u>	4.0	
ethod	EPH	601			Date An	alyzed	12/11-12	/13
			Results	in <u></u>				
plicate	s/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
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4427	0	0			0	C	0	
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ikes nple #1	Initial Conc.	 1	Conc. Spiked	1	% Spike Recovered	ig 1		Comment
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			Quality C	cal Labor ontrol Da	atory ta Sheet		Sequence	: 159, 489, 451, 454 : 54 4148- 4150 54 4139- 4141 54 4126- 4788 34 4161- 4162
	_		OROBENZEN	<u>E</u>		<u>WAT</u>	ER H. U	
inalyst iethod	BAX EPA				Instrum Date An		$\frac{12}{12} - 12$	/13
			Results	in <u>ng</u>	1			
	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
4150	0	0			0	0	0	
4427	6	U			0	0	0	
		ļ			·····			
<u>ikes</u> mple #		└ ├	Conc. Spiked	 	Z Spike Recovered	┝ 	↓↓ ↓	Comment
4161	U	 	2.52		12.6			<u> </u>
		}	- }					
		<u> </u>						······································
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		<u> </u>			<u> </u>			
1		+		}	+		• • • • • • • • • • • • • • • • • • • •	
House	Audite		•	Average	Range	Range / Ave	Target	Comment
		No. 2						
Samp.		No. 2 ()		0	0	0		
Samp.	No. 1							
Samp.	No. 1							
Samp.	No. 1							
House	No. 1							
Samp. [(*; {	No. 1 U					0		0.5
Samp. (+5)	No. 1					0	Lection:	0.5
Samp. (+5)	No. 1 U					0		0.5
Samp. (455	No. 1 U					0		0.5
Samp.	No. 1 U					0		0.5

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602 nellis

UBTL 520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

6-11,12,13

November 28, 1983

ANALYTICAL REPORT

SUBMITTED TO:	George	Condradt
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SUBMITTED BY: Patrick Merz

REFERENCE DATA:

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Benzene, Toluene, Ethyl Benzene, Analysis of: Chlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene

SA-4151 through SA-4153

Identification: 455

Analyses: 21 Sample(s): 3

UBTL Laboratory No .:

The above indicated water samples were analysed for the analytes listed using EPA Test Method 602 for Purgeable Aromatics.

Method: A 5 milliliter sample of water was purged with helium for 13 min and any analytes were collected on a 10-inch Tenax trap. The trap was heated to $180^{\circ}C$ and the analytes were desorbed onto a 6 ft x 1/8 inch stainless steel column packed with 5% SP-1200 and 1.75% Bentone -34. The gas chromatograph was operated with thermal programing, 50°C for 2 minutes, increasing at a rate of 4°C/min to 110°C, and held there for 16 min.

The limit of detection for each analyte was 0.5 μ g/L.

The results are tabulated on the following page(s).

P. Merz P. Merz Lim D. Lessley, Ph.

DENG NEEP NG RESEARCH DEVELOPMENT

		LUL1	·
	ANALYTICAL I	REPORT FORM	
		Date 1/10/84 101	. •
C	Dames & Moore	UBTL Identification Number 455	
	gency Name Dames & Moore		-
AUDIESS			
Attention		Telephone	
Sampling C	ollection and Shipment		
	Sampling Site	Date of Collection	_
	Date Samples Received at UBTL	lovember 8, 1983	
Analysis	Method of Analysis Purge and	d Trap	
	Nul -	19, 1983	

Field	UBTL		Results
Sample Number	Lab Number	Sample Type	VOLATILE HALOCARBONS EPA METHOD 602
W 11	SA 4151	WATER	all analytes < 0.5 mg/Liter
W 12	SA 4152		all analytes < 0.5 mg/Liter
W 13	SA 4153	\checkmark	Toluene - 7.1 mg/Liter
Limit	of Dete	tion	all analytes (0.5 mg/Liter
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Comments

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Patrick M Analyst Reviewe ۶ ole.

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Laboratory Supervisor

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

		t		DICAL TEST	tory	Y	► 45 45 45 HEE/TA ♥ Sequence	55 58 :
Analyte	BEN	ZENE			Matrix	WAT	er	
Analyst	PATA	lick M	ER2		Instrum	ent	CHO	
Method	EPA 6	02 - F	URGE \$TA	AP	Date An	alyzed	Nov. 19,	1983
				in <u>mg</u> /				
Dum <u>licate</u> S jle #		No. 2	No. 3	No. 4	Average	Range		Comment
5A 4151	NO. 1 0	0	NO. 3	NO. 4	0	O	Range/Ave	Comment
				[
		<u> </u>	 				+	
pikes	Initial	!	Conc.	♣- <u></u>	% Spike		++	Comment
ample #	Conc.		Spiked		Recovered			Comment
<u>// 1/2</u>								
		<u> </u>	<u> </u>	<u> </u>				
			{	<u>}</u>				
1			4	↓	ļ	ļ	44	
n House	144 X L D	No. 2	1	Average	Range	Range/Av	e Target	Comment
n House A	No. 1	NO. Z		1	1	1	12.3	
				<u> </u>	ļ			
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C Samp.	No. 1							
C Samp.	No. 1							
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Matrix Instrume Date Ana //Liner Average	alyzed	Range/Ave	1983 Comment	
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/LIVER Average	Range	Range/Ave		
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% Spike		•	Comment	
Recovered /25		╉───╉		
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UBTL 520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

November 28, 1983

ANALYTICAL REPORT

SUBMITTED TO: George Cordradt

SUBMITTED BY: Patrick Merz

REFERENCE DATA:

Analysis of: Benzene, Toluene, Ethyl Benzene, Chlorobenzene, 1,2,-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene

SA 4159 through SA 4160

Identification No.:

Sample(s): 2 Analyses: 14

UBTL Laboratory No .:

The above indicated water samples were analyzed for the analytes listed using EPA Test Method 602 for Purgeable Aromatics.

458

Method: A 5 milliliter sample of water was purged with helium for 13 min. and any analytes were collected on a 10-inch Tenax trap. The trap was heated to 180° C and the analytes were desorbed onto a 6 ft x 1/8 inch stainless steel column packed with 5% SP-1200 and 1.75% Bentone -34. The gas chromatograph was operated with thermal programing, 50°C for 2 minutes, increasing at a rate of 4°C/min to 110°C, and held there for 16 min.

The limit of detection for each analyte was 0.5 mg/sample

The results are tabulated on the following page(s).

P. Men

D.

	ANALYTICAL REPORT FORM	
	Date 1/10/84 101	
	UBTL Identification Number 458	
	Agency Name Dames & Moore	
Attention _	Telephone	
Sampling C	ollection and Shipment	
	Sampling Site Date of Collection	
	Date Samples Received at UBTL November 9, 1983	
Analysis		
	Method of Analysis Purge and Trap	
	Date(s) of Analysis November 19, 1983	

Analytical Results

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Field Sample Number	UBTL Lab Number	Sample Type	Results VOLATILE AROMATICS EPA METHOD 602
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Comments _

Patrick Mery Reviewe Laboratory Supervisor 1s.

520 Wakara Way / Sait Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

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UBTL 520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

November 23, 1983

ANALYTICAL REPORT

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George Cordradt SUBMITTED TO:

SUBMITTED BY: Patrick Merz

REFERENCE DATA:

Benzen, Toluene, Ethyl Benzene, Analysis of: Chlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene

Identification:

Sample(s): 3 Analyses: 21

UBTL Laboratory No .: SA-4136 through SA-4138

The above indicated water samples were analysed for the analytes listed using EPA Test Method 602 for Purgeable Aromatics.

450

Method: A 5 milliliter sample of wter was purged with helium for 13 min and any analytes were collected on a 10-inch Tenax trap. The trap was heated to $180^{\circ}C$ and the analytes were desorbed onto a 6 ft x 1/8 inch stainless steel column packed with 5% SP-1200 and 1.75% Bentone -34. The gas chromatograph was operated with thermal programing, 50°C for 2 minutes, increasing at a rate of 4°C/min to 110°C, and held there for 16 min.

The limit of detection for each analyte was 0.5 μ g/L.

The results are tabulated on the following page(s).

P. Merz P. Merz <u>Sim D. Lessley</u> Sim D. Lessley. Ph.



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ANALYI	ICAL REPORT FORM	

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		Date 1/10/84 MM	
		UBTL Identification Number	450
Corporate / Agency	NameDames & Moo		
		Telephone	
Sampling Collection	on and Shipment		
Sar	npling Site	Date of Collection	
Dat	e Samples Received at UBT	November 4, 1983	
Analysis	-		

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Method of Analysis	Purge and Trap	
	November 17, 1983	

Analytical Results

Field	UBTL	-	Results
Sample Number	Lab Number	Sample Type	VOLATILE AROMATICS EPA METHOD 602
DM 3	SA 4136	WATER	all analytes (6.5 mg) titer Toluene - 12.77 mg/Liter
DM 2	SA 4137		Toluene - 12.77 mg/Liter
DM 1	SA 4138	V	all analytes (0.5 mg/Liter
Limit d	Detect	ion	all analytes: 0.5 mg /Liter
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Comments __

Patrick	Mer	
Analyst	in the	
Reviewer	Gold Sale	
Laboratory Sup	ervisor	

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

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Ple # 9152 9152 9152 9152 9152 9152 9152 9152	Conc. O Audits No. 1	No. 2	Spiked LO	Average	Recovered	d Range/Ave	1	Comment Comment
louse A	Conc.	No. 2	Spiked LO	Average	Recovered		Target 12.3	
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			Analyti	cal Labora	tory		Sequence		~ .	
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Analyst	VATA	rick Me	R2_		Instrue	ent	240		·	
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		1		DICAL TEST	tory	Ŷ	45 45 HRE/TA # Sequence	- 8 :-
Analyte	ETHY	L BENZ	ENE		Matrix	WAT	er.	
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Nethod	EPA 60	12 - T	URGE \$TR	AP	Date An	alyzed	Nov. 19,	1983
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1			<u> </u>	<u></u>		[
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n House								
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		No. 2	 	Average	Range	Range/Av	e Target 32.9	Comment
C Samp.	No. 1	No. 2		Average	Range	Range/Av		Comment
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	PATA EPA 6 es/Splits No. 1 O Initial Conc. O	CHLOROTSENZ PATRICK M EPA 602 - T es/Splits No. 1 No. 2 O O Initial Conc. O Audits No. 1 No. 2 O O O O O O O O O O O O O	Analyzi Quality C <u>CHLOROBENZENE</u> <u>PATRICK MERZ</u> <u>EPA 602 - Purge 478</u> Results <u>No. 2 No. 3</u> <u>O</u> <u>O</u> <u>Initial</u> Conc. Spiked <u>O</u> <u>IO</u> <u>Audits</u> No. 1 No. 2 <u>O</u> <u>O</u> <u>INO. 2</u> <u>O</u> <u>O</u> <u>INO. 2</u> <u>O</u> <u>O</u> <u>INO. 3</u> <u>O</u> <u>O</u> <u>INO. 3</u> <u>O</u> <u>O</u> <u>INITIAL</u> <u>Conc.</u> <u>Spiked</u> <u>O</u> <u>O</u> <u>INO. 2</u> <u>O</u> <u>INO. 2</u> <u>O</u> <u>INO. 2</u> <u>INO. 2</u> <u>O</u> <u>INO. 2</u> <u>INO. 2</u> <u>INO. 1</u> <u>INO. 2</u> <u>INO. 1</u> <u>INO. 2</u> <u>INO. 2</u> <u>INO. 1</u> <u>INO. 1</u> <u>INO. 2</u> <u>INO. 1</u> <u>INO. 2</u> <u>INO. 1</u> <u>INO. 2</u> <u>INO. 1</u> <u>INO. 1</u>	Analytical Labor Quality Control Da <u>CHLOROBENZENE</u> <u>PATRICK MER2</u> <u>EPATRICK MER2</u> <u>EPATRICK MER2</u> <u>Results in mg/</u> <u>es/Splits</u> <u>No. 1 No. 2 No. 3 No. 4</u> <u>O</u> <u>Initial</u> <u>Conc.</u> <u>Spiked</u> <u>O</u> <u>Conc.</u> <u>Spiked</u> <u>O</u> <u>Conc.</u> <u>Spiked</u> <u>O</u> <u>Conc.</u> <u>Spiked</u> <u>O</u> <u>Conc.</u> <u>Spiked</u> <u>O</u> <u>Conc.</u> <u>Spiked</u> <u>O</u> <u>Conc.</u> <u>Spiked</u> <u>O</u> <u>Conc.</u> <u>Conc.</u> <u>Spiked</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Spiked</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Spiked</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc.</u> <u>Conc</u>	ARRIVICEN LABORATORY Quality Control Data Sheet <u>CHLOROBENZENE</u> Matrix <u>PATRICK MER2</u> Instrum <u>EPA 602 - Purge 4TRAP</u> Date An <u>Results in mg/LINER</u> <u>es/Splits</u> <u>No. 1 No. 2 No. 3 No. 4 Average</u> <u>O O O O</u> <u>Initial</u> Conc. 2 Spike <u>Conc. Spiked</u> <u>Recovered</u> <u>O IO II3</u> <u>Audits</u> <u>No. 1 No. 2 Average Range</u> <u>O O</u> <u>Audits</u>	Quality Control Data Sheet	BAN BIOMEDICAL TEST LABORATORY BUE/TA #: Analytical Laboratory Quality Control Data Sheet CHLOROTENZENE Natrix DATER PATRICK MER2 Instrument CH O EPA 602 - PLRGE #TRAP Date Analyzed Nov. 11, Results in mg/LINTR Besults in mg/LINTR Besults in mg/LINTR Besults in mg/LINTR Besults in mg/LINTR D	H SO H SO H SIDMEDICAL TEST LABORATORY MAEITA 8: Analytical Laboratory Quality Control Data Sheet ChloRODENZENE Matrix MATEX PATRICK MER2 Instrument CH O ETH 102 - PLAGE 4TRAP Date Analyzed NOU. 19, 1983 Results in my/Liner

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Analyst		lick r	LER2		Instrum	ent	CHO	
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mple #	Conc.		Spiked		Recovered			Commen t	
ample #	Conc.		Spiked		Recovered			Comment	
House A	Conc. U	No. 2	Spiked 10	Average	Recovered		Target	Comment Comment	
House A	Conc. U	No. 2	Spiked 10	Average	Recovered		e Target		
House A	Conc. U udits No. 1	No. 2	Spiked 10	Average	Recovered				
A 4/52 A 4/52 A House A Samp.	Conc. U udits No. 1	No. 2	Spiked 10	Average	Recovered				
pikes ample # A 4/52 A 4/5 A 4/52 A 4/52 A 4/52 A 4/52 A 4/52 A 4/52 A 4/52 A 4/52 A 4/52 A 4	Conc. U udits No. 1	No. 2	Spiked 10	Average	Recovered				

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Pestecidar 12,13

December 1, 1983

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UBTL 520 WAKARA WAY SALT LAKE CITY. UTAH 84108 801 581-8267

Aldrin, Dieldrin, Chlordane, DDT isomers,

Endrin, Endrin Aldehyde, Heptachlor,

ANALYTICAL REPORT

SUBMITTED TO: Dames & Moore

SUBMITTED BY: Ellen Jenkins

REFERENCE DATA:

Analysis of:

Identification No.: 456

Sample(s): 3

UBTL Laboratory No.:

The above numbered water samples were prepared for analysis by EPA Method 608. The samples were analyzed on a Tracor 222 gas chromatograph equipped with an electron capture detector. A 6' x 2 mm i.d. glass column packed with 3% OV-17 and 3% QF-1 on 100/120 mesh chromQ was used isothermally at 190°C and with a gas flow of 75 mL per minute.

Analyses: 33

SA-4154 through SA-4156

Lindane

The limits of detection were 0.01 μ g/L for Aldrin, Dieldrin, o,p,-DDT, DDD, DDE, Endrin, Endrin Aldehyde, Heptachlor, and Lindane and 0.1 μ g/L for Chlordane.

The results are tabulated on the following page(s).

Ellen Jenkins

Lin D. Lessley, Sim D. Lessley, Ph.

MEDIC NE BIOENGINEERING CHEMISTRY RESEARCH

	B	\mathbf{D}	В	
ANALYT	ICAL F	REPORT	FORM	
		Date _	12/29/83 1	øL.

		UBTL Identification Number	456
Corporate/Agency Name	Dames & Moore		
Address			
Attention		Telephone	
Sampling Collection and Shi	pment		
Sampling Site		Date of Collection	- <u></u>
Date Samples	Received at UBTL <u>No</u>	vember 9, 1983	

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Analysis

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Method of Analysis

Date(s) of Analysis_

Analytical Results

Field	UBTL				Results
Sample Number	Lab	Sample Type	FOUND		PESTICIDES
W 11	SA 4154	WATER	A Second	12.001	OTHER
W 12	SA 4155	1	NONE		OTHER
W 13	SA 4156	V	3 50 5	0.34) OTHER
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Comments _

· _ Analys Revié Laboratory Supervisor

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

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	UİTL Analytica)	Laboratory			×	
	Quality Control	l Data Sheet	ID #	NM456	2	نغت و المسالح
Analyte	ALDRIN					
Analyst name	EEJ	Matrix		WATERS	-	
Analyst number	457	Instrument		222		1
Method	ECGC	Date		16 NOV + 1983		
					~ ·	- 15
	Results in l	JG/L ·				

Results in UG/L -

Sample	Valuei	Value2 Num	Mean	Tarset	Ranse	Rns/Mean Sta	5
QC16685 JA4142 SA4155A SA4155B	.056 000 000 ,770	.056 2 000 2 000 2 .773 2	.056 -,000 000 ,771	. 056	000. 0,000 0.000 ,003	,005 0,000 0,000 ,003	

Limit of detection O(O)

Checked by

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Quality Control D	lata Sheet	XD \$	DN456
ENDRINALDEHYDE			
EEJ	Matrix		WATERS
457	Instrument		222 16 NOV., 1983
	ENDRINALDEHYDE EEJ	ENDRINALDEHYDE EEJ Matrix 457 Instrument	ENDRINALDEHYDE EEJ Matrix 457 Instrument

Results in UG/L

Sample	Valuei	Value2 Num	Mean	Tarset		Rns/Mean Sta
SA4155A SA4155B	001 001	-,001 2 -,001 2	-,001 -,001		0.000	0,000

Limit of detection \bigcirc,\bigcirc |

Checked by TP

Jun 12/7 12/29 Mel

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	UBTL Analytical Lat	boratory				
	Quality Control Dat	ta Sheet	ID +	NM456		,
					ب ع ا	- N . ; - { }
Analyte	OPDDT					
Analyst name	EEJ	Matrix	•	WATERS	•	in in The second second second second second second second second second second second second second second second se
Analyst number Method	457 ECGC	Instrument B ate		222 16 NDV., 1983		
HE CHOG	2000	NA A		10 10000 1705		

Results in UG/L

Sample	Value1	Value2 Num	Hean	- Tarset		Rns/Mean	• •
SA4142 `A4155B	.000 ,895	.000 2 ,894 2	•000 •894		0.000,001	0,000,001	

Limit of detection O.C. |

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12/29 MM

UBTL Analytical Laboratory

Quality Control Data Sheet ID 🛊 DH456

Analyte DIELDRIN

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Analyst name	EEJ	Matrix	WATERS
Analyst number	457	Instrument	222
Method	ECGC	Date	16 NDV., 1983

Results in UG/L

Sample	Valu e1	Value2 Num	Mean	Tarset	Ranse	Rns/Mean Stat	
`C16685	•112	.112 2	.112	, 114	، 001	، 006	
3A4142	-,001	-,001 2	-,001	•••	0,000	0.000	
SA4144A	001	001 2	001		0,000	0,000	
SA4144B	-,001	-,001 2	-,001	•	0,000	0,000	
SA4155A	001	001 2	001		0.000	0.000	
SA4155B	,832	3829 2	,830		,003	,004	

Limit of detection $\bigcirc \bigcirc$

Checked by (12/27)

UBTL Analytical	Laboratory		
Quality Control	Data Sheet	ID, ŧ	DM456

Analyte

ENDRIN

Analyst	name
Analyst	number
Method	

EEJ 457 ECGC

Results in UG/L

Sample	Value1	Value2 Num	Mean	Tarset	Range	Rn⊴/Mean	Sta
SA4142	000	000 2	-,000		0.000	0,000	
JA4155A	-,000	-,000 2	-,000		0,000	0,000	۰.
SA4155B	.910	•914 2	4912		,003	.004	

Matrix

Date

Instrument

Limit of detection \bigcirc \bigcirc |

Checked by GKPS

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WATERS

222 16 NOV() 1983

M. M. 17 12/29 lol

UBTL Analytical	Laboratory
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Quality Control Data Sheet ID # DH456

Matrix

Bate

Instrument

Analyte CHLORDANE Analyst name EEJ

457

ECGC

Analyst name Analyst number Method

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Results in UG/L

Sample		Value2 Num		Tarset		
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Limit of detection O. |

Checked by SMC

NATERS

16 NOV., 1983

222

Mr 4/2/7 2/29 Add

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	UBTL Analytical	Laboratory		
· · · ·	Quality Control	Data Sheet	ID 🛊	DM456
Anglyte	LINDANE			
Analyst name Analyst number Method	EEJ 457 ECGC	Matrix Instrument Date		WATERS 222 16 Nov., 1983

Results in UG/L

Sample	Value1	Value2 Num	Mean	Target	Ranse	Rng/Mean	Stat
SA4142	٠٥٥٥	.000 2	.000		0.000	0,000	
SA4155A	,000	,000 2	,000		0,000	0,000	
A4155B	•726	1746 2	.736		,020	.027	
SA4156	,000	,000 2	,000		0,000	0,000	

Limit of detection 0.01

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Checked by 213

Mar 12/2 12/29 Mal

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Quality	Control	Data	Sheet	ID	ŧ	DM456

Analste HEPTACHLOR

Analyst name	EEJ	Matrix	WATERS
Analyst number	457	Instrument	222
Method	ECGC	Date	16 NOV., 1983

Results in UG/L -

Sample	Value1	Value2 Num	Mean	Tarset	Ranse	Rns/Mean	Stat
7016685	.026	 026 2 ،	.026	.028	.000	.005	
JA4142	-,000	-,000 2	-,000		0,000	0,000	
SA4143	000	000 2	-,000		0.000	0.000	
SA4155A	-,000	-,000 2	000		0.000	0,000	
SA4155B	•686	.702 2	.694		.016	,023	
SA4156	-,000	-,000 2	-,000		0,000	0,000	

Limit of detection O[O]

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	UBTL	Analytical Labo	oratory			Ĩ.	
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Analyst name Analyst number	EEJ 457		Matrix Instrum	ent	NATERS 222		
Method	ECGC		letenn		-17 NOV., 1983		
	Re	esults in UGZL					
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SA4142	.000	.000	2	.000	0	.000	0,000	
SA 1154	,000	,000	2	,000	0	,000	0,000	
SA4155A	.000	.000	2	.000	0	.000	0,000	-
SA4155B	,890	2886	2	'888		,004	,004	
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Limit of detection $\mathbb{C}_{1} \bigcirc /$

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	UBTL Analytical	Laborators		
	Quality Control	Nata Sheet	ID #	NM456
Analyte	DDD			
Analyst name	EEJ	Matrix		NATERS

Results in UG/L

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ECGC

Samele	Value1	Value2 Num	Mean	Tarset	Ranse	Rnø/Mean	Stat
EA4142	.000	,000 2	+000		0,000	0,000	
A4155A	,000	.000 2	,000		0,000	0,000	
JA4155B	.000	·000 2	.000		0,000	0,000	

Limit of detection $\widehat{\bigcirc} \bigcirc i$

Analyst number

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Method

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Checked by ACB

Instrument

Date

222 17 NOV., 1983

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nalyst name nalyst number ethod	EEJ 457 ECGC		Matríx Instru Date		NATERS 222 17 Nov	·• 1983	
	Re	sults in UG/L					
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		\rangle	N. C. 12/7	12/29 ML			
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mple # Conc. Spiked Recovered Comment 41553 <c.oi< td=""> C.S 111 </c.oi<>	Spikes			Conc.		% Spike	·		
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				<u> </u>	<u> </u>				
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2C Samp.	No. 1	No. 2		Average	Range	Range/Ave	Target	Comment	
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le thod	ECEK	1		_			11/16/9	
	tes/Splits			in Ug	11			
umple (7	No. 2	No. 3	<u>No. 4</u>	Average	Range	Range/Ave	Comment
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ouse		No. 2		Average	Range	Range/Ave	e Target	Comment

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Analyst	281	- - 			Instrum	ent <u>Ty</u>	ncn 22	.2		
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			Results	in <u>Ug</u>	<u>/L</u>					
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	UTAH BIOMEDI Analytics Quality Con	al Labor	story	Y	HHE/TA # Sequence	
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nalyst <u>29</u>			Instrum	ent <u>Tyr</u>	ru 22	2
ethod <u>ECHC</u>			Date An	alyzed	11/16/9	3
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				ical Labors Control Dat			Sequence	•:
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Analyst	225				Instrum	ent TV	nn22	2
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Nethod	ECIC) ī			Date An	alyzed	11/16/8	53
			Results	in <u>Ug</u> i	1			
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			Analyti	ical Labora	tory		Sequence	
			Quality (Control Dat	a Sheet			
Analyte	Lind	lane			Matrix	Wate	rs	
Analyst	<u>735</u>				Instru	ent <u>l've</u>	ru SS	<u>L</u>
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			Conc.		% Spike			
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<u>Spikes</u>	Initial Conc.							Comment
<u>Spikes</u> Sample #	Initial Conc.		Spiked		Recovered			Comment
<u>Spikes</u> Sample #	Initial Conc.		Spiked		Recovered			Comment
<u>Spikes</u> Sample #	Initial Conc.		Spiked		Recovered			Comment
<u>Spikes</u> Sample #	Initial Conc.		Spiked		Recovered			Comment
<u>Spikes</u> Sample #	Initial Conc.		Spiked		Recovered			Comment
Spikes Sample # SAGISSS	Initial Conc.		Spiked		Recovered 93			
Spikes Sample #J	Initial Conc.	No. 2	Spiked	Average	Recovered 93	Range/Ave	Target	Comment Comment
Spikes Sample # SAGISSS	Initial Conc.		Spiked		Recovered 93		Target	
Spikes Sample # SAGISSS	Initial Conc.		Spiked		Recovered 93		Target	
Spikes Sample # SAGISSS	Initial Conc.		Spiked		Recovered 93		Target	
Spikes Sample # SAGISSS	Initial Conc.		Spiked		Recovered 93		Target	
Spikes Sample # SAGISSS	Initial Conc.		Spiked		Recovered 93		Target	
Spikes Sample # SAGISSS	Initial Conc.		Spiked		Recovered 93		Target	
Spikes Sample # SAGISSS In House QC Samp.	Initial Conc.	No. 2	Spiked		Recovered 93 Range	Range/Ave		Comment
Spikes Sample # SAGISSS In House QC Samp.	Initial Conc.	No. 2	Spiked		Recovered 93 Range	Range/Ave	Target	Comment

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		U	Analyt	DICAL TEST Ical Labora Control Dat	tory	Ŷ	HHE/TA # Sequence	
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Analys	132				Instru	ent Typ	<u>22 nu</u>	2
	ECHO						11/161	
	• • ••••••		Results	i in <u>110</u>	/ <u></u>			
<u>i plica</u> Sample (tes/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
AYIY2	< 0.01	<0.01]					· · · _ · _ ·
	<00)							
	<0.01					1		
	10.05	<0.01						
	10.02	<0.01						
píkes	Initial Conc.		Conc. Spiked	1	% Spike Recovered	•	1	Comment
					86			
ample #	<u> </u>		0.8	(
ample #	<0.01		0.8			1		
ample #	<u> </u>		0.8					
ample #	<u> </u>		0.8					
ample #	<u> </u>		0.8					
Sample #	<u> </u>							
ample #								
n House	<0.01	No. 2				Range/Ave	Target	Comment
ample # A 41:55 S 	Audits No. 1	No. 2		Average	Range	Range/Ave		Comment
ample # A 41:55 S 	<0.01	No. 2 0.006		Average D.D26		Range/Ave	Target	Comment
ample # A 41:55 S	Audits No. 1				Range			Comment
ample # A 41:55 S 	Audits No. 1				Range			Comment

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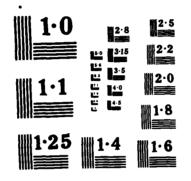
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UNCLAS	SIFIE	>								F/G :	13/2	NL	
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NATIONAL BUREAU OF STANDARDS

L'ALLANDA KANA INT

Jailie 1. C.3

520 WAKARA WAY SALT LAKE CITY. UTAH 84108 801 581-8267

December 1,,1983

ANALYTICAL REPORT

SUBMITTED TO: Dames & Moore

SUBMITTED BY:

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REFERENCE DATA:

Analysis of:

of: Aldrin, Dieldrin, Chlordane, DDT isomers, Endrin, Endrin Aldehyde, Heptachlor, Lindane

SA-4142 through SA-4144

Ellen Jenkins

Identification No.: 452

Sample(s): 3 Analyses: 33

UBTL Laboratory No.:

The above numbered water samples were prepared for analysis by EPA Method 608. The samples were analyzed on a Tracor 222 gas chromatograph equipped with an electron capture detector. A 6' x 2 mm i.d. glass column packed with 3% OV-17 and 3% QF-1 on 100/120 mesh Chrom Q was used isothermally at 190°C and with a gas flow of 75 mL per minute.

The limits of detection were 0.01 μ g/L for Aldrin, Dieldrin, o,p-DDT, DDD, DDE, Endrin, Endrin Aldehyde, Heptachlor, and Lindane and 0.1 μ g/L for Chlordane.

The results are tabulated on the following page(s).

<u>Ellen Jeukins</u>

D. La Sim D. Lessley. Ph.

MEDICINE BIOENGINEER NG CHEMISTRY RESEARCH DEVELOPMEN* ANALYS S

			EPORT FORM Date 12/29/83 JUL	·
			UBTL Identification Number	452
Corporate / A	Agency Name	Dames & Moore		
		<u></u>		<u> </u>
Attention		· · · · · · · · · · · · · · · · · · ·	Telephone	
Sampling C	ollection and Shi	pment		
	Sampling Site		Date of Collection	
	Date Samples	Received at UBTL No	vember 4, 1983	
Analysis				

KAN 1434 34 36 36 38 AT 40 49 48 48 49 49 49

Method of Analysis <u>20.061</u> Date(s) of Analysis

Analytical Results

Field	UBTL			Results JJ2				
Sample Number	Lab Number	Sample Type	FOUND POUND PESTICIDES					
DM 3	SA 4142	WATER	NONS	$\alpha_{i+1} \leq \alpha_{i+1}$				
DM 2	SA 4143		NDUS	31 5-14				
DM 1	SA 4144		aldr. 6.01	August Sauly				
	5944	E ici +	aidrin 10.01 opti					
		<u>2015</u>	alde op vie of Ge	075 Backy				
			ENCLANCE -	- retreased - marine C. T.				
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Comments _

Analys TRevie a len Laboratory Supervisor

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

UBTL Analytical Laboratory

Quality Control Data Sheet ID #

Analyte ALDRIN

Analyst name	EEJ	Natrix	WATERS
Analyst number	457	Instrument	222
Method	ECGC	Date	16 NDV - 1983

Results in UG/L -

Sample	Value1	Value2 Num	Hean	Tarset	Ranse	Rns/Mean Stat
QC16685 A4142 SA4155A SA4155B	•056 -•000 -•000 •770	•056 2 000 2 000 2 .773 2	•056 -•000 -•000 •771	,05L	000. 0,000 0,000 ,003	

Limit of detection $\widehat{\bigcirc}, \widehat{\bigcirc}$ [

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DM456

Analys Analys Method QC166 A414 SA415 SA415 SA415

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	UBTL Analytical	Laboratory			í.	
	Quality Control	Data She et	ID #	DM456		
Analste	ENDRINALDEHYDE					
Analyst name Analyst number Hethod	EEJ 457 ECGC	Matrix Instrument D ate		NATERS 222 16 Nov++ 1983		
	Results in UG	/L				

Sample	Valuei	Value2 Num	Mean	Tarset	Ranse	Rng/Mean	Sta
SA4155A SA4155B	001 001	001 2 001 2	-,001 -,001		0,000	0,000 0,000	

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	UBTL Analytical Lab	oratory	
	Quality Control Dat	a Sheet ID \$	DM456
Analyte	OPDDT		
Analyst name Analyst number Method	EEJ 457 ECGC	Matrix Instrument Date	WATERS 222 16 Nov., 1983

Results in UG/L

Sample	Valuei	Value2 Num	Nean	Tarset		Rns/Mean Sta	
SA4142 JA4155B	.000 ,895	.000 2 .894 2	• 000 • 894		0.000,001	0,000	

Limit of detection $\bigcirc,\bigcirc)$

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	UBTL Analytical L	aboratory			
	Quality Control D	lata Sheet	ID ŧ	DH456	
Analyte	DIELDRIN				
Analyst name Analyst number Method	EEJ 457 ECGC	Matrix Instrument Date		WATERS 222 16 Nov., 1983	
	Results in UG/	۲ L			

Results in UG/L

Sample	Value1	Value2 Num	Mean	Tarset	Ran≤e	Rns/Mean	Stat
QC16685	.112	.112 2	•112	. 114	.001	.006	
A4142	-,001	-,001 2	-,001		0,000	0.000	۰.
SA4144A	001	001 2	001		0,000	0,000	
SA4144B	-,001	-,001 2	-,001	•	0,000	0,000	in the second se
SA4155A	001	001 2	001		0.000	0.000	
SA4155B	,832	3829 2	,830		,003	,004	

Limit of detection 0.01

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UBTL Analytical Laboratory	UBTL	Anglytical	Laboratory
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Quality	Control	Data	Sheet	ID 🕈	DM456

ENDRIN Analyte

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Analyst name	EEJ	Matrix	WATERS
Analyst number	457	Instrument	222
Method	ECGC	Date	16 NOV., 1983

Results in UG/L

Sample	Valuei	Value2 Num	Mean	Tarset	Ranse	Rns/Mean Sta
3A4142	000	000 2	-,000		0.000	0,000
SA4155A	-,000	-,000 2	-,000		0,000	0,000
SA4155B	•910	.914 2	,912		,003	:004

Limit of detection \bigcirc,\bigcirc }

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imit of detect	ion (). (Checked	by)1/1			<u>ن</u> د
SA4142	.001	.001 2	.001		0.000	0,000	
Sample	Value1	Value2 Num	Mean	Tar⊴et	Ranse	Rns/Hean	Stat
	Re	sults in UG/L					
ethod	ECGC		Date		16 NOV	li≠ 1983	۰ <u>ـ</u>
nalyst name nalyst number	EEJ 457		Matrix Instrum	ent	222		1
			Mai a i		WATERS		2 %
nalyte	CHLORO						
	Quali	ty Control Dat	a Sheet	ID ŧ	NM456		
	UBTL	Analytical Lab	oratory				• -
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	UBTL Analytical	Laboratory		
·	Quality Control	Data Sheet	ID 🛊	DM456
Analyte	LINDANE	i -		
Analyst name	EEJ	Matrix		WATERS
Analyst number	457	Instrument		222
Method	ECGC	Date		16 NOV., 1983

Results in UG/L

Sample	Value1 `	Value2 Num	Mean	Tar⊴et	Ranse	Rng/Hean	Stat
SA4142	.000	.000 2	.000		0.000	0,000	•
SA4155A	,000	,000 2	,000		0,000	0,000	
A4155B	.726	.746 2	•736		,020	.027	•
SA4156	,000	,000 2	.000		0,000	0,000	• • •

Limit of detection $\bigcirc,\bigcirc]$

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UBTL Analytical Laboratory		
Quality Control Data Sheet	ID # DM456	
HEPTACHLOR		

Matrix

Date

Instrument

WATERS

16 NOV., 1983

222

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Analyst name Analyst number Method

Analyte

Results in UG/L

EEJ

457 ECGC

Sample	Value1	Value2 Num	Mean	Tarset	Ranse	Rns/Mean	Sta
9C16685 3A4142	•026 -,000	،026 2 -،000 2	•026 -•000	,028	•000 •000	•005 0,000	·
SA4143	000	000 2	-,000		0,000	0.000	
SA4155A Sa4155B	-,000 ,686	-,000 2 ,702 2	000 .694		0.000	6,000 ,023	
SA4156	-,000	-,000 2	-,000		0,000	0,000	

Limit of detection 0,0

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UBTL Analytical Laboratory

	Quality Control	Data Sheet	4 Q.I	DM456
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Analyte	PPDQT			
Analyst name	EEJ	Matrix		NATERS
Analyst number	457	Instrument		222
Method	ECGC	Date		17 NOV., 1983

Results in UG/L

Sample	Valu e 1	Value2 Num	Mean	Target	Ranse	Rus/Mean S	t a
SA4142	.000	,000 2	.000		0,000	0,000	• - 444 - 4444
SA4154	,000	,000 2	,000		0,000	0,000	
SA4155A	.000	+000 2	.000		0,000	0,000	
2A4155B	, 890	\$886 2	,888		,004	,004	

Limit of detection \bigcirc,\bigcirc

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	UBTL (Analytical	Laboratory			•
	Quali	ty Control	Nata Sheet	II ŧ	JM456	<u> </u>
Analyte	D D D					
Analyst name Aralyst number Method	EEJ 157 ECGC		Matrix Instrum Date	ent	NATERS 222 17 NOV.+ 1983	
	Re	sults in U	3/L			•
Samøle	Value1	Value2 No	um Mean	Target	Range Rod/Hean (Blat-

						-
SA4142	.000	,000 2	.000	0,000	0.000	
741155A	.000	s000 2	.000	0,000	0,000	
94155B	.000	·000 2	.000	0,000	0.000	

Limit of detoction O(O)

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UBTL Analytical Laboratory

Quality Control Data Sheet

.[D # DM456

Analyte PPDDT Analyst name EEJ Matrix NATERS Analyst number 457 Instrument 222 Method ECGC Date 17 NOVer 1983

Results in UG/L

Sample	Valuei	Value2 Num	Mean	Tarset	Ranse	Rns/Mean Sta
SA4142	.000	,000 2	+000		0,000	0,000
SA1154	,000	,000 2	,000		0,000	0,000
SA4155A	.000	.000 2	.000		0,000	0,000
SA4155B	,890	5886 2	,888		,004	→ 004

Limit of detection 6,6

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	UBTL Analytical	Laboratory			•• • •
	Quality Control	Data Sheet	ID ŧ	NM456	2
Analyte	הנה				-
Analyst name	EEJ	Matrix		NATERS	~
Analyst number	157	Instrument		222	-
Method	ECGC	Date		17 NOV.+ 1983	

Sample	Valuei	Value2 Num	Mean	Tarset		RnsZKean	
SA4142 CA4155A	.000 ,000	,000 2 ,000 2	.000 .000		0,000	0,000	
A4155B	.000	.000 2	.000		0,000	0,000	

Limit of detoction (\bigcirc,\bigcirc)

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		UBTL Analytical	_aboratory		
K		Quality Control	Data Sheet ID	\$ DH436	
	Analyte	DDE			
t 	Analyst name	EEJ	Natrix	NATERS	
	Analyst number Method	457 ECGC	Instrument Date	222 17 NOV(+ 1983	

Results in UG/L

Somele	Value1	Value2 Num	Mean	Tardet	Ranse	Rns/Mean 9	Stat .
CA4142	-,000	-,000 2	000		0.000	0,000	
144155A	-,000	-,000 2	-,000		0,000	0,000	
0A41558	.572	.863 2	.867		.009	،010	

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			Analyti Quality C	cal Labor Control Da	-		Sequence	• ♥:	
Analyte	pp-C	IT			Matrix	write	<u></u>		
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lethod	ECEC) =			Date An	alyzed	11/16]	83	
			Results	in U.S.					
uplicate	s/Splits No. 1		No. 3	No. 4	Average	Range	Range/Ave	Comment	
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<u>4155</u>	Initial	<0.01	Conc.	I	Z Spike		<u> </u>	_	
	Conc.	1	Spiked		Recovered			Comment	
mple #			$\wedge \sigma$						1
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House	< <u>C</u> .Ol		0.8						
House	< <u>C</u> .Ol	No. 2		Average		Range/Ave	e Target	Comment	
House	< <u>C</u> .Ol	No. 2		Average		Range/Ave	e Target	Comment	
	< <u>C</u> .Ol	No. 2		Average		Range/Ave	e Target	Comment	
House	< <u>C</u> .Ol	No. 2		Average		Range/Avi	e Target	Comment	
House	< <u>C</u> .Ol	No. 2		Average		Range/Avo	e Target	Comment	

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Analyst	SE	<u>t</u>			Instrum	ent II	man 7	72
Method	SC	SC					11/16/8	
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uuplicates				0		Pence		Comment
Sample *	No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	
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pikes Sample #	Initial Conc.		Conc. Spiked		% Spike Recovered	la	1 1	Comment
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In House A		No. 2		Average	Range	Range/Av	e Target	Comment
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			utah bionei	ICAL TEST	LABORATO	t Y	181E/TA #	:	52 12
			-	ical Labor Control Da	-		Sequence	• •:	
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nalyst	285		·		Instru	HERE IN	<u>25 noc</u>	2	•
lethod	ECHO	<u>\</u>					11/16/		
				in U.G.		, ···· e			
			ME3U1 (3	ALC:					
mple •		No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
SISSA		10.02	+	<u> </u>	}		┞───┤		■
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kes	Initial		Conc.	·	% Spike				
ple #	Conc.		Spiked	 	Recovered	3 <u>4</u>	┼───┤	Comment	
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		†	1	1	<u>† </u>	1	<u>† </u>		
House A	udite			·					
Samp.		<u>No. 2</u>	1	Average	t Range	Range/Ave	Target	Comment	
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HHE/TA #: Sequence #:

Analytical Laboratory Quality Control Data Sheet

Analyte	<u>op-p</u>	DT			Matrix	Wate	<u>cs</u>	
Analyst	233				Instrum	ent <u>Tyr</u>	25 nr	2
Nethod	<u>EC.4C</u>) =			Date An	alyzed	11/16/9	83
			Results	in USI	1			
Duplicat Sample #	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
SAYIVA	50.01	<0.01						
50.4144	<0.01							
SAYULB	<0.01	<u> </u>						
SAHISS	< 0.01	<u> </u>						<u></u>
Spikes	Initial	<u> </u>	Conc.		% Spike			
Sample #		I	Spiked	I	Recovered	l	11	Comment
SAWSSS	< 0.01		0.8		111			
In House	Audits		•	•	• •	•	•	
QC Samp.		No. 2	1	Average	Range	Range/Ave	Target	Comment
Checked by Remarks:	y:		•			129 ML	:ection:).()]

		t		cal Labor		r	HBE/TA 4 Sequence		E
Analyte	Endr	<u>.</u>			Matrix	Wate	rs		F.
Analyst	285				Instrum	ent <u>Tr</u>	son ZZ	2	
Nethod	ECIC	<u>1</u>				•	11/16/		
		Z			1.				
			Results	in <u>UG</u>	/				
Duplicat Sample	es/Splits	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment	
SA4147	<0.01	k0.01							
SAYIYUD									
50 4144B	50.01			ļ					
5A4155	<0.01		_	<u> </u>					
Spikes Sample #	Initial Conc.	1	Conc. Spiked	↓~··	% Spike Recovered		······································	Comment	
5A4135B			8.0		113				
									
In House	Audits								
QC Samp.		No. 2	- 	Average	Range	Range/Av	e Target	Comment] }
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HEE/TA #: Sequence #:

Analytical Laboratory Quality Control Data Sheet

Analyte	Dret	rin			Matrix	White	<u></u>	
Analyst	285				Instrum	ent <u>Tyr</u>	<u>22 nu</u>	2
Nethod	ECIC	۱ 			Date An	alyzed	11/16	83
			Results	in USI				
Duplicat Sample	tes/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
524142	<0.01	<0.01						
SAULAN	50.01	l						
SAYIYHB	<0.01		ļ	<u> </u>				
SAUSS	10.72	< 0.01						
. <u></u>		L	I	ļ		L		
<u>Spikes</u> Sample #	Initial Conc.	I	Conc. Spiked	1	% Spike Recovered	1	1	Comment
SAUSSS	< 0.01		0.8		103			
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In House QC Samp.		No. 2	4	Average	Range	Range/Ave	Target	Comment
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		U	-	OICAL TEST cal Labors control Dat	tory	Ŷ	HHE/TA # Sequence		
inalyte	<u>JOE</u>	·			Matrix	Water	<u></u>		
nalyst	<u>139</u>				Instrum	ent <u>Typ</u>	<u>rn 22</u>	2	-
ethod	ECHC	·				alyzed			
			Results	in <u>ual</u>					
	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Lange/Ave	Comment	
JULIR .						T			
kes	Initial Conc.		Conc. Spiked		Z Spike Recovered			Comment	
<u>kes</u> ple #∣								Comment	
<u>kes</u> ple #∣	Conc.		Spiked		Recovered			Comment	
<u>kes</u> ple #1 H155	Conc.		Spiked		Recovered			Comment	
<u>kes</u> ple # 1155	<u>Conc.</u>		Spiked		Recovered			Comment	
kes ple # 1155 House	Conc.	No. 2	Spiked O.E		Recovered	Range / Ave	Target	Comment	
kes ple # 1155 House	Conc. < C. O/	No. 2	Spiked O.E		Recovered		Target		

	ol Data Sheet		Sequence	•:
alve <u>Aldrin</u>	Matrix	Wate	<u></u>	
alyst <u>225</u>	Instrum	ent <u>Tyr</u>	son 22	2
thod <u>ECSC</u>	_ Date An	alyzed	11/16/8	<u>83</u>
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NY 0.01				
14B 0.01				
455 50 01 KC. 01				
es Initial Conc. le # Conc. Spiked	% Spike Recovered	•		Comment
65 50.01 0.8	96			
			t	
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ouse Audits	erage Range	Range/Ave	Target	Comment
	056 0.00	0.005	0.056	
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Analyte	Line	tone_	<u></u>		Matrix	<u>unte</u>	<u></u>	
Analyst	139				Instru	ent In	25 02	2
Nethod	ECIK	<u>)</u>			Date Ar	alyzed	11/16	83
			Results	in US	1			
	tes/Splits	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Connent
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4155	< 0.01	<0.01				L		
		< 0.01				L		
STUD	CO.01						•	
ikes	Initial		Conc.		% Spike			
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AUIX pikes ample # AUSS	Initial Conc.		Spiked		Recovered			Comment
oikes ample #	Initial Conc.		Spiked		Recovered			Comment
<u>ikes</u> mple #	Initial Conc.		Spiked		Recovered			Comment
<u>ikes</u> mple #	Initial Conc.		Spiked		Recovered			Comment
<u>ikes</u> mple #	Initial Conc.		Spiked		Recovered			Comment
ikes mple # 4(SSS House	Initial Conc. <0.01		Spiked		Recovered 93			
ikes nple # gisss House	Initial Conc. <0.01		Spiked O.8	Average	Recovered 93	Range/Ave	Target	Comment
ikes aple # 41558 House	Initial Conc. <0.01		Spiked O.8	Average	Recovered 93		Target	
ikes nple # 4(SSS House	Initial Conc. <0.01		Spiked O.8	Average	Recovered 93		Target	
ikes mple # 4(SSS House	Initial Conc. <0.01		Spiked O.8	Average	Recovered 93		Target	
ikes aple # 41558 House	Initial Conc. <0.01		Spiked O.8	Average	Recovered 93		Target	

			Analyti	ICAL TEST : cal Laborationtrol Data	LOTY	,	HTE/TA #: Sequence		
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Analyte	Hoota	CUOF			MATTIX	Water	<u> </u>		-
Analyst	223				Instrume	ent Type	<u>55 n</u>	2	
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Nethod	ECUC				Date Ani	alyzed	1/101	0.)	-
			Results	in ugl	L				
				-0					
	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range R	ange/Ave	Comment	
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AUUU									
AUUUR									- -
50415S		<0.01							
SAHISL		<0.01							. 1
Spikes	Initial		Conc.	•	% Spike				:
Sample #		L	Spiked	ļ	Recovered	 		Comment	
A 4155 S	<0.01		0.8		86	 			-
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-									•
									• .
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In House	Audits								- (
		No. 2		Average	Range	Range/Ave		<u>Comment</u>	• (• (
In House QC Semp. 16685		No. 2 0.026		Average	Range	Range/Ave	Target C.O28	<u>Comment</u>	- (- (
QC Samp.	No. 1			1				Comment	- (- (
QC Samp.	No. 1			1				Comment	•
QC Samp.	No. 1			1				Comment	
QC Samp.	No. 1			1				Comment	

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UBTL 520 WAKARA WA SALT LAKE CITY UTAH 84108 801 581-8267

December 16, 1983

ANALYTICAL REPORT

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SUBMITTED TO: Dames & Moore

SUBMITTED BY:

Dave McGlochlin

REFERENCE DATA:

Analysis of:	Oil & Grease in water
Identification No.:	446
Sample(s): 3	Analyses: 3
UBTL Laboratory No.:	SA 4124 through SA 4126

The above-numbered water samples were analyzed for Oil & Grease according to the methods published in "EPA-600/4-79-020 Methods for Chemical Analysis of Water and Wastes."

The method number for Oil & Grease by IR Spectrophotometry is 413.2 according to the above reference. For these samples the Limit of Detection was 0.5 mg/L.

The results are tabulated on the following page(s).

Dave McGlochlin

Sim D. Lessley, Ph.D.

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		UBTL Identification Number_	446	
Corporate/A	gency NameDames & Moor			
			<u>.</u>	
		Telephone		
Sampling Co	pliection and Shipment			
	Sampling Site	Date of Collection		
	Data Samples Reseived at LIRT	November 4, 1983		

Analysis

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Method of Analysis SparkozHotometric (1.R.) Date(s) of Analysis 12/10/83

Analytical Results

Field	UBTL		Résults
Sample Number	Lab Number	Sample Type	OIL & GREASE mg/L
DM 3	SA 4124	WATER	<.5
DM 2	SA 4125		<.5 <.5 <.5
DM 1	SA 4126	\checkmark	<.5
		L.O.D.	.5
=			

Comments

Analysi

520 Wakara Way / Sait Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

UTAH BIOMEDICAL TEST LABORATORY

HHE/TA #: Sequence *: 446 5

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Analytical Laboratory Quality Control Data Sheet

Analyte	DILE Granso	_
Analyst	D.B.M.	

MATTIX WATER

Instrument BISCHAM 204

Method SPLETRO PHOTOMOTRIC

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Date Analyzed ______B3

Results in Mg

Duplicates/Splits

Sample #	No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
pikes	Initial Conc.		Conc. Spiked	ļ	% Spike Recovered		L [Comment
ample #	Conc.		Spiked		Recovered			Comment
				<u> </u>				
			<u> </u>	<u> </u>	1			
n House C Samp.		No. 2	•	Average	Range	Range/Ave	Target	Comment
1				ļ			 	
16723	6,4319	6.4319		6,4319	0.0	0.0	12.004/4	
16723	6.4319	6.4319		6.4319	0.0	0.0	12.004/2	

Checked by:

Remarks:

0/6 w.6,14

UBTL 520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

December 16, 1983

ANALYTICAL REPORT

Dames & Moore

SUBMITTED BY:

SUBMITTED TO:

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K

Dave McGlochlin

REFERENCE DATA:

Analysis of:	Oil & Grease in water
Identification No.:	457
Sample(s): 2	Analyses: 2
UBTL Laboratory No.:	SA 4157 through SA 4158

The above-numbered water samples were analyzed for Oil & Grease according to the methods published in "EPA-600/4-79-020 Methods for Chemical Analysis of Water and Wastes."

The method number for Oil & Grease by IR Spectrophotometry is 413.2 according to the above reference. For these samples the Limit of Detection was 0.5 mg/L.

The results are tabulated on the following page(s).

hich Dave McGlochlin

fim D. Lessley, Ph/D

orate/Agency NameDa	Date <u>12/29/83</u> <u>JUL</u> UBTL Identification Number <u>457</u> mes & Moore
	Telephone
pling Collection and Shipment	
Sampling Site	Date of Collection
Date Samples Receiv	red at UBTL November 9, 1983
lysis Method of Analysis _	SPECTROPHOTOMOTRIC (1, R.)
Date(s) of Analysis	2/10/83

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Analytical Results

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Field	UBTL		Results
Sample Number	Lab Number	Sample Type	OIL & GREASE Mg/
W 6	SA 4157	WATER	<,5
W 14	SA 4158		<u> </u>
		LO.D.	.5
			····
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Comments _

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UTAH BIONEDICAL TEST LABORATORY

Analytical Laboratory Quality Control Data Sheet

HHE/TA #: Sequence #:457

Analyte	DIL \$ GROADSE
Analyst	D.B.M.

SPECTROPHOT OMETRK

Method

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Matrix <u>WATER</u> Instrument <u>Beschmann 20A</u> Date Analyzed <u>12/14/83</u>

Results in <u>mg</u>

Sample #	No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
				1				
		ļ	ļ					
Spikes	Initial	-	Conc.	-	% Spike			-
Sample #1	Conc.	ł	Spiked	1	Recovered			Comment
·				1			1	
		ļ	ļ				ļ	
			l	I			_	
_		<u> </u>						
		ļ	L	+			↓ • _	
In House								
C Samp.	No. 1	No. 2		Average	Range	Range/Ave	Target	Comment
16723	6.4319	6,4319		6,4319	0,0	0.0	12.Crg/2	
				<u> </u>				
		{	╂	+			╂╼╼╼──╉	
		<u> </u>		<u> </u>				
								~ >
	y:		•		Li	it of Det	ection:	. <u>5</u> <u></u>
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hecked by lemarks:				1.1.	2/ 12	1 .		

6/10, 10, 1003 phones 6-11, 12, 13

UBTL 520 WAKARA W/ SALT LAKE CITY UTAH 84108 801 581-8267

December 16, 1983

ANALYTICAL REPORT

SUBMITTED TO:

Dames & Moore

SUBMITTED BY:

Dave McGlochlin

REFERENCE DATA:

Analysis of:	Oil & Grease in water
Identification No.:	453
Sample(s): 3	Analyses: 3
UBTL Laboratory No.:	SA 4145 through SA 4147

The above-numbered water samples were analyzed for Oil & Grease according to the methods published in "EPA-600/4-79-020 Methods for Chemical Analysis of Water and Wastes."

The method number for Oil & Grease by IR spectrophotometry is 413.2 according to the above reference. For these samples the limit of detection was 0.5 mg/L.

The results are tabulated on the following page(s).

Dave McGlochlin

Lim D. Lessley Sim D. Lessley, Ph.D.

December 7, 1983

ANALYTICAL REPORT

SUBMITTED TO: Dames & Moore

SUBMITTED BY:

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David McGlochlin

REFERENCE DATA:

Phenol Analysis of: 453 Identification No.: Analyses: 3 Sample(s): 3 UBTL Laboratory No .: SA-4145 through SA-4147

The above numbered water samples were analyzed for phenol according to the methods published in "EPA-600/4-79-020 Methods for Chemical Analysis of Water and Wastes."

The method number for phenol, according to the above reference, is 420.2. For this set of samples the limit of detection was 5. μ g/L.

David McGlochlin

EFR NG RESEARCH



UBTL 520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

Sim D. Lessley, Ph. D.

November 18, 1983

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UBTL 520 WAKARA W SALT LAKE CITY UTAH 84108 801 581-8267

ANALYTICAL REPORT

SUBMITTED TO: Dames & Moore SUBMITTED BY: Ken Bilak

REFERENCE DATA:

Analysis of:NitrateIdentification No.:453Sample(s):3UBTL Laboratory No.:SA-4145 through SA-4147

The above numbered water samples were analyzed for nitrate according to method 353.2, published in "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020 publication.

The limit of detection for nitrate is 0.02 milligrams per liter.

The results are tabulated on the following page(s).

Ken Bilak

Sim D. Lessley,

November 14, 1983

ANALYTICAL REPORT

SUBMITTED TO:

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SUBMITTED BY: Clint Merrell

REFERENCE DATA:

Analysis of: Lead

Identification: 453

Sample(s): 3 Analyses: 3

UBTL Laboratory No.:

The above numbered water samples were analyzed according to the EPA - 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." Method Number 239.2. The analyses were performed with an atomic absorption spectrophotometer.

SA-4145 through SA-4147

Dames and Moore

The limit of detection for each analyte is as follows:

Lead: 0.01 mg/LThe results are tabulated on the following page(s).

> Clint Meneel Clint Merrell

Lealer Rand Potter

UBTL 520 WAKARA WA

UBTL 520 WAKARA WAY SALT LAKE CITY. UTAH 84108 801 581-8267

MEDIC NE BIOENGINEERING CHEMISTRY RESEARCH DEVELOPMENT ANALYSIS

ANALY'	TICAL	REP(DRT	FORM

Date 12/29/83 10L

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		UBTL Identification Number	453
Corporate/Agency Name	Dames & Moore		<u>.</u>
Address			
Attention		Telephone	
Sampling Collection and Ship	oment		
Sampling Site		Date of Collection	

Date Samples Received at UBTL November 8, 1983

Analysis

Method of Analysis AA-H6A, Uisible Spectroscopy Date(s) of Analysis______II-18-83

Analytical Results

Field	UBTL			UG/L Resu	its mg/L	mall
Sample Number	Lab Number	Sample Type	NITRATE 3/L	PHENOL	LEAD	OIL & GREASE
W 11	SA 4145	WATER	0.45	<5.	<0.01	<0.5
W 12	SA 4146		0.67	<5.	<0.01	50.5
W 13	SA 4147	¥	0.39	800.	<0.01	<u><0.5</u> <u><0.5</u> <u><1.5</u>
		200	0.02 mg/L	5, ^u £/L	0.01 7%	0.5 mg/L
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Comments _

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520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

		Analytical Lab ty Control Dat		ID #	+		•
Analste	en Po						
Analyst name Analyst number Method	NCLM \$432 Eaas		Matrix Instrum Date	ent	XFILTERS \$751 IL2 10 NOV+,	1983	
	Re	sults in 4.06 V	nglitor				
Samrle	Value1	Value2 Num	Mean	Tarset	Ranse Ros	s/Mean Sta	.
5A4127	001	.000 2	000			-5,080 74,762	

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Analyte Analyst)12 \$ D.B.1	Groas N,	Control Dat	Matrix Instrum	A	HER GECKMA	<u>n 20A</u>
		SZTROP	Results	<u>s in</u>	Date An <u>7/1 _</u>	alyzed	<u>]2] [9]</u>	<u>35</u>
ample 4	No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
pikes ample #	Initial Conc.	! !	Conc. Spiked	↓ ↓	% Spike Recovered	! !	┞────┤ ┞────┤	Comment
		· · ·	· .					
n House	Audite-							
C_Samp.		No. 2	<u> </u>	Average	Range	Range/Ave	Target	Comment
6723	6.4319	6,4319		6,4319	0,0	0.0	12.6+2h	

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			Quality (Control Da	ta Sheet			
nalyte	Nite	rate			Matrix	U	later	
Analyst	<u> Ken</u>	Bilak	<u> </u>		Instrum	ent _A	utoanaly	2en 11
Method	<u>L'isib</u>	le spec	troscop	¥	Date An	alyzed	11-18-8.	3
			Results	in <u>mg</u>	16			
	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
4146	.664	.667			,6655	T	.0045	
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			<u> </u>				+	
pikes ample #	Initial Conc.	l	Conc. Spiked	↓ I	% Spike Recovered	¥	<u>+</u> +	Comment
							++	
			<u> </u>				<u> </u>	
				l	Ļ	ļ		
n House								
C Samp.		No. 2	┼───	Average			e Target	Comment
15994		.491		,4895	,003	.0061	.481	
110	.361	.363	<u> </u>	.362	.002	.0055	.357	
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16657			1			J	J 1	

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	D 1	3	Quality (Control Dat			1		
	<u>Phe</u>	_				U/c			•_*
Analyst	Dave	<u> </u>	lochlin		Instrum	ent <u>Au</u>	<u>loqnalyze</u>	on II	• •
Method	Visib	le Speci	rascopy		Date An	alyzed	11-18-83		
			Results	in <u> </u>	16				
<u>plicat</u> Sample #	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
4147	798.	807.			802.5	9	.01/2		
									-
Spikes Sample #	Initial Conc.		Conc. Spiked	↓ ↓	% Spike Recovered			Comment	
				<u> </u>					
		1		<u> </u>					
C Samp.		No. 2	1	Average	Range	Range/Av	el Target	Comment	
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hecked by	y:	<u> </u>		4	Li.	i		5 va/L-	
emarks:						12/29		<u></u>	
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UBTL 520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

December 2, 1983

ANALYTICAL REPORT

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SUBMITTED TO: Dames & Moore

SUBMITTED BY:

REFERENCE DATA:

Pheno1 Analysis of: 448 Identification No.: Sample(s): 3 Analyses: 3 SA 4130 through SA 4132 UBTL Laboratory No .:

The above-numbered water samples were analyzed for Phenol according to the methods published in "EPA-600/4-79-020 Methods for Chemical Analysis of Water and Wastes."

Dave McGlochlin

The method number for Phenol according to the above reference is 420.2. For these samples the limit of detection was 5 μ g/L.

The results are tabulated on the following page(s).

David Miglicht

Sim D. Lessley

Sim D. Lessley, Ph. D.



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ANALY	rical I	REPO	DRT	FORM

		Date 12/29/83 LOL		
		UBTL Identification Number	448	
Corporate/Agency Name	Dames & Moore			
Address				
Attention		Telephone		
Sampling Collection and Sh	ipment			
Sampling Site	e	Date of Collection		
Date Sample	s Received at UBTL <u>No</u>	vember 4, 1983		

Analysis

Method of Analysis ______ 11/10/23 Date(s) of Analysis____

Analytical Results

Field Sample Number	UBTL Lab Number	Sample Type	PHENOL Lij/L
DM 3	SA 413	WATER	< 5.
DM 2	SA 413	1	< 5,
DM 1	SA 413	12 1	< 5. < 5. < 5.
	1		
	1	LC.D.	5. wy/2
			· ·
	1		

Comments

Analyst ·ick 21.

Reviews mour Laborat Supervisor

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

		UTAH BIOMEDICAL TEST LABORATORY Analytical Laboratory Quality Control Data Sheet					HE/TA #: Sequence #: UBTL ID #: 448,45		
		HENOL		·			VATER		
Analyst	D.B.M.				Date Analyzed83				
Method		Lorime	TRIC Date Analyzed			alyzed _	11/18/83		
		•		ts in <u>ug</u>			·		
ample #	No. 1	No. 2	No. 3	• No. 4	Average	Range	Range/Ave	Comment	
		ļ				27	1.0256		
4130	1.52	4.72			3.120	2.2	11-2.50		
	1.52 798,	4.72 807.			5.120 BCR.5	9,0	0.0112		
4130 4147								· · · · · · · · · · · · · · · · · · ·	

Checked by:

Limit of Detection: 5. "9/2

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Remarks:

QC Samp.

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Limit of Det *Vi^{rg(2}/2 12/29 Lll*

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UBTL 520 WAKARA WA SALT LAKE CITY UTAH 84108 801 581-8267

November 14, 1983

ANALYTICAL REPORT

SUBMITTED TO:

SUBMITTED BY: Clint Merrell

REFERENCE DATA:

Analysis of: Lead

Identification: 447

Sample(s): 3 Analyses: 3

UBTL Laboratory No .:

The above numbered water samples were analyzed according to the EPA - 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." Method Number 239.2. The analyses were performed with an atomic

SA-4127 through SA-4129

Dames and Moore

absorption spectrophotometer.

The limit of detection for each analyte is as follows:

Lead: 0.01 mg/LThe results are tabulated on the following page(s).

> <u>Clint Menell</u> Clint Merrell

fin D. Lessley, Ph. D.

	4		Date 12/29/83 ML		
			UBTL Identification Number	447	
Corporate/Agency N					ŝ
Address					P .,
Attention			Telephone		· · · ·
Sampling Collection	and Shipm	ient			
			Date of Collection		- T L
Date	Samples Re	eceived at UBTL <u>Nov</u>	ember 4, 1983		
Analysis Metho Date(Analytical Results	od of Analy s) of Analy	sis <u>AAS-Gaphi</u> sis <u>11/10/83</u>	t Furnace		•
Metho Date(Analytical Results	od of Analy	sis <u>AAS-Gaphi</u> sis <u>11/10/83</u>	E Furnace Results		
- Metho Date(od of Analy (s) of Analys Sample Type	sis <u>AAS-Gaphi</u> sis <u>11/10/83</u> mg/Liter			
Metho Date(Analytical Results Field UBTL Sample Lab Number Number DM 3 SA 4127	Sample Type WATER	mg Liter	Results		
Metho Date(Analytical Results Field UBTL Sample Lab Number DM 3 SA 4127 DM 2 SA 4128	Sample Type WATER	mg Liter 20.01 20.01	Results LEAD		
Metho Date(Analytical Results Field Sample Number DM 3 SA 4127 DM 2 SA 4128 DM 1 SA 4129	Sample Type WATER	mg Liter 20.01 20.01 20.01	Results LEAD		
Metho Date(Analytical Results Field UBTL Sample Lab Number DM 3 SA 4127 DM 2 SA 4128	Sample Type WATER	mg Liter 20.01 20.01	Results LEAD		
Metho Date(Analytical Results Field Sample Number DM 3 SA 4127 DM 2 SA 4128 DM 1 SA 4129	Sample Type WATER	mg Liter 20.01 20.01 20.01	Results LEAD		
Metho Date(Analytical Results Field Sample Number DM 3 SA 4127 DM 2 SA 4128 DM 1 SA 4129	Sample Type WATER	mg Liter 20.01 20.01 20.01	Results LEAD		
Metho Date(Analytical Results Field Sample Number DM 3 SA 4127 DM 2 SA 4128 DM 1 SA 4129	Sample Type WATER	mg Liter 20.01 20.01 20.01	Results LEAD		- - - - - - - - - - - - - - - - - - -

Comments _

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<u>Clint Menell</u> Analyst

Reviewe S20 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

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		Analytical Lab Sy Control Dat		ID ŧ	*		۔ بر ا
Analyte	en Fb						
Analyst name Analyst number Method	NCLM \$432 Eaas		Matrix Instrum Date	ent	XFILTER \$751 TL 10 אטע		CE:
	Res	nim Bults in LUG h	ng Liter				
Samele	Value1	Value2 Num	Mean	Tarset	Rande	Rng/Mean	ta

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UBTL 520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

November 18, 1983

ANALYTICAL REPORT

SUBMITTED TO:

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Dames & Moore

SUBMITTED BY: Ken Bilak

REFERENCE DATA:

Analysis of:NitrateIdentification No.:449Sample(s):3UBTL Laboratory No.:SA-4133 through SA-4135

The above numbered water samples were analyzed for nitrate according to method 353.2, published in "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020 publication.

The limit of detection for nitrate is 0.02 milligrams per liter.

The results are tabulated on the following page(s).

Ken Bilak

Lesseley, Ph. D.



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	ANALYTICAL REPORT FORM
	Date 12/29/83 LOL
	UBTL Identification Number449
orporate//	Agency NameDames & Moore
ddress	
ttention _	Telephone
ampling C	Collection and Shipment
	Sampling Site Date of Collection
	Date Samples Received at UBTL <u>November 4, 1983</u>
nalysis	
	Method of Analysis Visible Spectroscopy
	Date(s) of Analysis
nalution) E	

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Analytical Results

Field Sample Number	UBTL Lab Number	Sample Type	Results, mg/L NITRATE	
DM 3	SA 4133	WATER		
DM 2	SA 4134		9.2	
DM 1	SA 4135	V	9,8	
······				
Limit	of de	tection	.02 mz/L	

Comments

Ken Bilak 5 an er Laborat Supervisoi 0

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

UBTL Analytical Laborators

Quality Control Data Sheet

ID # 525.

Analyte NITRATE

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KPB WATER Analyst name Matrix 27AA Analyst number 436 Instrument Method VISIBLE SPECTROSCOPY Date 5 DEC.+ 1983

Results in MG/L

Sample	Valuei	Value2 Num	Mean	Tansot	Range	Rns/Mean	5tat
8015994	.361	.363 2	، 362	- 759,000 35	7 ,002	.006	** .
9016657	,491	, 188 2	,489	-999,000,480	6,003	,006	XX
EA4146	,667	.664 2	.666	,	.003	,005	i

Limit of detection .02 mg/L

Checked by

y 2 12/29 Lac

December 21, 1983

To maintere

UBTL 520 WAKARA WA SALT LAKE CITY: -UTAH 84108 801 581-8267

ANALYTICAL REPORT

SUBMITTED TO: Dames & Moore

SUBMITTED BY: David McGlochlin

REFERENCE DATA:

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Analysis of:\$ MoistureIdentification:464Sample(s):28UBTL Laboratory No.:SA 4167 through SA 4194

The above numbered soil samples were analyzed for moisture according to the procedure described below.

Beakers were dried in an oven at 105°C for 1 hr., dessicated for 1 hr. and weighed. Approximately 10 grams of sample was added to each respective beaker and the weight of the beaker plus the sample was recorded. The samples were than dried at 105°C for 16 hrs, dessicated for 1 hr. and weighed.

For each sample the weight of the soil before drying and its moisture weight were calculated from weights obtained through the above procedure. The moisture weight was then divided by the weight of the sample before drying to find the percent moisture of each sample.

The results are tabulated on the following page(s).

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David McGlochlin

him D. Lessley, Ph Sim D. Lessley, Ph

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ANALYI	ICAL F	REPOR	T FORM

Date 12/29/83 LOL

		UBTL Identification	Number	464
Corporate/Agency Name	Dames & Moore	······		
Address				
Attention Mr. Yogi Kunze		Telephone	602 274-	5548
Sampling Collection and Shipmer	nt			
Sampling Site	Nellis AFB	Date of Collec	tion	
Date Samples Rec	eived at UBTL <u>N</u>	ovember 12, 1983	`	

Analysis

Method of Analysis <u>GRAVIMETRIC</u> Date(s) of Analysis <u>12/13/83</u>

Analytical Results

Field	UBTL		Results
Sample Number	Lab Number	Sample Type	7 Moisture
B1S3	SA 4167	SOIL	8.1
B1-S5	SA 4168		8,9
B1-S12	SA 4169		4.3
B1-S18	SA 4170		2.0
B2-S2	SA 4171		14.
B2-S6	SA 4172		4.6
B2-S10	SA 4173		4.7
B3-S1	SA 4174		6.6
B3-S9	SA 4175		5,0
B4-S3	SA 4176		/3,
B4-S7	SA 4177		5,4
B4-S11	SA 4178		6.2

Comments

Reviewer Analysi tory Supernsor

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

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Page _____ of ____

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Date 12/29/83 14

UBTL Identification Number ____

Analytical Results

			Results
Field Sample Number	UBTL Lab Number	Sample Type	\$ MOISTURE
B5-S5	SA 4179	SOIL	12.
85-S10	SA 4180		8.4
B6-S4	SA 4181		11,
B6-S9	SA 4182		15,
B6-S14	SA 4183		19.
B7-S1	SA 4184		19
B7-S5	SA 4185		23,
B7-S10	SA 4186		14,
B7-S15	SA 4187		28.
B8-S3	SA 4188		16.
<u> 88–58</u>	SA 4189		16.
B8-S13	SA 4190		20.
B9-S2	SA 4191		/3.
B9-S7	SA 4192		
<u>B9-S12</u>	SA 4193		21,
B9-S17	SA 4194		21,
	+		

Comments _

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520 Wakara Way / Salt Lake City, Utah 84108 / 1-801-581-8267

			CAL TEST Cal Labor Control Da	atory	Ŷ	HHE/TA # Sequence D [†]	
Analyte	70 Mois	TURE		Matrix	<u>ک</u>	01-	
Analyst	D.B.M	·		Instrum	ent M	BTTLER H	<u>AE 163</u>
Hethod	RAVIME	TRIC		Date An	alyzed	12/19	183
		Results	in <u>70</u>			7	
Duplicates/Spl Sample # No.		No. 3	No. 4	Average	Range	Range/Ave	Comment
4175 7.3			-	7.275	0.07	0.0096	
4179 11.74	1 11.55			11.65	0,19	0.0163	
4185 22.2	28 22.64	1		22,46	036	0.0160	
Spikes Init		Conc.		% Spike		0107001	-
Sample " Con	c.	Spiked	<u> </u>	Recovered	1		Comment
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				{	<u> </u>		
			<u> </u>				
In House Audits QC Samp. No.	•	•	Average	Range	IPange / Ave	el Target	Comment
QC 3829	1 10. 2		nverage	Kange	Kange/Ave	laiget	
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UBTL

520 WAKARA WA SALT LAKE CITY UTAH 84108

801 581-8267

December 29, 1983

ANALYTICAL REPORT

SUBMITTED TO: Yogi Kunze

SUBMITTED BY: James R. Baxter

REFERENCE DATA:

Analysis of:	EPA 601 Purgeable Halocarbons
Identification No.:	467
Sample(s): 28	Analyses: 812
UBTL Laboratory No.:	SA-4251 through SA-4278

The above numbered samples were analyzed using a modification of EPA Test Method 601 for purgeable halocarbons. A 1 gram sample of soil was diluted with 5 mL of organic free water and purged with helium. Any analytes present were collected on a trap consisting of activated charcoal, Tenax, and silica gel. The trap was then heated to 180° C and any analytes were flushed onto an 8' x 2mm I.D. glass column packed with 1% SP-1000 on Carbopack B. A thermal program starting at 50°C and proceeding at 8°C/minute to 220°C was used to separate the analytes. A Hall 700A electroconductivity detector in the halogen mode was used for detection and quantification of the analytes.

Samples SA-4253, 4262, 4273 were analyzed in duplicate and samples SA-4258, 4269, 4275 were analyzed neat and then reanalyzed with a spike consisting of bromomethane, chloroethane, 1,1-dichloroethene, chloroform, carbon tetrachloride, 1,1,2-trichloroethane, bromoform, chlorobenzene, and 1,4-dichlorobenzene. The results of the duplicate and spike analyses are on the QC sheets.

The limits of detection for each analyte are as follows:

Analyte	Limit of Detection (µg/gram)
Chloromethane	0.01
Bromomethane	0.01
Dichlorodifluoromethane	0.01
Vinyl Chloride	0.01
Chloroethane	0.01
Methylene Chloride	0.01
Trichlorofluoromethane	0.01
1,1-Dichloroethene	0.01
1,1-Dichloroethane	0.01
Trans-1,2-dichloroethene	0.01
Chloroform	0.01
1,2-Dichloroethane	0.01
1,1,1-Trichloroethane	0.01

Contras Rotmont Jaurida	0.01
Carbon Tetrachloride	
Bromodichloromethane	0.01
1,2-Dichloropropane	0.01
Trans-1,3-dichloropropene	0.01
Trichloroethene	0.01
Dibromochloromethane	0.01
1,1,2-Trichloroethane	0.01
Cis-1,3-dichloropropene	0.01
2-Chloroethylvinylether	0.01
Bromoform	0.01
1,1,2,2-Tetrachloroethane	0.01
1, 1, 2, 2-Tetrachloroethene	0.01
Chlorobenzene	0.01
1,2-Dichlorobenzene	0.01
1.3-Dichlorobenzene	0.01
1.4-Dichlorobenzene	0.01
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The results are tabulated on the following page(s).

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S.C

James R. Baxter James R. Baxter Sim D. Lessley, Ph.D.



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	UBTL Identification Number 467	
Corporate/Agency Name	Dames & Moore	
Address	5055 E. BROADWAY, SUITE C214	
	TUCSON, AZ 85711	
Attention Mr. Yogi Kunze	Telephone 602 274-5548	

Sampling Collection and Shipment

Sampling Site Nellis AFB Date of Collection

Date Samples Received at UBTL November 12, 1983

Analysis

Method of Analysis <u>GC</u> /Hall Detector - Halogen Mode Date(s) of Analysis <u>Dee 19 - 22 1983</u> Date(s) of Analysis_

Analytical Results

Field	UBTL				Re	sults M	glgram		
Sample Number	Lab Number	Sample Type	EPA 601						
B1-S3	SA 4251	SOIL	all	analyt	less	than	600.		
B1-S5	SA 4252		• •		• 6	1.	···		
B1-S12	SA 4253		4	11		11	• /		
B1-S18	SA 4254		1,	.1	٠,	()	•7		
B2-S2	SA 4255		11	14	11		· (
B2-S6	SA 4256		/,	1	11	1.	· ·		
B2-S10	SA 4257		11	',	11	. ,	1		
B3-S1	SA 4258		1,	17		1	11		
B3-S9	SA 4259		''	11	"	11	· ·		
B4-S3	SA 4260			* /	4	11			
B4-S7	SA 4261		11	11	41	4	',		
B4-S11	SA 4262	·.y	27		11	17	· ;		

Comments

Analys Review Laboratory Supervisor

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

Page _____ of _____

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Date 1/10/84 ML

UBTL Identification Number _____ 467____

Analytical Results

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Field	UBTL				Results	Mg	/gram
Sample Number	Lab	Sample Type			EPA 6		
B5-S5	SA 4263	SOIL	all	analyte	less	than	L.O.D.
B5-S10	SA 4264		• 1	· 0	11	11	· · ·
B6-S4	SA 4265		11	•	47	4	4
B6-S9	SA 4266		1	11	· ·	4	4
B6-S14	SA 4267		• ,		1.		1.
B7-S1	SA 4268		τ.	11	4	4	
B7-S5	SA 4269			,,	· · ·	11	•,
B7-S10	SA 4270		11	11	11	17	1,
B7-S15	SA 4271		11	17	<u></u>	17	•,
B8-S3	SA 4272		·.	• •	1	-11	4
B8-S8	SA 4273		11	11		"	4
B8-S13	SA 4274		۰,		•,	•/	1.
B9-S2	SA 4275		· ,	4	11	11	-1
B9-S7	SA 4276		11	4	4	11	1,
B9-S12	SA 4277		4		•,	ί.	
B9-S17	SA 4278			1,	(7		•1
limit	dete	tim	0,0	1 ug/gran	n for e	sch o	endyte
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	t			······			<u> </u>

Comments _____

520 Wakara Way / Salt Lake City, Utah 84108 / 1-801-581-8267

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		U	Analyti	ICAL TEST cal Labora ontrol Dat	tory	Ŷ	-1915/74 Sequence	•: 467 •: 5á 4251	- 42-71
Analyte	BRO	NOMETH	ANK		Matrix	561	\		323
Analyst	BAX	re			Instrum	ent _C	sh. o		
Nethod	EPA	601 (s	<u>0115)</u>		Date An	alyzed _	12 19-22	83	
			Results	in <u></u> /	gram				
plicat Sample #	es/Splits No. 1		No. 3	No. 4	Average	Range	Range/Ave	Comment	
4253	0	6			0	0	101		
4262	0	0	[0	0	0		
4273	0	0			0	0	0		
		1							
Spikes	Initial		Conc.		% Spike	•			1 860
Sample #	Conc.	<u> </u>	Spiked		Recovered	<u> </u>		Comment	
4258	0	ļ	0.01		1	[
4269	0	ļ	0.025	· .	93	ļ			~
<u>کړ :</u>	0	<u> </u>	0.025		93				
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In House			_					C a a a b	-
QC Samp.	<u>No. 1</u>	No. 2		Average	Range	Range/Av	e Target	Comment	
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		1	<u> </u>		†	<u> </u>	++		
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Nethod <u>EPA b01 (soils)</u> Date Analysed <u>V2 19-22 83</u> Results in <u>mp /gram</u> Nuplicates/Splits ample $\stackrel{\bullet}{=}$ No. 2 No. 3 No. 4 Average Range Range/Ave Comment 253 0 0 0 0 0 0 0 262 0 0 0 0 0 0 273 0 0 0 0 0 0 273 0 0 0 0 0 0 Dikes Initial Conc. X Spike Recovered Comment 258 0 0 0 0 0 275 0 0 0 0 0 0 275 0 0 0 0 0 0 0 275 0 0 0 0 0 0 0 275 0 0 0 0 0 0 0 0 275 0 0 0 0 0 0 0 0 0 275 0 0 0 0 0 0 0 0 0 275 0 0 0 0 0 0 0 0 0 0 275 0 0 0 0 0 0 0 0 0 0 0 0 0 275 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		UTAH BIOMEDICAL TEST LABORATORY Analytical Laboratory Quality Control Data Sheet										
Nethod <u>EPA b01 (soils)</u> Dire Analyzed <u>V2 19-22 83</u> Results in <u>N0 / gram</u> Duplicates/Splits sample * No. 1 No. 2 No. 5 No. 4 Average Range Range/Ave Comment 253 0 0 0 0 0 17262 0 0 0 0 0 17262 0 0 0 0 0 17273 0 0 0 0 0 17273 0 0 0 0 0 1728 Initial Conc. Z Spike ample # Conc. Spiked Recovered Comment 1258 0 0 0 0 1275 0 0 0 0 0 0 1275 0 0 0 0 0 0 1275 0 0 0 0 0 0 1275 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 0 0 0 0 1275 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Analyte	CHL	DROMETH	ANE		Matrix	Soil					
Method EPA bol (soils) Date Analyzed 12 $19-22$ 83 Duplicates/Splits Results in $\frac{10}{972m}$ $\frac{10}{972m}$ Duplicates/Splits No. 2 No. 3 No. 4 Average Range Range/Ave Comment 253 0 0 0 0 0 0 0 4262 0 0 0 0 0 0 0 4273 0 0 0 0 0 0 0 0 initial Conc. 2 Spiked Recovered Comment 0 0 0 0 1258 0	Analyst	Bax	<u>re</u>			Instrum	ent <u>C</u>	<u>h. 0</u>				
Results indram Duplicates/Splits Sample * No. 1 No. 2 No. 3 No. 4 Average Range Range/Ave Comment 253 0 0 0 0 0 0 0 4262 0 0 0 0 0 0 0 4273 0 0 0 0 0 0 0 0 4273 0 <	Nethod	EPA	601 (50115)		Date An	alyzed	12 19-22	83			
Sample # No. 1 No. 2 No. 3 No. 4 Average Range Range/Ave Comment 253 0			·	Results	in	•						
253 0				No. 3	No. 4	Average	Range	Range / Ave	Comment			
CONT O				T								
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pikes Initial Conc. % Spike iample # Conc. Spiked Recovered Comment 1258 0 0 0 0 1275 0 0 0 0 1275 0 0 0 0 In House Audits 0 0 0		0	0				0	0				
ample # Conc. Spiked Recovered Comment 1258 0												
Sample # Conc. Spiked Recovered Comment 1258 0				1								
1258 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			•	Conc.	•				Comment			
<u>10900000000000000000000000000000000000</u>	Sample #1		1	Spiked	1	Recovered						
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In House Audits	Sample #	Conc.		0		0						
	Sample # 1258 269	Conc. O		0		0						
	Sample #	Conc. O		0		0						
	Sample # 1258 269	Conc. O		0		0						
	iample # 1258 269	Conc. O		0		0						
	Sample # 1258 2.69 1275	Conc. O O		0		0						
	Sample # 1258 269 1275 In House A	Conc. O O O			Average	0		Target				
	ample # 1258 2.69 1275 n House A	Conc. O O O			Average	0		Target				
	Sample # 1258 269 1275 In House A	Conc. O O O			Average	0		Target				
	Sample # 1258 2.69 4275	Conc. O O O			Average	0		Target				

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		U		DICAL TEST cal Labora Control Dat	tory	(Sequence	•: 54 4251	
Analyte	_VIN	IVL CH	LORIDE		Matrix	Soil			
Analyst	Bax	22			Instrum	ent <u>C</u>	h. 0		
Nethod	EPA	601 (50115)		Date And	lyzed	12 19-22	83	
			Results	in <u>ma</u>	gram				•
Luplicat	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
4253	6	0			0	0	0		
4262	Ð	0			0	0	0		
4273	0	0			0	0	0		
Spikes Sample #	Initial Conc.	I	Conc. Spiked	1	% Spike Recovered			Comment	
4258	0		0		0				
1-169	0		0		0				
4275	0		0		0		<u>↓</u>		
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In House									•
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			JORO METH	ANE		561						
Analyst	lyse BAXTER Instrument Ch. O											
Nethod	EPA	EPA 601 (soils) Date Analyzed 12 19-22 83										
			Result	in <u>ung</u> /	9[am	•						
plicate	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment				
253	0	0		0	0	0	0					
1262	0	0		0	ð	6	0					
4273		0	<u> </u>	0	<u></u>	0	0					
pikes ample #	Initial Conc.	↓	Conc. Spiked		% Spike Recovered	ļ		Comment				
1258	0	1	0		0		11					
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		U	Analyti	cal Labora	TEST LABORATORY HEE/TA F: aboratory Sequence 4 1 Data Sheet					
Analyte	CHLO	RUETHAN	۱ <u>۲</u>		Matrix Soil					
Analyst	BART	22			Instrument Ch. O					
Nethod	EPA	601 (ioils)		Date Analyzed 12 19-22 83					
			Results	in <u></u>	gram					
Duplicate Sample #	es/Splits No. 1	No. 2	No3	No. 4	Average	Range	Range/Ave	Comment		
1253	0	0			6	0	0			
4262	U	0			Ο	0	0			
4273	0	0			0	0	0			
Spikes	Initial Conc.		Conc. Spiked		% Spike Recovered	1	+ 1 1	Comment		
Sample #			0.DI		51					
	6			a second se		1				
4258	<u>6</u> 0		0.025		88_	I	1			
4258			0.025		8 8 78					
4258	0					· · · · · · · ·				
4258	0									
Sample # 4258 4275 4275	0									
4258 4275 4275	O O Audits		0.025		78					
4258 4275 10 House	O O Audits	No. 2	0.025	Average	78	Range/Ave	Target	Comment		
4258 4275 4275	O O Audits	No. 2	0.025	Average	78	Range/Ave	Target	Comment		
4258 - 69 4275 In House	O O Audits	No. 2	0.025	Average	78	Range/Ave	Target	Comment		
4258	O O Audits	No. 2	0.025	Average	78	Range/Ave	Target	Comment		

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	UTAH BIOMEDICAL TEST LABORATORY Analytical Laboratory Quality Control Data Sheet									
Analyte	METH	ANLENE	CHLORID	٤	Natrix Soil					
Analyst	BAKT	<u>n</u>			Instrument Ch. O Date Analyzed 12 19-22 83					
Nethod	EPA	601 (S	oils)							
			Results	in <u>ung</u>	<u>Igram</u>					
Duplicate	No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment		
1253	0	0		1	101	0	0			
1262	0	0			0	0	0			
1273	0	0			0	0	0			
5 <u>pikes</u> Sample # 1258	Initial Conc.		Conc. Spiked	 	% Spike Recovered			Comment		
2.69	6		0		0					
1275	0		0		0					
			I	1	1	ļ				
]				1		
	Audite							I		
In House A	Audits No. 1	No. 2	[Average	Range	Range/Av	e Target	Comment		
n House A		No. 2		Average	Range	Range/Av	e Target	Comment		
n House A		No. 2		Average	Range	Range/Av	e Target	Comment		
n House A		No. 2		Average	Range	Range/Av	e Target	Comment		

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			Quality C	cal Labor Control Da	-		orque nce	• 467 • SÁ 4251	- T		
Analyte	TRICHLOROFLUOROMETHANE MATTIX SOIL										
Analyst	BAX	Tee			Instrument Ch. O						
Nethod	EPA	601 ((soils)		Date Analyzed 12 19-22 83						
			Results	in <u></u>	<u>lgram</u>						
plicat sample #	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment			
253	0	0	T		0	Õ	0				
1262	0	0			0	0	0				
1273	0	D			0	0	0				
				 							
		<u> </u>	Conc.	ļ	% Spike						
<u>pikes</u> Sample # 	Initial Conc.	. I	Spiked	I	Recovered		1	Comment			
1258	0		0		0		•				
1269	Õ		0		0						
75	6		0		0				, ,		
		T									
n House	Audite			•					,		
C Samp.		No. 2	1	Average	Range	Range/Av	e Target	Comment	·.		
									<u>.</u>		
		I									
	200		لىلەرىن - يەمىرىنى 1								
ecked by	y: <u>PPM</u>		-		Li	mit of D	etection:_(0.0			
enarks:				11	19 9 1/10	ISL			•		
				1/1	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	~					
				/							

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		ı	TAH BIOMEDI Analytic Quality Co	al Labora	tory	{	Sequence	46 / •: SA 4251 - 48
Analyte	_11-	DCHLOR	DETHENE		Matrix	501		
Analyst	Bax	re			Instrum	ent	h. O	
Nethod	EPA	601 (soils)		Date An	alyzed	12 19-22	83
			Results	in <u>mg/</u>	gram			
unplicat	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment
253	D	0			0	0	6	
1262	0	0			0	0	0	
273	0	0			0	0	0	
<u>pikes</u>	Initial Conc.	₄ ┨	Conc. Spiked		% Spike Recovered			Comment
1258	0		0.025		98 102			
iample # 1258 17.69 1275 in House 10 Samp.	O O Audits	No. 2	0.025	Average	102	Range/Av	e Target	Comment

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UTAH BIOMEDICAL TEST LABORATORY

467 -1012/74-1-Sequence *: 54 4251 -

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Analytical Laboratory Quality Control Data Sheet

Analyte	1.1 - DICHLORDETHANE	Natrix Sol
Analyst	BAXTER	Instrument Ch. O
Nethod	EPA 601 (soils)	Date Analyzed 12 19-22 83
)

Results in mg/gram

Luplicates/Splits

nt j.	Comment	Range/Ave	Range	Average	No. 4	No. 3	No. 2	No. 1	Sample #
		0	0	0			D	D	4253
·		Θ	0	Ø			0	0	4262
		0	0	0			0	0	4273
							 		

<u>Spikes</u> Sample #	Initial Conc.	Conc. Spiked	% Spike Recovered	Comment
4258	Ð	0	0	
U7.69	0	0	0	#2.
4275	D	0	ð	
<u></u>				

In House Audits Range |Range/Ave| Target Comment No. 1 No. 2 Average | QC Samp.]

Checked by: _ PRM

Remarks:

Limit of Detection: 0.01 M^{illi}g 'lio ML

		U		DICAL TEST cal Labora Control Dat	tory	Y	-191E/7A F Sequence	• 467 •: Sá 4251-	427,
Inalyte	TRAN	15-1,2-3	CHLOROFT	HANE	Matrix	501			2 2 2 2 2 2
	BAXT					ent <u>C</u>			
lethod	EPA		50115)				12 19-22	2 83	ج د • •
			Results	in <u>mg/</u>	gram				
	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment	• • •
53	0		Ð		0	0	D		
262	Ο		0		ల	0	0		
273	D		0		0	0	0		
ikes mple #	Initial Conc.	۔۔۔۔۔ 	Conc. Spiked	!	% Spike Recovered	ـــــــــــــــــــــــــــــــــــــ		Comment	i
258	0		0		0				
269	0		0		0	<u> </u>			<u> </u>
25	0								<u> </u>
		1		1					
House			_						[
Samp.	No. 1	No. 2		Average	Range	Range/Ave	larget	Comment	
		+		<u> </u>		1			;
			1	1		1			
	·: PRM						ection:		
eked b					14	mit of Day	action . C	0.01	

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		U	-	ICAL TEST cal Labora ontrol Dat	tory	Y	- 1812/7A-4 Sequence	•: 54 4251	- 4c
Analyte	C	HLORD FOR	(m		Matrix	561	\		<u>.</u>
Analyst	Bax	re			Instrum	ent	ch. 0		
Nethod	EPA	601 (ioils)		Date An	alyzed	12 19-22	2/83	
			Results	in <u></u> /	gram				•
uplicat ample #	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment	2
253	6	0			0	0	6		
262	0	0			0	0	0		
273	0	0			0	0	0		,
oikes ample #	Initial Conc.	<u>]</u>	Conc. Spiked	l	% Spike Recovered		↓↓	Comment	
258	0	<u> </u>	0.01	 	51				,
~ 1,9	0	<u> </u>	6.025		107		4		
275	0		0.025		92		<u> </u>		
		<u> </u>							
n House		No. 2		Average	Range	Range/Av	e Target	Comment	
Samp.		+				<u> </u>	┨───┤		
Samp.		+	+	<u> </u>	<u> </u>				
Samp.		1				-	1		<u> </u>
54mp.					1				

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			JTAH BIOMED Analyti Quality C	cal Labor	atory	Ŷ	-HEE/TA - F Sequence	• 467 •: Sá 4251-427
nalyte	1,2-	DICHLO	LOETHANE		Matrix	56	۱	
halyst	BAKT	re			Instrum	ent	ch. O	
ethod	EPA	601 (soils)		Date An	alyzed _	12 19-22	2 83
			Results	in	<u>Igram</u>			
	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
53	0	0			6	6	0	
62	0	0			0	•	0	
57	0	0			0	•	0	
kes	Initial		Conc.		% Spike			
ple #	Conc.	l	Spiked	1	Recovered	L		Comment
58	0		0	ļ	· 0			
.69	0		0	 	0			
.75	6		0		0			•
					<u> </u>			
House A	Audits No. 1	No. 2	{	Average	Range	Range/Av	el Target	Comment
			1	ļ		l		
				 				
		<u> </u>	1	1	<u> </u>	l	etection:_C	

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UTAH	BIOMEDIC	AL TEST	LABORATORY

467 MIT / 74-17 Sequence :: 54 4251 - 4.72

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Analytical Laboratory

Analyte	_1,1,1-	TRICHLOR	OFTHAN	<u> </u>	Matrix	<u></u> 561	١		
Analyst	Bax	<u>Pre</u>			Instrum	ent	2h. 0		
Nethod	EPA	601 (50115)		Date An	alyzed _	12 19-22	83	
			Result	s in	gram				
Duplicat Sample #	es/Splits	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
4253	0	0			0	0	0		
4262	0	0			0	0	0		
4273	0	0			0	0	0		
							1 1		•

<u>Spikes</u> Sample #	Initial Conc.	Conc. Spiked	% Spike Recovered	Comment	
4258	0	0	D		
. 7.69	0	0	0		
4275	0	0	0		
					<u> </u>
					- Kina-

In House Audits Range/Ave Target Average | Range Comment QC Samp.] No. 1 No. 2

Checked by: <u>PRM</u>

Limit of Detection: 0.01

Reparks:

F

		U	TAH BIOMED Analyti Quality C	cal Labor	atory	Ŷ	-1815/7x-+ Sequence	• 467 • Sá 4251-42
Analyte	CARBON	TETRACH	LORIDE		Matrix	50	\	
	BAXT				Instrum	ent _C	ch. O	
		601 (soils)				12 19-22	. 83
			Results	in				
Duplicate Sample #	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment
4253	0	0			0	0	0	
4262	0	0			0	0	0	
4273	Ô	Ο			0	Õ	0	· · · · · · · · · · · · · · · · · · ·
Spikes Sample # 4258 4275 4275 1n House A QC Semp.	Initial Conc. O O O O O O Audits No. 1	No. 2	Conc. Spiked 0.01 0.025	Average	X Spike Recovered 37 100 128 Range		e Target	Comment Comment
hecked by	: <u>P</u> rm		-	L Mr	L1 ¹ ¹ ¹ /10	ait of De	tection:_0	. 0]

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			UTAH BIOMEI Analyti	DICAL TEST		Ŷ	- 1912/74 - • Sequence	• 467 •: 5á 4251	- 407E
			Quality C	Control Dat	ta Sheet			•	
Analyte	BROOD	PICHLORO	METHANE		Matrix	501			
Analyst	Bax	TER			Instrum	ent _C	<u>h. 0</u>		
Nethod	EPA	601 (soils)		Date An	alyzed	12 19-22	83	
			Results	in <u></u>	,				
plicat	es/Splits			-0.	0				
Sample #	No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
4253	0	$\frac{1}{2}$	<u> </u>	<u> </u>	0	0	0		
4262	0	0		<u> </u>	0	0			
4273		<u> </u>		<u> </u>	<u> </u>	- <u> </u>	+		
				<u> </u>	{		╉╾╼╾╉		
Spikes Sample #	Initial Conc.	·	Conc. Spiked		% Spike Recovered	· · · · · · · · · · · · · · · · · · ·	· ·	Comment	
4258	6		O	†	0		+		
4269	ð	1	0	1	0				
کار _	0		0		0				
	ļ	ļ			ļ	 			
	L	L		Ļ	 		l		<u></u>
In House						-			
QC Samp.	No. 1	No. 2		Average	Range	Range/Av	e Target	Comment	
	<u>}</u>	<u> </u>	-{		<u> </u>	{			
		<u>↓</u>	+	<u> </u>		t			
			+	1	1		1		
	DOWA						أميغة ويستوالله ويرواك		
Checked b	A: <u>IFIN</u>		-	•	i. /		tection:_C	0.01	
Renarks:				1º	4'q 1/1	o M			

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			-	CAL TEST	tory		-1012/7x-v Sequence	- 467 •: SÁ 4251-
Analyte	_1,2-7	DICALOR	OPROPANE		Matrix	501		
Analyst	BAX	Tre			Instrum	ent <u>C</u>	n. O	
Nethod	EPA	601	(soils)		Date An	alyzed	12 19-22	2 83
			Results	in <u></u>	gram			
aplicato	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range J	Lange/Ave	Comment
253	0	0			0	Ō	0	
262	Ø	Ø			0	Ð	0	
273	0	U			0	0	0	
		<u> </u>						
	Initial	.	Conc. Spiked	!	% Spike Recovered	ł		Comment
ample #	Conc.	1			RECOVELED			
ample # 258			5piked		0			
ample # 258 7.69	Conc.		0					
pikes ample # 258 7.69 4.275	Conc.		0		0			
ample # 258 7.69	Conc.		0		00			
ample # 258 7.69	Conc.		0		00			
ample # 258 7.69 4.75	Conc. D D		0		00			
ample # 258 7.69 4.75 n. House	Conc. O O O Audits	No. 2	0 0 9	1 Average	000		Target	Comment
ample # 258 7.69 6.75	Conc. O O O Audits	No. 2	0 0 9	Average	000	Range/Ave	Target	Comment
mple # 258 7.69 275 4 1005e	Conc. O O O Audits	No. 2	0 0 9	Average	000		Target	Comment
ample # 7258 7.69 1.275	Conc. O O O Audits	No. 2	0 0 9	Average	000		Target	Comment
mple # 258 7.69 275 4.75	Conc. O O O Audits	No. 2	0 0 9	Average	000		Target	Comment

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		U	Analyti	DICAL TEST Cal Labora Control Dat	tory	ŕ	- 1815/74 - F Sequence	: 467 •: SÁ 4251	-427
Analyte	<u> </u>	1,3-DIC	HLOROPROP	PENE	Matrix	501			
Analyst	Bax	Tre			Instrum	ent _C	ch. 0		
Nethod		601 (ioils)				12 19-22	2 83	
			Results	in <u></u>	;	-			
Duplicat Sample #	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment	
4253	0	D	T		0	3	0		
4262	Ð	0			0	0	0		
4273	0	0			0	Ð	0		
<u>Spikes</u> Sample # 4258 (* 7.69 4275	Initial Conc. O O		Conc. Spiked		% Spike Recovered 0 0			Comment	
In House QC Samp.		No. 2		Average	Range	Range/Av	e Target	Comment	
Checked by Remarks:	y: <u>P</u> PM	۔۔۔۔۔ ۱		Mire."	L <i>G</i> 1/10	nit of De	tection:	0.0]	

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	T	TAH BIOMED: Analytic Quality Co	al Labors	tory	Y	Sequence	: 467 •: SA 425
malyre TR	CHLORDETH	ENE		Matrix	<u></u> 561	١	
nalyst _B	KTER			Instrum	ent _C	ch. O	
	A 601 (soils)				12 19-22	83
	·	Results	in <u>/</u>	gram.			
mplicates/Spli mple # No. 1		No. 3	No. 4	Average	Range	Range/Ave	Comment
53 O	0			0	0	0	
62 0	0			0	0	0	
3 0	D			0	0	0	
ces Initi ole# Conc		Conc. Spiked	i 1	% Spike Recovered			Comment
58 0	·	0.010		0-71			
		0.0250		0.92			
				099			
90		Auto					
90		20250					
90		0.0600					
90							
9 0							
9 0 15 0 0 0 0 0 0 0 0 0 0 0 0 0	No. 2		Average	Range	Range/Av	e Target	Comment
9 0 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	No. 2		Average	Range	Range /Av	re Target	Comment
69 75 0 House Audits	No. 2		Average	Range	Range/Av	e Target	Comment
190 150 Nouse Audits	No. 2		Average	Range	Range/Av	e Target	Comment
9 0 15 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	No. 2		Average	Range	Range/Av	re Target	Comment

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		UT	Analyti	DICAL TEST Cal Labora Control Dat	tory	ïY	-182/7A-1	m: 467 ∎ •: Sá 4251	- 4 <u>-</u> 72
Analyte	TRANS	- 1,3-D	KHLORUPI	20 PENE	Matrix	Soil			
Analyst	Bart	ree.			Instrue	ent C	h. Ò		
Nethod		601 (s	<u>oi15)</u>		Date An	alyzed	12 19-2	2 83	
			Results	in	gram				
	No. 1		No. 3	No. 4	Average	Range	lange/Ave	Comment	•
4253	0	D			0	0	0		
4262	0	D			0	0	0		
4273	0	0			0	D	0		
Spikes Sample #	Initial Conc.	1	Conc. Spiked	1	% Spike Recovered	3 ₁ 1		Comment	
4258	0		0		0				
17.69	0		0		0				-
4275	0		0		0				
			l		ļ		L		
In House	Audits								
QC Samp.	No. 1	No. 2	!	Average	Range	Range/Ave	Target	Comment	
		 	ļ	 	 	<u> </u>			
			 	 	ļ			<u> </u>	
		 	<u> </u>	<u> </u>	 			ļ	
		<u> </u>	 	<u> </u>	 				
		1	L	L	<u> </u>	<u></u>	1	<u> </u>	
Decked by	: <u>PRM</u>		-		Li	mit of Det	ection:	0.01	
lenarks:					A 1/2	1/10 Mah			
					Nº 4	1			
					¥				•

للمكرمين بعشيعية وتربقا بعراجا اجراجا والابرادي والإدام

		1	UTAH BIQMED: Analytic Quality Co	al Labor	atory	Ŷ		: 467 •: SÁ 4251-4272
Analyte	_1,1,2	- TRICH	LORDETHEN	.E	Matrix	561	\	
Analyst	Bax	TER			Instrum	ent _C	<u>ch. 0</u>	
			(soils)		Date An	alyzed _	12 19-22	. 83
			Results	in	<u>Igram</u>			
plicat ample #	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment
253	0	0			0	Ö	0	
1262	0	ð			0	0	0	
273	<u>ŏ</u>	0			0	0	0	
pikes ample #	Initial Conc.		Conc. Spiked		% Spike Recovered		1 1	Comment
258	0		0.01		150			
269	0		0.025		Ø92			
<u>کר ِ</u>	0		0.025		øqq			
n House C Seep.		No. 2	-{	Average	Range	Range/Av	e Target	Comment
					+			
		1			1			
		1						

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		1	-	ICAL TEST cal Labora Control Dat	tory	Ŷ	Sequence	- 467 • •: sá 4251	
Analyte	PIB	ROMOCHI	HOMETHA	NG	Matrix	561	۱		
Inalyst	BAX	TER			Instrum	ent _C	ch. O		
le thod		601 ((soils)				12 19-2	2 83	
			Results	in <u></u>	gram				
plicat	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment	
53	0	0			0	0	0		
262	ð	0			0	0	0		
273	0	0		<u> </u>	0	•	0		
<u>ikes</u> mple #	Initial Conc.	[Conc. Spiked	 	% Spike Recovered	l		Comment	
258	0	<u> </u>	0	<u> </u>	0	 			`.
269	0	<u> </u>	0	<u> </u>	0	<u> </u>			
75	0		0	 	0				
						 			
				 		<u> </u>			
17	A	!		Į	↓	 			
House Samp.	No. 1	No. 2	1	Average	Range	Range/Av	ej Target	Comment	1.
						ļ			<u> </u>
		ļ			<u> </u>				
				1	3	I			
					<u> </u>				

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				ICAL TEST	story	Y	-1812/7A-7 Sequence	• 467 • Sá 4251 - 427
Analyte	2.0	HLORDE	THYLUINYL	ETHER	Matrix	561	۱	
Analyst	Bax	TER			Instrum	ent _C	ch. O	
Nethod	EPA	601	(soils)		Date An	alyzed _	12 19-22	83
			Results	in ang /	gram			
plicat	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment
253	0	0			0	0	6	
262	0	0			0	0	0	
273	0	D			0	0	0	······································
<u>ikes</u> mple #	Initial Conc.	·	Conc. Spiked	 	% Spike Recovered			Comment
258	0		0		0			
269	0	<u> </u>	0	ļ	0	ļ		
25	0		0		D			
House		No. 2	1	Average	Range	Range/Av	el Target	Comment
		<u> </u>		<u> </u>	 	<u> </u>		
				<u> </u>				
		1	+	<u> </u>		<u>├</u>	+	

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467 -1815/74-1-4_72 Sequence *: 54 4251 -

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Analytical Laboratory Quality Control Data Sheet

Analyte	BROMOFORM	Natrix Soil
Analyst	BAXTER	Instrument Ch. O
Nethod	EPA 601 (soils)	Date Analyzed 12 19-22 83
	Results in _	ng/gram

plicates/Splits

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Sample #	No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
4253	0		Ð		0	0	0		
4262	0	1	0		0	0	0		
4273	0		0		0	0	0		
			_						

<u>Spikes</u> Sample #1	Initial Conc.	Conc. Spiked	% Spike Recovered	Comment
4258	0	0.01	75	
4269	0	0.025	82	∰ •∪
2,075	0	0.025	3	

In House Audits

QC Samp.]	No. 1	No. 2	1	Average	Range	Range/Ave	Target	Comment
					··			
						┥───┤		 :
								·
								I

Checked by: <u>PRM</u>

Limit of Detection: 0.01

Remarks:

	UTAH BIOMEDICAL TEST LABORATORY Analytical Laboratory Quality Control Data Sheet								
Analyte	TETRA	CHLORO	THENE		Mattix	<u></u> 561	<u>ا</u>		
Analyst	BAXT	<u>n</u>			Instrument Ch. O				
Nethod	EPA	601 (50115)		Date Ani	alyzed _	12 19-22	83	
			Results	in <u></u>	<u>Igram</u>				
uplicate	No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
253	6	0	Ø		0	0	0		
262	0	0	N		0	0	0		
273	0	0			0	0	0		
oikes ample #	Initial Conc.		Conc. Spiked		% Spike Recovered		<u> </u>	Comment	
258	0		0		0				
7.69	0		0	<u> </u>	0				
275	0		0		0				
House	Audits No. 1	No. 2	1	Average	Range	Range/Av	vel Target	Comment	
					<u> </u>				
			1	1	ſ	{	1		

Remarks:

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			Analyt	DICAL TEST ical Labor Control Da		Y	-1912/7A-F	: 467 •: 5á 4251 -
Analyte		2,2-TE	TRACHLOR	JETHANE	Matrix	56	1	
Analyst	Bax	Ter			Instrum	ent (
Nethod			(soils)				12 19-22	83
			Result	s in <u>"ng</u>	gram			
	es/Splits	<u>s</u> No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment
253	0	0			0	0	0	
4262	Û	0			0	0	0	
4273	0	0			0	0	0	
b <mark>pikes</mark> Sample #	Initia Conc.		Conc. Spiked	1	% Spike Recovered	 		Comment
1258	0		0		0			
1269	0		0		0			
7275	0		0	<u> </u>	0			
	[┽╾╍╌┤	
		+			- <u> </u>	}		
<u> </u>		_	_			!	_	
C Samp.		No. 2	ł	Average	Range	Range/A	ve Target	Comment
		1	1					
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		۲		cal Labor	-	Y		• 467 •: 54 4251 - 427	
Analyte	CH	LORUBEN	VZENE	•		561	١		
	Bax					ent (
Nethod									
	<u>مر نوب کر محمد میں اور اور اور اور اور اور اور اور اور اور</u>			in					
	oo/Solito		KESUITS	1n - 10	giam				
	es/Splits No. 1		No. 3	No. 4	Average	Range	Range/Ave	Comment	
4253	0	0			0	0	0		
4262	0	0			0	Q	0		
4273	0	0			0	0	0		
		ļ			l				
		<u> </u>						<u> </u>	
<u>Spikes</u>	Initial		Conc.		% Spike			_	
Sample #	Conc.		Spiked	<u> </u>	Recovered	<u> </u>		Comment	
4258	6		0.01		66				
0-69	0	<u> </u>	0.025	[83				
4275	0		0.025		108				
		+	<u> </u>						
				<u> </u>					
				 		ļ			
In House		No 2	•		Range	Panco /A-	e Target	Comment	
QC Samp.	No. 1	No. 2		Average	Nange	nange/Av	e rarker		
		+			+				
					+				
		+	1	<u> </u>	 	¦	+		
			1			 			
	<u> </u>	- 		I	_I	I			
Checked by	h: Thw	\	-		Li	ait of D	tection: C	0.01	
Renarks:				V	1 19 1/1	o Noh	stection: <u>C</u>		

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UTAH	BIOM	DICAL	TEST	LAB	DRATORY
	Inalyi	ical (Labora	tor	,
A		Cantan			

-1812/74-17:	467	
Sequence #:	SÁ 4251	- 4=7

ан. 2

Analyte	1,2- DICHLUROBENENE	Matrix Soll
Analyst	BAXTER	Instrument Ch. O
Method	EPA 601 (soils)	Date Analyzed 12 19-22 83

đ

Results in <u>ung/gram</u>

<u>plicat</u>	es/Splits No. 1	No. 2	No. 3	No.4	Average	Range	Range/Ave	Comment	•
4253	0	0			0	0	0		 j.
4262	D	0			0	0	6		
4273	C	0			0	б	0		
			-	ļ					
<u>Spikes</u> Sample #	Initial Conc.	l	Conc. Spiked	1	% Spike Recovered		1	Comment	
4258	0		0		0				
4269	0		0		0				` BL4
75	0		0		0				
				1					
		1					1 1		
				1			1		
In House	Audits			_	•				-
QC Samp.		No. 2	1	Average	Range	Range/Av	e Targei	Comment	
_									
Checked b	y: <u>PRM</u>				Liz	it of De	tection:_0	. 01	
Renarks:				I ANT	1g 1/10	m			
				1					
				1					

		t	-	DICAL TEST cal Labor Control Da	atory	X	- 1815/7A - 4-3 Sequence	467 •: Sá 4251 - 427.		
Analyte	_13-	DICHLOR	OBENZEN	5	Matrix	<u></u> 561	<u> </u>			
Analyst	Bax	Ter		_	Instrum	ent _C	2h. 0			
Nethod			(soils)				12 19-22	. 83		
Results in ung/gram										
	es/Splits No. 1		No. 3	No. 4	Average	Range	Range/Ave	Comment		
4253	0	0	T		0	() ()	C C			
4262	0	0	+		0	0	0			
4273	0	0	+	<u> </u>	0	0	0			
		1	1		1			,		
		1	1							
<u>Spikes</u> Sample #	Initial Conc.		Conc. Spiked	•	% Spike Recovered		1 1	Comment		
4258	D		0		0					
4269	0		0		0					
55.	0		0		0					
		1		ļ		ļ				
				ļ		L				
In House								-		
QC Samp.	No. 1	No. 2		Average	Range	Range/Av	e Target	Comment		
		+		+			++			
·		1		1	1					
Checked by	y: PRW	۱ <u>ــــــــــــــــــــــــــــــــــــ</u>			L{:	t of D		. 01		
Remarks:			-		Nº 19	lio me	etection: <u>0</u>	<u>`</u> ≚⊥		

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				DICAL TEST	atory	Y	BE/7A -	• 467 • \$á 4251	-1-72
Analyte	,4	-Dich	LOROBENZE	ENE	Matrix	<u></u> 561	۱		
Analyst	Bax	Ter			Instrum	ent _C	ch. 0		
Nethod	hod EPA 601 (Soils) Date Analyzed 12 19-22 83								
			Results	in <u>mg</u>	<u>Igram</u>				-
licat Sample #	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
1253	0	0			0	0	0		1996 1997
4262	0	0			0	0	0		
4273	0	0			0	0	0		
Spikes Sample # 4258 4269 4269	Initial Conc. D D		Conc. Spiked O.U1 O.025 O.025		% Spike Recovered /30 /04 /18			Comment	
In House QC Samp.		No. 2	† †	Average	Range	Range/Av	e Target	Comment	
		No. 2		Average	Range	Range/Av	e Target	Comment	
		No. 2		Average	Range	Range/Av	e Target	Comment	
		No. 2		Average	Range	Range/Av	e Target	Comment	
		No. 2		Average	Range	Range/Av	e Target	Comment	
hecked by									
hecked by	No. 1								
C Samp.	No. 1						e Target		

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December 16, 1983

ANALYTICAL REPORT

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SUBMITTED TO: Dames & Moore

SUBMITTED BY: Dave McGlochlin

REFERENCE DATA:

Analysis of:	Oil & Grease in soil
Identification No.:	465
Sample(s): 28	Analyses: 28
UBTL Laboratory No .:	SA 4195 through SA 4222

The above-numbered water samples were analyzed for Oil & Grease according to the methods published in "EPA-600/4-79-020 Methods for Chemical Analysis of Water and Wastes."

The method number for Oil & Grease by IR Spectrophotometry is 413.2 according to the above reference. For these samples the Limit of Detection was .05 mg/g.

The results are tabulated on the following page(s).

1-12 Dave McGlochlin

Sim D. Lessley, Ph.D.

UBTL 520 WAKARA WAY SALT LAKE CITY. UTAH 84108 801 581-8267

> A DIVISION OF THE UNIVERSITY OF UTAH RESEARCH INSTITUTE WEDICINE BIOEN BINEERING DHEMISTRY RESEARCH DEVELOPMENT NAL YSIS

U B	\mathbf{D}		
ANALYTICAL F	EPORT	FORM	
	Date 🗐	2/29/83	IR

		UBTL Identification Number465
Corporate/Agency Name	Dames & Moore	
Address	5055 E. BROADWA	Y, SUITE C214
	TUCSON, AZ 85	711
Attention <u>Mr. Yogi Kunze</u>		Telephone602 274-5548
Sampling Collection and Shipm	ent	
Sampling Site	Nellis AFB	Date of Collection
Date Samples Re	ceived at UBit No	ovember 12, 1983

Analysis

Method of Analysis <u>1.6. SPECTROPHO TO METRIC</u> Date(s) of Analysis <u>12/10/83, 12/12/83, 12/13/83</u>

Analytical Results

Field	UBTL		Results
Sample Number	Lab	Sample Type	OIL & GREASE mg/Q
B1S3	SA 4195	SOIL	<.05
B1-S5	SA 4196		<u><.05</u>
B1-S12	SA 4197		<.05
B1-S18	SA 4198		6.05
B2-S2	SA 4199		<.05
B2-S6	SA · 4200		<15
B2-S10	SA 4201		5.05
B3-S1	SA 4202		<.05
B3-S9	SA 4203		<.0.5
B4-S3	SA 4204		<.0
B4-S7	SA 4205		< .05
B4-S11	SA 4206	\vee	6.05

Comments _

Ċ Analyst -....

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

Page	_2	01	_2_
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Date 12/29/83 LOL

UBTL Identification Number _____ 465

Analytical Results

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	T T		Results
Field Sample	UBTL Lab	Sample	OII GREASE Wy g
Number	Number	Туре	
B5-S5	SA 4207	SOIL	<u> </u>
B5-S10	SA 4208		<u><.</u> 0.5
B6-S4	SA 4209		L .05
B6-S9	SA 4210		<.05
B6-S14	SA 4211		5.05
B7-S1	SA 4212		6.05
B7-S5	SA 4213		5.05
B7-S10	SA 4214		4.05
B7-S15	SA 4215		<.05
B8-S3	SA 4216		5.05
B8-S8	SA 4217		<.05
B8-S13	SA 4218		4.05
B9-S2	SA 4219		6.65
B9-S7	SA 4220		5.05
B9-S12	SA 4221		5.05
B9-S17	SA 4222	1	6.65
		L.O.D.	05 mg/g
	ļ		3/ d
	<u> </u>		
	1		
L	<u> </u>		

Comments .

520 Wakara Way / Salt Lake City, Utah 84108 / 1-801-581-8267

UTAH	BICHEDI	CAL	TEST	LABORATORY
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HHE/TA #: Sequence *: 465

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Analytical Laboratory Quality Control Data Sheet

Analyte	OIL & GREASE
Analyst	D.B.M.

Matrix Soil

Instrument BOCKNAN 20A

Method SPECTROPHOTOMETRIC

Date Analyzed 12/14/83

Results in <u>Mg</u>.

	Sample #	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment	
									·	
									······	
	<u>Spikes</u> Sample #	Initial Conc.	ļ	Conc. Spiked	! 	% Spike Recovered			Comment_	
SАЧ	203(6)	≺.L		.51079		61			<u> </u>	
SA	4207W)	<.1		.51079		67				
SA	42 B (a)	<,1		.51079		47				

 In House Audits
 QC Samp.
 No. 1
 No. 2
 Average
 Range
 Range/Ave
 Target
 Comment

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Checked by: _

Limit of Detection:____

Limit of De 12/29 101

Remarks:

January 4, 1984

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UBTL 520 WAKARA WAY SALT LAKE CITY, UTAH 84108 801 581-8267

ANALYTICAL REPORT	
SUBMITTED TO:	Yogi Kunze
SUBMITTED BY:	James R. Baxter
REFERENCE DATA:	
Analysis of:	Benzene, Toluene, Ethyl Benzene, Chlorobenzene, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobe
Identification No.:	466
Sample(s): 28	Analyses: 196
UBTL Laboratory No.:	SA-4223 through SA-4250,

ð

The above numbered samples were analyzed using a modification of EPA Test Method 602 for Purgeable Aromatics. A 1 gram sample of soil was diluted with 5 mL of organic free water and purged with helium. Any analytes present were collected on a 10 inch trap consisting of Tenax. The trap was heated to 180° C and the analytes were desorbed onto a $6' \times 1/8"$ stainless steel column packed with 5% SP-1200 and 1.75%Bentone-34. The gas chromatograph was operated with thermal programming, 50° C for 2 minutes, increasing at a rate of 4° C/minute to 110° C, and held there for 16 minutes. The analytes were selectively detected by a Photoionization detector equipped with a 10.2 eV ultraviolet lamp.

Camples SA-4226, 4233, and 4242 were analyzed in duplicate and samples SA-4225, 4241 and 4244 were analyzed neat and then reanalyzed with a spike consisting of benzene, toluene, ethyl benzene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene. The results of the duplicate and spike analyses are on the QC sheets.

The limit of detection for each analyte was 0.01 μ g/gram of soil. The results are tabulated on the following page(s).

Lessley.

A DIVISION OF THE UNIVERSTY OF UTAH RESEARCH INST Y JE BIOENGINEER NG CHEWISTRY RESEARCH DEVELOPMENT ANALYSIS

	B	D	В
ANALYT			
		Date _	1/10/84 M

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	UBTL	Number 466	
Corporate/Agency Name	Dames & Moore		
Address	5055 E. BROADWAY, SUIT	TE C214	
	TUCSON, AZ 85711		
Attention <u>Mr. Yogi Kunze</u>	·	Telephone	602 274-5548
Sampling Collection and Shipn	ent		

Sampling Site Nellis AFB _____ Date of Collection _____ Date Samples Received at UBTL November 12, 1983

Analysis

Method of Analysis <u>GC/PID Detectur</u> Date(s) of Analysis <u>Dec. 30</u> - Jun 5

Analytical Results

Field	UBTL		Results 119/gram
Sample Number	Lab Number	Sample Type	EPA 602
B1-S3	SA 4223	SOIL	all analytes less than 0.01
B1-S5	SA 4224		
B1-S12	SA 4225		
B1-S18	SA 4226		1, 11 1, 11 1.
B2-S2	SA 4227		11 y 11 h 11
B2-S6	SA 4228		Benzene - 0.015
B2-S10	SA 4229		all analyting these than C.C.I
B3-S1	SA 4230		
B3-S9	SA 4231		11 <i>(, , , , , , , , , , , , , , , , , , </i>
B4-S3	SA 4232		
B4-S7	SA 4233	:	1/ 1/ (/ // //
B4-S11	SA 4234	J	··· ·· ·· ·· ·· ··

Comments

R. Barty a Laboratory Supervisor

520 Wakara Way / Salt Lake City, Utah 84108 / 1-800-453-5653 ext. 8267

Page ____ of ___



Date 1/10/84 10L. UBTL Identification Number 466

Analytical Results

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					Results	ug/	cram
Field Sample Number	UBTL Lab Number	Sample Type			EPA 602		·
B5-S5	SA 4235	SOIL	all	anality	less	Han	0.01
85 - S10	SA 4236		11	J_,	11	11	•.
36-S4	SA 4237		()	,	/	20	
36-89	SA 4238			· · · · · · · · · · · · · · · · · · ·	//	<u>.</u>	
36-S14	SA 4239		/		<u> </u>	<i>4.</i>	
37-S1	SA 4240		',	/.			
87 - 85	SA 4241		· · · · · · · · · · · · · · · · · · ·	· · ·			
87-S10	SA 4242		11	,			·
B7-S15_	SA 4243		: /	, ·	1.	<u> </u>	·
38 - S3	SA 4244				i /	11	I
38-58	SA 4245		· · · · ·	/	1,		
<u>88-S13</u>	SA 4246		//	//		1/	· .
<u> 89–82</u>	SA 4247		17	11	·	1,	•
B9-S7	SA 4248		11		· · · · · · · · · · · · · · · · · · ·	· · ·	
B9-S12	SA 4249	· · · · · · · · · · · · · · · · · · ·		(,		· · .	
<u>89-S17</u>	SA 4250		1/	·····		1,	·.
limit	Plut	tetion	0.0	1 for el	rch as	ali	G
	/	<u> </u>				Ţ	
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Comments __

520 Wakara Way / Salt Lake City, Utah 84108 / 1-801-581-8267

	Roy		UTAH BIOMED Analyti Quality C	cal Labora	atory La Sheet							
Analyte Analyst	BEN: BAX				Instrument CHO							
Method	EPA C				Instrum Date An			1/5/84				
			Results	in <u>ng</u>	gram							
Duplicat	es/Splits No. 1	No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment				
1220	0	0			0	0	0					
1233	0	0			0	0	0					
1242	0	0			0	_0	0					
pikes ample #	Initial Conc.		Conc. Spiked		% Spike Recovered		l l	Comment				
4225	Ð		0.025		96.4							
741	0	<u> </u>	0.025		158.							
4244	6		0.025		115.							
In House	Audite											
C Samp.	No. 1	No. 2	4	Average	Range	Range/Ave	Target	Comment				
		<u> </u>		l		l	┨────┤					
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	r: <u> </u>	1					ection:_0	- •				
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		1	UTAH BIOMED Analyti Quality C	cal Labors	tory	Sequence 4: (A (1223-4750)						
Analyte	TOL	NENE		Matrix SOIL								
Analyst	Bax	TFE	Instrument CHO									
Method					Date Analyzed _12/31/83- 1/5/84							
	Results in mg/grum											
L <u>,licate</u> Sample #		No. 2	No. 3	No. 4	Average	Range	Range/Ave	Comment				
4226	0	0			0	0	0					
c 233	0	0			0	δ	0					
4242	0	0			0	0	0					
pikes ample #	Initial Conc.	ļ	Conc. Spiked		% Spike Recovered	<u> </u>	↓↓ ↓	Comment				
4225	0	<u> </u>	0.025		. 86.0							
4244 4244	0		0.025		127.							
n House A	Audits											
C Samp.	No. 1	No. 2		Average	Range	Range/Av	e Target	Comment				
hecked by	· PAN	1			14	mit of De	tection: (
				P	. \/	1/10 LOL						

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		ı	TAH BIQMEDI Analytic Quality Co	al Labora	Itory	ΙΥ	HHE/TA #: 466 Sequence #: 54 4223-4250				
Analyte	ETHYL	. BEN	NZENE MATTIX SOIL								
Analyst	BAXT	FR	InstrumentCH O								
Method	EPA G	02			Date Ar	alyzed	2/31/83-	1/5/84			
			Results	in mg/	grum						
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4233	0	0			0	0	0				
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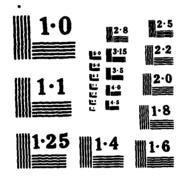
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4233	0	0			0	0	0		
4242	0	0			0	0	0		
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APPENDIX E

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REFERENCES

APPENDIX E

REFERENCES

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APPENDIX F

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BIOGRAPHIES OF KEY PERSONNEL

Curriculum Vitae

KENNETH J. STIMPFL

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Title	Partner
Expertise	Environmental Analysis Impact Assessment Site and Route Selection Aquatic Ecology
Experience With Firm	 Principal-in-Charge/Project Director Site selection and evaluation study for additions to existing fossil power plants, Michigan. Environmental assessment, permits and hearing for a new manufacturing plant in Michigan. Environmental baseline studies for a fossil-fueled power plant, Michigan. Environmental and geohydrological assessment of inactive industrial waste site, Michigan. Geohydrological assessment of chemically contaminated site, Michigan. Geohydrological assessment and defense in litigation for oil well development, Michigan. Environmental and engineering evaluation of manufacturing plant sites in lowa, Indiana, Missouri, Michigan, Wisconsin, and Ontario. Ecological assessment of potential chemical contamination in the Menominee River, Wisconsin. Environmental assessment, preliminary containment design, and negotiation of consent judgment with state and federal agencies for a contaminated chemical plant site, Michigan. Site selection study for a new fossil or nuclear power plant, Michigan. Preparation of a regulatory compliance plan for a proposed synfuels project. Illinois. Radiation survey, assessment, decontamination and health physics monitoring for NRC release of contaminated plant site, Michigan. Wetland assessment, development of alternative layouts and agency negotiations regarding a denied 404 permit for a dock in Wisconsin. Assessment of potential economic impacts form a proposed regulation to ban landfill disposal of chlorinated solvents for the Ullinois Department of Energy and Natural Resources. Assessment of aquatic impacts and effects on low-level hydroelectric potential for a variety of proposed dam modifications on the Fox River for the Chicago District, Corps of Engineers. Project Manager Aquatic ecology baseline study and impact assessment for nuclear power plant in Wisconsin, Wisconsin Electric Power Company.<!--</td-->

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	• Environmental baseline studies and impact assessment for copper/zinc mine in Wisconsin, Exxon Minerals Company.	'r :
	 Power plant site selection study. 	
Past	Sargent & Lundy Engineers, Chicago, Illinois	12
Experience	• Power plant site selection and evaluation studies in Illinois, Iowa Wisconsin, Indiana, and Oklahoma.	
	 Ecological baseline studies and impact assessments for thirteen fossil and nuclear power plants. 	•••
	• Impact assessment, route selection and evaluation of alternative designs for trans- mission line in West Virginia.	
	• Evaluation of alternate cooling systems for nuclear power plant.	-
	Faculty Appointment, Indiana University	
	Assistant Professor of Zoology, Colorado State University	
Academic	B.S., zoology, Northern Illinois University	¥
Background	M.S., zoology, Colorado State University Ph.D., limnology, Indiana University	÷
Professional Affiliations	Ecological Society of America; American Society of Limnology and Oceanography: Freshwater Biological Association; Societas Internationalis Limnologiae; illinois Asso- ciation of Environmental Professionals; Consulting Engineers Council of Illinois	•
Registration	Certified senior ecologist (Ecological Society of America)	

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Curriculum Vitae

GEORGE W. CONDRAT

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Title	Senior Engineer
Expertise	Ground Water Hydrology Engineering Geology Mining Engineering
Experience With Firm	 Project Manager/Principal Investigator Ground water contamination evaluations including detailed site investigations, baseline and operational monitoring, predictive modelling and control measures. Numerical modelling of ground water flow and chemical contaminant transport from liquid and solid waste disposal sites. Preparation of computer programs for management of ground water and geologic data including storage and retrieval, statistical evaluation, plotting and contouring. Principal investigator for report of state-of-the-art of uranium tailings disposal. Preparation of environmental impact assessments. Principal investigator for ground water portion of preliminary safety analysis report for proposed nuclear power plant in Maryland. Studies of deep shaft dewatering requirements for uranium mines. Siting, design and preparation of environmental assessments for mining, milling, tailings disposal, deep well injection, and heap and in-situ leaching projects in Wyoming, Colorado, Utah, and New Mexico. Site selection, investigation and design of earth and tailings dams. Engineering geology, soils and geologic hazards investigations. Regional and site specific geologic, seismologic and tectonic studies for dams, power plants and other critical facilities.
Past Experience	Senior Officer, Sverdrup & Parcel Officer, U.S. Army Corps of Engineers in the United States and Vietnam Assistant Geologist, Guggenheim Exploration Company
Academic Background	Professional Degree of Geological Engineer, Colorado School of Mines B.S., mining engineering, University of Utah M.S. candidate, mining engineering, University of Utah
Professional Affiliations	Association of Engineering Geologists; Society of Mining Engineers of AIME: National Water Well Association; Utah Geological Association
Registration	Professional engineer, Utah, Colorado and Wyoming

Dames & Moore

Publications

Coauthor, "Ground Water Contamination and Tailings Ponds" and "Depressurization of a Multilayered Artesian System for Water and Grout Control During Mine Shaft Development"

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Curriculum Vitae

LUTZ "YOGI" KUNZE

Title Associate

Expertise

ise Geotechnical/Civil Engineering Tailings and Earth Dam Design Soil and Foundation Engineering

Managing Principal-In-Charge, Tucson Office

• Responsible for marketing and performance of geotechnical projects.

Experience With Firm

ence Principal-in-Charge, Lexington Office irm • Responsible for marketing and performance of geotechnical

projects.

Senior Engineer, Chicago Office

• Management of large-scale multidiscipline projects both in the United States and overseas, including the University of Riyadh, Saudi Arabia project and the Semen Padang Cement Plant Expansion in Sumatra, Indonesia.

Project Engineer, Chicago Office

- Foundation investigations for U.S. Steel's Minntac mining facilities.
- Soil and foundation investigations for high rise buildings, industrial plants and power plants.

Staff Engineer, Los Angeles Office

- Soils and foundation investigations for numerous residential and office buildings, refineries and industrial plants.
- Foundation investigation for offshore oil drilling platforms in Santa Barbara Channel.
- Field explorations for various elements of Disney World near Orlando, Florida.

Past Experience

Manager of Geotechnical Engineering

 Responsible for the management and execution of design studies for tailings dams, waste dumps and sedimentation facilities in the Philippines, Dominican Republic, Mexico, and the United States.

Principal Engineer

 Management and direction of complex geotechnical projects, including nuclear power plant siting studies, tailings dams in Missouri, dam safety inspections for U.S. Army Corps of Engineers.

Dames & Moore

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Academic Background	M.S.E., Civil Engineering, Arizona State University, 1973 B.S.E., Civil Engineering, University of Connecticut, 1966 Short Course, Embankment Dams, University of Missouri, 1974
Professional Affiliations	American Society of Civil Engineers, National Society of Professionel Engineers, Arizona Society of Professional Engineers, Society of Mining Engineers of AIME, U.S. National Society of the I.S.S.M.&F.E.
Registration	Professional Engineer: Arizona, California, Illinois, Kentucky, Maine, Missouri, Ohio, Tennessee, Virginia, Washington, Nevada.
Publications	Coauthor, "Waste Disposal - Planning and Environmental Protection Aspects" to be published in the 1983 AIME Mudd Series Book on Surface Mining.

Curriculum Vitae

STEVEN B. JOHNSON

Title Staff Hydrologist

Expertise Ground Water Hydrology

Experience As an assistant and staff hydrologist, STEVEN B. JOHNSON has been With Firm responsible for the organization and analysis of ground and surface water data. As a principal investigator, he has conducted ground water contamination studies and operated in situ permeability apparatus. In addition, Mr. Johnson has contributed to the hydrologic analyses of siting, baseline, environmental, and final safety analysis reports for several large utilities. Some of his more pertinent experience is as follows:

- Hydrogeological investigation of industrial site, West Virginia.
- Ground water contamination study of industrial site, Michigan.
- In situ permeability study, Missouri.
- Fossil fuel power plant siting study, Wisconsin.
- Deep well sampling project, Wisconsin.
- Baseline ground water and surface water study for fossil fuel plant, Michigan.
- Baseline ground water study for nickel-zinc mine, Wisconsin.
- Nuclear final safety analysis report, ground water section, Kansas.
- Nuclear environmental report, ground water section, Kansas.
- Nuclear preliminary safety analysis report, geology section, Illinois.
- Ground water contamination study of industrial site, Ohio.
- Underground natural gas storage study, Illinois.
- Preparation of RCRA and Arizona hazardous waste permits.
- Site selection for fossil fuel power plant wastes, Wisconsin.
- Installation of ground water monitoring system for uranium tailings pond, Wyoming.
- Investigation of nitrate contamination of ground water, Oklahoma.
- Ground water investigation and RCRA compliance at refinery, New Mexico and Utah.
- Investigation of gasoline spill at service station, Utah.
- Investigation of seepage from fertilizer tailings pond, Utah.
- Conducted pumping tests at a proposed landfill site, Utah.

Dames & Moore

Academic Background

1975, B.A., Geology, Macalester College, St. Paul, Minnesota. 1977, M.S., Geology, Arizona State University, Tempe, Arizona. M.S. Thesis Topic: Delayed Yield in Unconfined Aquifers. <u>F</u>

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Curriculum Vitae

WILLIAM R. HIGHLAND

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Title	Project Engineer
Expertise	Ground Water Hydrology Solid Waste Disposal
Experience With Firm	 Project Manager/Principal Investigator Detailed seepage investigations for subgrade disposal of uranium mill wastes. Studies include mass transport modelling, detailed field and geochemical investigations and evaluation of synthetic and natural lining materials, Wyoming, New Mexico. State-of-the-art evaluation of ground water monitoring and liners for management of uranium mill wastes, for an international corporation. Investigation of ground water contamination and design of a cut-off/collector system for a major oil refinery. North Dakota. Mathematical modelling of ground water-surface water interactions for a proposed open-pit uranium mining reclamation plan, Wyoming Preliminary design of evaporation ponds and evaluation of seepage control methods for tailings disposal alternatives, uranium mill waste, Colorado.
Past Experience	 Hydrogeologist, Barr Engineering Company Design and evaluation of seepage control systems for mine waste disposal, water retention dams and fly ash disposal, Minnesota, Missouri. These projects included detailed investigations of the physical and chemical suitability of synthetic liners for seepage control. Application and development of analytical and finite difference models for dewatering, seepage through dams, and water well supply. Design of monitoring systems for evaluation of ground water contamination from sanitary landfills, mine waste disposal, fly ash disposal and a coal tar refining plant, Minnesota.
Academic Background	B.S., geology, University of Illinois M.S., hydrogeology, University of Minnesota Course work toward Ph.D., emphasis on mass transport in ground water, University of Illinois
Professional Affiliations	American Society of Civil Engineers; National Water Well Association: Utah Geological Association
Registration	Civil engineer, Minnesota

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Dames & Moore

Curriculum Vitae

JOHN G. DUDLEY

TITLE Hydrogeologist

EXPERTISE Ground Water and Vadose Zone Monitoring Contaminant Transport

EXPERIENCE WITH FIRM

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- Hydrogeologic investigation to characterize vadose zone contamination beneath crude oil separation sumps. Design of subsurface soil and water sampling and laboratory testing programs.
 - Subsurface investigation of water quality impacts, and contaminant migration from waste disposal facilities at a major defense installation.

Senior Hydrologist, HDR Sciences, Santa Barbara, CA

- Investigation of hydrologic impacts resulting from planned deployment of a major military defense system in large areas of Nevada and Utah.
- Investigation of surface water and ground water impacts resulting from planned stream diversions in small watersheds in Southern California.
- Assessment of hydrologic and water resources impacts associated with construction of oil and gas processing facilities and pipelines in California.

Geohydrologist, State of New Mexico, Santa Fe, New Mexico

- Design and implementation of large surface water/ground water investigation to evaluate water quality impacts attributable to uranium industry activities.
- Preparation and presentation of technical testimony at numerous public hearings held by Water Quality Control Commission to promulgate water quality regulations, or to evaluate the compliance of specific industrial and mining industry waste disposal plans.
- Numerous subsurface investigations to assess baseline hydrogeologic conditions, contaminant migration, ground water pollution, and remedial measures at industrial, hazardous waste and nuclear waste disposal sites.

Dames & Moore

PAST EXPERIENCE ACADEMIC BACKGROUND BACKGROUND M.S., Water Resources Management, University of Wisconsin, Madison, 1972. M.S., Geology, University of Wisconsin, Madison, 1973.

MEMBERSHIP Ground-water Technology Division, National Water Well Association.





Curriculum Vitae

HON-WOO T. (Thomas) LEE

Title

Past

Experience

Staff Engineer

Expertise

Geotechnical/Civil Engineering Mine Tailings Disposal Earth/Rock Dam Design

Experience with Firm Staff Engineer

- Design studies, stability analyses, and seepage analyses for several tailings dams, flood control levees, and earth dams in Arizona, California, and New Mexico.
- Engineering design for drilled caissons for highway bridge in Arizona.
- Remedial design for highway embankments in Arizona includes stability analyses, evaluation and design of internal reinforced earth structures such as Reinforced Earth, Welded Wire Wall, Tensar, and Cribwall.
- Conceptual design and cost estimate for on-site stabilization of inactive uranium tailings piles in Colorado.
- Site planning, pavement design and design drawing for waste management facility in Ohio.
- Stability analyses, seepage analyses, construction cost estimates, design drawings, and construction monitoring for an earthen dam and water supply reservoir in Arizona.
- Feasibility study, site selection, and cost estimate for mine leaching operation in New Mexico.
- Site investigation and sampling of hazardous waste contaminant for contamination studies in Arizona and Nevada.
- Supervision of field explorations including drilling and sampling of subsurface soils, installation of piezometer and in situ testing.
- Blast vibration monitoring.
- Construction inspection for earth dams, synthetic lining materials, earthfills and installation of caissons.

Geotechnical Engineer

- Construction inspection on various foundations and earthworks for natural gas and oil refinery plants in Texas and Saudi Arabia.
- Standard Laboratory Soil Testings.

Dames & Moore

Academic
BackgroundB.S. and M.S. in civil engineering (B.S. with honor), Texas A&M
University, College Station, Texas, 1978 and 1980, respectively.
U.S.G.S.-sponsored research on development of methods to prevent
blow-out in off-shore drilling.Professional
AffiliationsAmerican Society of Civil Engineers; Tau Beta Pi; Chi Epsilon
Civil Engineer, Arizona, 1983
RegistrationCountries
Worked InUnited States, Saudi Arabia

Language Proficiency Chinese

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APPENDIX G

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DAMES & MOORE HEALTH AND SAFETY PLAN

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DAMES & MOORE HEALTH AND SAFETY PLAN

Job Number: 01016-185-07 and 01016-179-22 Project Name and Site Location: Nellis Air Force Base, Nevada Project Manager: Lutz Kunze On-Site Safety Officer: Plan Preparer: Michael W. Ander Plan Reviewer: Kim Petschek Date of Preparation: October 12, 1983

Plan Approvals: 10/24 ITochek Kim Petschek Program Director-Industrial Hygiene and Safety 101 W Fisher Campbell, MPIC Peter <u>10/16/83</u> (date) und utz Kunze, Project Manager

I. PURPOSE

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The purpose of this Plan is to assign responsibilities, establish personnel protection standards, specify mandatory operating procedures, and provide for contingencies that may arise while operations are being conducted at the site.

II. APPLICABILITY

The provisions of the Plan are mandatory for all on-site Dames & Moore employees and subcontractors engaged in hazardous material management activities including but not limited to initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization.

III. RESPONSIBILITIES

A. Project Manager

The PM shall direct on-site investigation and operational efforts. At the site, the PM, assisted by the on-site Safety Officer, has the primary responsibility for:

1. Assuring that appropriate personnel protective equipment is available and properly utilized by all on-site personnel.

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- 2. Assuring that personnel are aware of the provisions of this plan, are instructed in the work practices necessary to ensure safety, and in planned procedures for dealing with emergencies.
- 3. Assuring that personnel are aware of the potential hazards associated with site operations (see Tables 1 and 2).
- 4. Monitoring the safety performance of all personnel to ensure that the required work practices are employed.
- 5. Correcting any work practices or conditions that may result in injury or exposure to hazardous substances.
- 6. Preparing any accident/incident reports (see attached Accident Report Form).
- 7. Assuring the completion of Plan Acceptance and Feedback forms attached herein.

B. Project Personnel

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Project personnel involved in on-site investigations and operations are responsible for:

- 1. Taking all reasonable precautions to prevent injury to themselves and to their fellow employees.
- 2. Implementing Project Health and Safety Plans, and reporting to the PM for action any deviations from the anticipated conditions described in the Plan.
- 3. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the PM.

IV. BACKGROUND

Based on preliminary site evaluations of the Nellis Air Force Base, there appear to be five (5) areas that may have generated some environmental contamination over the lifetime of the facility. Although suspected contaminants have been identified, none has been quantified. However, we anticipate that only relatively low levels of contaminants will be encountered in the proposed drilling and soil and water sampling.

Site No. 1, Main Base Landfill, has accepted solid waste since 1942. These wastes may have included paint, thinners, solvents such as methyl ethyl ketone (MEK) and trichloroethylene (TCE), and waste petroleum, oils, and lubricants (POL).

Site No. 17, STP Percolation Ponds, was operated from 1952 to 1972. Although some hazardous materials may have passed through this system, it appears that, except for heavy metals, there is little concern for field personnel to encounter hazardous materials.

Site No. 24, Fuel Tank Sludge Area, was used at various times from 1942 through 1976 for STP sludge and leaded fuel storage tank cleaning residue. Hazardous materials that may be encountered here include heavy metals and fuel residue.

Site No. 15, Storm Drain Gully, apparently has received unauthorized waste fuel and hydraulic fluid. The storm drain also carried shop wastes including paint strippers, solvents, and carbon removers.

Site No. 20, Existing Fire Training Area, has received as much as 10,000 gallons per month of waste POL since the early 1950s and prior to 1972. This was reduced to 300 gallons per month after 1972. Since the area is landfarmed, biological decomposition has significantly reduced potential contamination. Heavy metals may be the primary contaminants of concern.

A. Dames & Moore Activity

Dames & Moore will drill soil borings at Sites 15 and 20 and collect soil samples. Monitoring wells will be installed at Sites 1, 17, and 24 and water samples will be collected.

B. Suspected Hazards

Suspected hazards are presented above in as much detail as is currently available.

V. EMERGENCY CONTACTS AND PROCEDURES.

Should any situation or unplanned occurrence require outside or support services, the appropriate contact from the following list should be made:

Agency	Person to Contact		Telephone
Daw Project Manager	L. Kunze	(office) (home)	602-790-5813 602-299-5876
D&ivi Industrial Hygiene and Safety Director	K. Petschek	(office) (home)	914-761-6323 212-724-6414
Police			2311
Fire			117
Amoulance			2333
Hospital			2498/2343
Command Post			2446

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In the event that an emergency develops on site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- o Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on scene.
- o A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

The following emergency procedures should be followed:

- a. In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on scene, the entire field crew should immediately halt work and act according to the instructions provided by the Project Manager.
- b. The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team and reevaluation of the hazard and the level of protection required.
- c. In the event that an accident occurs, the PM is to complete an Accident Report Form for submittal to the MPIC of the office, with a copy to the Health and Safety Program Office. The MPIC should assure that followup action is taken to correct the situation that caused the accident.

VI. HAZARD CHARACTERISTICS, MONITORING METHODS, AND PROTECTION REQUIRED

Exposure Limits and Recognition Qualities

Information concerning exposure limits and recognition qualities of the contaminants that are suspected to be on site is presented in Table 1.

Symptoms of Overexposure, Potential Chronic Effects and First Aid Treatment

Symptoms of overexposure to the suspected contaminants, potential chronic effects of these substances, and first aid treatment information are presented in Table 2.

Monitoring Methods, Action Levels and Protective Measures

Methods for monitoring for suspected contaminants, action levels, and protective measures to be used for various contaminant concentration levels are presented in Table 3.

Protective Equipment Required for On-Site Activities

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The protective equipment required may vary, depending on the concentrations and dispersion of contaminants encountered during each phase of the work. Table 4 specifies protective equipment required for each on-site activity.

FORM #IHST-1

REVIEW RECEIPT

PROJECT HEALTH AND SAFETY PLAN

Instructions: This form is to be completed by each person to work on the site and returned to the Program Director-Industrial Hygiene and Safety.

Job No. 01016-185-07

Project: Nellis Air Force Base, Nevada

Rev. No. 0

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Date 10/12/83

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

Signed

<u>/0-16-83</u> Date

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TABLE 1

EXPOSURE LIMITS AND RECOGNITION QUALITIES

State	Liquid	Gas
Recognition Qualities Odor	Quality: sweet, sharp Hedonic tone: neutral to unpleasant [.]	Soft, solventy, etheral, chloroform-like
Color	Colorless	Colorless
Exposure Standard ^a IDLH ^b Level Color	3000 ppm	1000 ppm
	200 ppm	50 ppm
Compound	MEK	TCE

^aOSHA permissible exposure limit or ACGIH Threshold Limit Value.

bIDLH = immediately dangerous to life or health.

TABLE 2

SYMPTOMS OF OVEREXPOSURE, POTENTIAL CHRONIC EFFECTS AND FIRST AID TREATMENT

Potential	Chronic Effects	None specified as yet.	Suspected carcinogen, liver and kidney damage, cardiac arrhythmias.
Symptoms of Overexposure	Inhalation/Ingestion	Numbness of fingers and arms, nausea, headache, throat irri- tation, vomiting, dizziness, loss of coordination.	Drowsiness, dizziness, tremor, loss of coordination, mental confusion, vomiting, abdominal cramps.
Symptoms	Skin	Irritation, dermatitis	Irritation
	Eye	Irritation	Irritation
	Compound	MEK	TCE

General First Aid Treatment

Irrigate immediately Soap wash promptly Move to fresh air Get medical attention
Eye Skin Inhalation Ingestion

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TABLE 3

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HAZARD MONITORING METHOD, ACTION LEVELS, AND PROTECTIVE MEASURES

Hazard	Monitoring Method	Action Level	Protective Measures
Explosive	Explosimeter or	<10% LEL*	Continue working.
atmosphere	combustible gas meter	10 - 25% LEL	Continue working with continuous monitoring.
		>25% LEL	EVACUATE the area; EXPLOSION HAZARD.
Toxic atmosphere	HNU continuous recorder	Depends on species for which the HNU is calibrated.	See Table 1 for exposure standards.

*Lower Explosive Limit (LEL) for MEK = 1.8%; for TCE = 12.5%.

TABLE 4

PROTECTIVE EQUIPMENT

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Level	Protective Equipment	Criteria for Use
С	Half-face respirator with air-purifying cartridges for gas/dusts, organic vapors/dusts and mists	When drilling or sampling where dusts become airborne, when organic odors are noticeable, or when the HNU reads 5 or more units.
	Disposable coveralls	
	Rubber boots	
	Hard hat with splash shield or safety glasses/goggles	
	Nitrile gloves	
D	Rubber boots	During sampling activities other than those mentioned above
	Disposable coveralls (optional)	
	Nitrile gloves	
	Safety glasses or goggles	
	Hard hat	

ATTACHMENT 1

PROTECTIVE EQUIPMENT

I. INTRODUCTION

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When field investigation activities are conducted where atmospheric contamination is known or suspected to exist, where there is a potential for the generation of vapors or gases, or where direct contact with toxic substances may occur, equipment to protect personnel must be worn. Respirators are used to protect against inhalation and ingestion of atmospheric contaminants. Protective clothing is worn to protect against contact with and possible absorption of chemicals through the skin. In addition to protective clothing and respiratory protection, safe work practices must be followed. Good personal hygiene practice prevents ingestion of toxic materials.

Personnel equipment to be used has been divided into two categories commensurate with the degree of protection required, namely Levels C and D protection.

II. LEVELS OF PROTECTION

- A. Level C
 - 1. Personal Protective Equipment
 - o Air-purifying respirator (MSHA/NIOSH approved)
 - o Disposable chemical resistant coveralls
 - o Gloves, outer, working gloves
 - o Gloves, inner, chemical resistant
 - o Boots, steel toe and shank
 - o Hard hat (face shield)
 - o Rubber boots, outer, chemical resistant (disposable)
 - 2. Criteria for Selection
 - a. Air concentrations of identified substances are such that reduction to at or below the substance's exposure limit is necessary and the concentration is within the service limit of the cartridge.
 - b. Atmospheric contaminant concentrations do not exceed the Immediately Dangerous to Life or Health (IDHL) levels.
 - c. Contaminant exposure to unprotected areas (head and neck) are within skin exposure guidelines, or dermal hazards do not exist.
 - d. Job functions have been determined not to require a higher level of protection.

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B. Level D

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- 1. Personal Protective Equipment
 - o Coveralls
 - o Boots/shoes, safety or chemical resistant, steel toe and shank
 - o Boots, outer (chemical resistant disposables)
 - o Hard hat (face shield)
 - o Gloves

2. Criteria for Selection

- a. No indication of any atmospheric hazards.
- b. Work function precludes dusting, splashes, immersion, or potential for exposure to any chemicals.
- 3. Guidance on Selection Criteria
 - a. Level D protection is primarily a work uniform and should not be worn in any area where the potential for contamination exists.
 - b. In situations where respiratory protection is not necessary, but site activities are needed, chemical resistant garments — high quality or disposable — must be worn.

III. RESPIRATORY PROTECTION

The following procedures should be used for respiratory protection:

- A. Inspect all washers, diaphragms, and facepiece-to-face seal area for any tears, pinholes, deformation, or brittleness. Should any of these exist, use a different respirator.
- B. Place the respirator on the face, tighten and use both a positive and a negative pressure test, prior to entering the site, to assure a proper fit. Checking for proper fit involves the following:

1. Negative Pressure Test

Close off the inlet opening of the cartridge or the breathing tube by covering it with the palm of the hand or by replacing the tap seal. Gently inhale so that the facepiece collapses slightly, and hold the breath for 10 seconds. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is satisfactory.

2. Positive Pressure Test

Remove the exhalation valve cover. Close off the exhalation valve with the palm of the hand. Exhale gently so that a slight positive

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pressure is built up in the facepiece. If no outward leakage of air is detected at the periphery of the facepiece, the face fit is satisfactory. (Note: With certain devices, removal of the exhaust valve cover is very difficult, making the test almost impossible to perform.)

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ATTACHMENT 2

DAMES & MOORE STANDARD OPERATING PROCEDURES

WORK PRACTICES

- 1. Smoking, eating, drinking and chewing tobacco are prohibited in the contaminated or potentially contaminated area.
- 2. Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surface (i.e., ground, etc.).
- 3. All field crew members should make use of their senses (all senses) to alert them to potentially dangerous situations (i.e., presence of strong and irritating or nauseating odors).
- 4. Prevent, to the extent possible, spillages. In the event that a spillage occurs, contain liquid if possible.
- Prevent splashing of the contaminated materials. 5.
- 6. Field crew members shall be familiar with the physical characteristics of investigations, including:
 - wind direction ٥
 - accessibility to associates, equipment, vehicles 0
 - communication 0
 - o hot zone (areas of known or suspected contamination)
 - o site access

- nearest water sources
- 7. The number of personnel and equipment in the contaminated area should be minimized consistent with site operations.
- 8. All wastes generated during D&M and/or subcontractor activities on site should be disposed of as directed by the Field Activity Leader.

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Half-face Respirators

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Inspection Procedure

- Look for breaks or tears in the headband material. Also stretch to check the elasticity.
- 2. Make sure all headbands, fasteners and adjusters are in place and not bent.
- 3. Check the facepiece for dirt, cracks, tears or holes. The rubber should be flexible not stiff.
- Look at the shape of the facepiece for possible distortion that may occur if the respirator is not protected during storage.
- 5. Check the exhalation valve located near the chin between the cartridges by the following:.
 - unsnap the cover
 - lift the value and inspect the seat and value for cracks, tears, dirt and distortion.
 - replace the cover, it should spin freely.
- 6. Check both inhalation valves (inside the cartridges holders).
 Look for same signs as above.
- 7. Check the yoke for cracks.
- 8. Make sure the cartridge holders are clean. Make sure the gaskets are in place and the threads are not worn. Also look for cracks and other damage.
- 9. Check the cartridges for dents or other damage, especially in the threaded part.

Donning Procedure

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 Screw the cartridge into the holder hand tight so there is a good seal with the gasket in the bottom of the holder...but don't force it. If the cartridge won't go in easily back it out and try again. Ĺ

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Always use cartridges made by the same manufacturer who made the respirator.

- Place the facepiece over the bridge of your nose and swing the bottom in so that it rests against your chin.
- 3. Hold the respirator in place and fasten the top strap over the crown of your head.
- 4. Fit the respirator on your face and fasten the strap around your neck. Don't twist the straps. Use the metal slide to tighten or loosen the fit...but not too tight.

5. Test the fit by:

- lightly covering the exhalation valve with the palm of your hand. Exhale...if there is a leak, you will feel the air on your face.
- and
- covering the cartridges with the palms of your hands.
 Again don't press too hard. Inhale...the face piece should collapse against your face.
- If there is a leak with either test adjust the headbands or reposition the facepiece and test until no leakage is detected.

Sanitizing Procedures

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- 1. Remove all cartridges plus or seals not affixed to their seats.
- 2. Remove elastic headbands.
- 3. Remove exhalation cover.
 - Remove speaking diaphragm or speaking diaphragm-exhalation valve assembly.
 - 5. Remove inhalation valves.
 - 6. Wash facepiece and breathing tube in cleaner/sanitizer powder mixed with warm water, preferably at 120° to 140° F. Wash components separately from the facemask, as necessary. Remove heavy soil from surfaces with a hand brush.
 - 7. Remove all parts from the wash water and rinse twice in clean warm water.
 - 8. Air dry parts in a designated clean area.
 - 9. Wipe facepieces, valves, and seats with a damp lint-free cloth to remove any remaining soap or other foreign materials.

Environmental Samples

Environmental samples must be packaged and shipped according to the following procedure:

Packaging

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag, and seal bag.

2.

- Place sample in a fiberboard container or metal picnic cooler which has been lined with a large polyethylene bag.
- Pack with enough noncombustible, absorbent, cushioning material to minimize the possibility of the container breaking.

4. Seal large bag.

5. Seal or close outside container.

Environmental samples may also be packaged following the procedures outlined later for samples classified as "flammable liquids" or "flammable solids". Requirements for marking, labeling, and shipping papers do not apply.

Marking/Labeling

Sample containers must have a completed sample identification tag and the outside container must be marked "Environmental Sample". The appropriate side of the container must be marked "This End Up" and arrows should be drawn accordingly. No DOT marking and labeling is required.

Shipping Papers

No DOT shipping papers are required.

Transportation

There are no DOT restrictions on mode of transportation.

ACCIDENT REPORT FORM

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PLAN FEEDBACK FORM

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Problems with plan requirements:

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Unexpected situations encountered:

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Recommendations for future revisions:

PLEASE RETURN TO THE FIRMWIDE HEALTH AND SAFETY OFFICE-WP

SCOPE OF WORK

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APPENDIX H

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1.

INSTALLATION RESTORATION PROGRAM PHASE IIB FIELD EVALUATION NELLIS AFB, NEVADA

I. DESCRIPTION OF WORK

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The purposes of this task are to determine if environmental contamination has resulted from waste disposal practices at Nellis AFB, Nevada; to provide estimates of the magnitude and extent of contamination, should contamination be found; to identify potential environmental consequences of migrating pollutants; and to identify any additional investigations and their attendant costs necessary to identify the magnitude, extent, and direction of movement of discovered contaminants.

The presurvey report (IRP Phase IIA survey report) (mailed under separate cover) and Phase I IRP report (mailed under separate cover) incorporated background and description of the sites for this task. To accomplish the survey effort, the contractor shall take the following steps. (Ambient air monitoring of hazardous and/or toxic material for the protection of contractor and Air Force personnel shall be accomplished when necessary, especially during the drilling operations.)

- A. General
 - 1. Water sampling shall be accomplished only once at each location.
 - Sampling, maximum holding time, and preservation of samples shall strictly comply with the following references: (a) <u>Examination of</u> <u>Water and Wastewater</u>, 15th Ed., pp. 35-42 (1980); (b) ASTM, Part 31, pp. 72-82, Method D-3370 (1976); and (c) <u>Methods for</u> <u>Chemical Analysis of Waters and Wastes</u>, USEPA Manual 600/4-79-020, pp. xiii-xix (1979).
 - 3. Ground water monitoring wells installed during this effort shall be completed to a depth of 20 feet below the surface of the ground water table. Inspection of drill cuttings for soil characteristics shall be accomplished as the wells are installed.
 - 4. All wells shall be developed, water levels measured, and locations recorded on a project map and specific zone map. Ground water monitoring wells shall, as a minimum, comply with USEPA Publication 330/9-81-002, <u>NEIC Manual for Ground Water/Subsurface Investigations at Hazardous Waste Sites</u>, or State of Nevada requirements for monitoring well installation, whichever is more stringent. Only screw-type joints shall be used. No glue fittings are permitted.
 - 5. Boreholes shall be monitored for organic vapors with an HNU and explosimeter throughout drilling, and readings thus obtained shall become part of the boring logs.
- B. In addition to items delineated above, conduct the following specific actions at sites identified on Nellis AFB.

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- 1. Zone No. 1 (Sites 1, 17, and 24 the Base Landfill, STP Percolation Ponds, and Fuel Tank Storage Area)
 - a. The contractor shall construct three new water table monitor wells in such a manner as to locate a contaminant plume, if any. All wells shall be downgradient of the site and generally located as follows: one well downgradient to the southwest of the area near the southern base boundary; one well downgradient due south of the area along the southern base boundary; and one well downgradient southeast of the area along the southeastern base boundary. Estimated maximum well depths are 175 feet.
 - b. Each monitoring well shall be sampled. Samples shall be shipped to the contractor laboratory for analysis. Each sample shall be analyzed for oil and grease (by USEPA Method 413.2), lead, phenol, pesticides, nitrates, and (using GC techniques) volatile aromatics and volatile halocarbons.
 - c. Three base production wells one north, one northeast, and one southwest of the golf course — and the USGS monitoring well shall be sampled and analyzed for oil and grease (by USEPA Method 413.2), lead, phenol, pesticides, nitrates, and (using GC techniques) volatile aromatics and volatile halocarbons.
- 2. Zone No. 2 (Site 15 Storm Drain Gully)

- a. The contractor shall install five soil borings 20 feet deep in the area where the site is believed to be located. Representative samples of each 1-foot increment (a total of 20) shall be collected from each boring and shipped to the contractor laboratory. A maximum of four samples from each boring shall be selected for analysis. A maximum of 16 samples total shall be analyzed from this zone. Those samples not analyzed shall be frozen for possible future analyses. Samples shall be analyzed for oil and grease by USEPA Method 413.2 and for volatile aromatics and volatile hydrocarbons utilizing GC techniques.
- b. Water samples shall also be collected from two base production wells: one north and one northwest of the discharge outfall to Zone 2. The water samples shall be analyzed for oil and grease by USEPA Method 413.2 and for volatile aromatics and volatile hydrocarbons utilizing GC techniques.
- 3. Zone No. 3 (Site 20 Existing Fire Training Area)

The contractor shall install four soil borings 20 feet deep in the area where the site is believed to be located. Representative samples of each 1-foot increment (a total of 20) shall be collected

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from each boring and shipped to the contractor laboratory. A maximum of four samples from each boring shall be selected for analysis. A maximum of 12 soil samples total shall be analyzed from this zone. Those samples not analyzed shall be frozen for possible future analyses. Samples shall be analyzed for oil and grease by USEPA Method 413.2 and for volatile aromatics and volatile hydrocarbons utilizing GC techniques.

C. Well and Boring Installation and Cleanup

Upon completion of each boring, the borehole shall be pressure-grout backfilled with a bentonite-cement mixture. Each well head shall be completed with the installation of a lockable cap and the sanitary concrete pad and seal required by Nevaja regulations. The well and boring area shall be cleaned following the completion of each well and boring. Drill cuttings shall be removed and the general area cleaned. Disposal of drill cuttings is not the responsibility of the contractor. A total of nine borings and three wells shall be accomplished. The exact locations of borings and wells shall be determined in the field.

D. Data Review

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Results of sampling and analysis shall be tabulated and incorporated in the monthly R&D Status Report and forwarded to the USAF OEHL for review as soon as they become available as specified in Item VI below.

- E. Reporting
 - 1. Draft reports delineating all findings of the field investigations shall be prepared and forwarded to the USAF OEHL as specified in Item VI below for Air Force review and comment. The reports shall include a discussion of the regional hydrogeology, well logs of all projec⁻ "ells, data from water level surveys, boring logs from all project borings, soil test results and conclusions, water quality analysis results, and laboratory quality assurance information. The reports shall follow USAF OEHL supplied format (mailed under separate cover).
 - 2. Estimates shall be made of the magnitude, extent, and direction of movement of contaminants discovered. Potential environmental consequences of discovered contamination must be identified or estimated. Where data are insufficient to properly determine or estimate the magnitude and extent of movement of discovered contaminants, specific recommendations, fully justified, shall be made for additional efforts required to properly evaluate contamination migration.
 - 3. Specific requirements, if any, for additional soil borings or for future ground water monitoring must be identified.

F. Cost Estimates

The contractor shall provide cost estimates for all additional work recommended to permit proper determination of contaminants. The recommendations provided shall include all efforts required to determine the magnitude, extent, and direction of movement of discovered contaminants, along with an estimate of the time required to accomplish the proposed effort. This information shall be provided in a separately bound appendix to the draft final report. ٤.

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II. SITE LOCATION AND DATES

Nellis AFB NV USAF Hospital Nellis/SGPB Dates to be established

III. BASE SUPPORT: None

IV. GOVERNMENT FURNISHED PROPERTY: None

V. GOVERNMENT POINTS OF CONTACT

- 1.Dee Ann Sanders
USAF OEHL/ECQ2.2LT David Gibson
USAF OEHL/ECQBrooks AFB TX 78235
(512) 536-3305
AV 240-3305Brooks AFB TX 78235
(513) 536-3305
AV 240-3305Brooks AFB TX 78235
(513) 536-3305
AV 240-3305
- 3.Maj Nic Farinacci
USAF Hospital Nellis/SGPB
Nellis AFB NV 89191
(702) 643-33164.Col Jerry Dougherty
HQ TAC/SGPAE
Langley AFB VA 23665
(804) 764-2180
AV 432-2180
- VI. In addition to sequence numbers 1, 5, and 10 listed in Attachment 1 to the contract, which are applicable to all orders, the reference numbers below are applicable to this order. Also shown are data applicable to this order.

Sequence No. Block 10 Block 11 Block 12 Block 13 Block 14

4 ONE/R 84MAR15 84APR03 84JUN12

*Contractor shall supply the USAF OEHL with 20 copies of the draft report and 50 copies plus the original camera ready copy of the final report.

VII. The ceiling price of Items 0001 and 0002 of this order as contemplated by the "Payments" clause of the General Provisions is \$219,853.25.

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DESCRIPTION/SPECIFICATIONS REQUIRED SAMPLE_DETECTION LIMITS

	CONCENTRATION				
COMPOUND	WAT	WATER		SOIL	
Volatile Organic Compounds	٠	L	•		
Nitrates	0.1	mg/L			
Arsenic	10.	μg/L	0.1	ug/g	
Cadmium	50.	µg/L	0.5	µg/g	
Chromium	100.	μg/L	1.0	µg/g	
Copper	50.	µg/L	0.5	µg/g	
Lead	20.	µg/L	0.2	µg/g	
Mercury	1.	µg/L	0.01		
Nickel	100.	µg/L	1.0	µg/g	
Selenium	10.	µg/L	0.1	µg/g	
Silver	10.	µg/L	0.1	µg∕g	
Zine	50.	µg/L	0.5	µg/g	
Phenol	10.	µg/L			
Oil and Grease	0.3	mg/L	100.	µg/g	
Polychlorinated Biphenyls	0.25	μg/L	1.	µg/g	
Aldrin	0.02	µg/L	0.02	µg/g	
Dieldrin	0.02	µg/L	0.02	µg/g	
Chlordane		$\mu g/L$		µg/g	
DDT Isomers	0.02	µg/L		µg/g	
Endrin		µg/L		µg/g	
Endrin Aldehyde		µg/L		µg/g	
Heptachlor		µg/L		µg/g	
Lindane		µg/L		µg/g	

*Detection limits for volatile organic compounds shall be as specified for the compounds by USEPA Methods 601-602.

APPENDIX I

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WELL LOCATION AND ELEVATION SURVEY



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DEPARTMENT OF THE AIR FORCE

NELLIS AIR FORCE BASE NV 521-1

SGPB

Land Survey of Ground Water Sampling Points

JAN 2 5 1984

Mr. George Condrat Dames & Moore 250 E Broadway, Suite 200 Salt Lake City JT 841112480

Enclosed are two copies of the US Army Corps of Engineers section map (sheets 1-5) number 15-06-24, "Survey Ties", March 1951 (atch 1). These are provided to you at the request of Mr. Stimpfl. I have also enclosed (atch 2 and 3) a copy of the survey data and the scope of work requested of the surveyor (USAF).

If you have any questions, please call me at (702) 643-3316.

printice

NICK A. FARINACCI, Major, USAF, BSC Chief, Bioenvironmental Engineering Services 3 Atch

- 1. USACOE maps
- 2. 820 CES/DES Ltr, 18 Jan 84
- 3. Scope of Work

-Readiness is our Profession



DEPARTMENT OF THE AIR FORCE B20TH CIVIL ENGINEERING SO HA JAED HORSES NELLIS AIR FORCE BASE. NV 89191

JAN 18 HER

REP. - TO DES (MSgt Biehl, 4401) OF Water Well Survey SUBLECT

* Elevation of measuring point on the still stond of the from which water levels are measured.

70 SGPB

> 1. The following information is supplied as per your request (Letter dated 12 December 1983).

a. Ground Water Monitoring Wells:

Ground Water Monitoring Wells:				
WELL		HORZ CONTROL	VERTICAL CONTROL*	Gunt:
(1)	DM-1	N529,621.18 E656,743.17	1804.00	1801.
(2)	DM-2	N529,607.76 E658,261.31	1799.98	: 717.4
(3)	DM-3	N529,975.11 E659,441.55	1801.85	1 749

b. Base Water Production Wells:

WELL	HORZ CONTROL	VERTICAL CONTROL
(1) No. 6	N538,969.60 E654,678.38	1840.34
(2) No. 11	N534,938.33 E658,090.97	1820.07
(3) No. 12	N534,752.74 E660,477.66	1816.74
(4) No. 13	N532,516.81 E656,938.64	1814.40
(5) No. 14	N534,992.47 E654,107.75	1827 .91

NOTE: Grid coordinates were computed from field work and information taken from Army Corps of Engineers drawing 15-06-24 sheets 1-5 dated March 1951, and using transverse mercator projection State of Nevada East Zone Central Meridian 115°35' 00.000" N.A. Datum (1927).

2. Copies of field work and computations will be furnished to you after they have been transcribed from our field books and preliminary computations. If additional information is required by the contractor, 820th POC's are MSgt Biehl, SSgt Dupuis or MSgt Armijo.

JARY H. JUNNINGHAM, Lt Colonel, USAF C nation

1 Attachment Request For Survey

Readiness is our Profession

APPENDIX J

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GLOSSARY OF TERMS, ACRONYMS, ABBREVIATIONS, AND SYMBOLS

APPENDIX J

GLOSSARY OF TERMS, ACRONYMS, ABBREVIATIONS, AND SYMBOLS

AFB Air Force Base

alluvium Unconsolidated sediments deposited during comparatively recent geologic time by a stream or other body of running water.

alluvial fan Alluvial material deposited as a cone or fan at the base of a mountain slope.

aquifer A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring.

aquiclude A body of relatively impermeable rock that is capable of absorbing water slowly but functions as an upper or lower boundary of an aquifer and does not transmit ground water rapidly enough to supply a well or spring.

aquitard A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.

aromatic Designating cyclic organic compounds characterized by a high degree of stability in spite of their apparent unsaturated bonds and best exemplified by benzene and related structures, but also evident in other compounds.

artesian Ground water confined under hydrostatic pressure.

as N As weight of nitrogen

AVGAS Aviation gasoline

caliche An opaque, reddish brown to buff or white calcareous material of secondary accumulation (in place), commonly found in layers on, near, or within the surface of stony soils of arid and semiarid regions, but also occurring as a subsoil deposit in subhumid climates. The cementing material is essentially calcium carbonate, but may contain magnesium carbonate, silica, or gypsum.

cone of A depression in the potentiometric surface of a body of water that has the shape of an inverted cone and develops around a well from which water is being withdrawn.

conglomerate The consolidated equivalent of gravel, both in size range and in the essential roundness and sorting of its constituent particles.

DEQPPM Defense Environmental Quality Program Policy Memorandum

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DESEP	Civil Engineering/Environmental Planning
DOD	Department of Defense
downgradient	In the direction of decreasing hydraulic static head; the direction in which ground water flows.
effluent	A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment.
٥F	Degrees Fahrenheit
ft	Foot, feet
gpd/ft	Gallon(s) per day per foot
gpm	Gallon(s) per minute
HNU	A type of photoionization detector for measurement of organic vapors
hydraulic gradient	In an aquifer, the rate of change of pressure head per unit of distance of flow at a given point and in a given direction.
in.	Inch, inches
IRP	Installation Restoration Program
mg/g	Milligram(s) per gram
mg/L	Milligram(s) per liter
ml	Milliliter(s)
µg/g	Microgram(s) per gram
µg/L	Microgram(s) per liter
MOGAS	Motor gasoline
monitoring well	A well used to measure ground water levels and to obtain samples.
No.	Number
NPDES	National Pollutant Discharge Elimination System
OEHL	Occupational and Environmental Health Laboratory
рH	Negative logarithm of hydrogen in concentration; measurement of acids and bases.

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[J-2]

PCB Polychlorinated biphenyl; highly toxic to aquatic life; PCBs persist in the environment for long periods of time and are biologically accumulative.

PCBs Polychlorinated biphenyls

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PDWS Primary drinking water standard(s)

percolation Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

permeability The property or capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

phenols Any of various acidic compounds analogous to phenol and regarded as hydroxyl derivatives of aromatic hydrocarbons.

POL Petroleum, oil and lubricants

porosity The property of a rock, soil, or other material of containing interstices.

potentiometric An imaginary surface representing the static head of ground water surface and defined by the level to which water will rise in a well.

Precambrian Geologic time before the beginning of the Paleozoic; it is equivalent to about 90 percent of geologic time and ended approximately 570 million years ago.

PVC Polyvinyl chloride

QC Quality control

RCRA Resource Conservation and Recovery Act

RED HORSE Rapid Emergency Deployable Heavy Operational Repair Structural Engineering

specific The rate of discharge of a water well per unit of drawdown, capacity commonly expressed as gallons per minute per foot.

specific With reference to the movement of water in soil, a factor expressing **conductivity** the volume of transported water per unit of time in a given area.

STP Sewage treatment plant

TAC Tactical Air Command

TCE Trichloroethylene

[J-3]

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- TDS Total dissolved solids
- **Tertiary** The first period of the Cenozoic era, thought to have covered the span of time between 66 and 3 to 2 million years ago.
- TFWC Tactical Fighter Weapons Center
- TOC Total organic carbon

- TOX Total organic halogens
- transmissivity The rate at which water is transmitted through a unit width under a unit hydraulic gradient.
- USAF United States Air Force
- USEPA United States Environmental Protection Agency
- USGS United States Geological Survey
- wash A term applied in the western United States to the broad, shallow, gravelly or stony, normally dry bed of an intermittent stream, often situated at the bottom of a canyon; it is occasionally filled by a torrent of water.
- water table That surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

