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APPENDIX A

PRELIMINARY DESIGN REPORT

INDUSTRIAL POWER TECHNOLOGY

EVAPORATION IMPOUNDMENTS

PRELIMINARY DESIGN REPORT

GILA BEND POWER PARTNERS, L.L.C.

GILA BEND POWER PROJECT

PREPARED BY

INDUSTRIAL POWER TECHNOLOGY

NOVEMBER 6, 2000

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This document has been prepared under the supervision of and signed by:

R. C. Walther

Robert C. Walther P.E. CA-CS4283
President
Industrial Power Technology

TABLE OF CONTENTS

1.0 INTRODUCTION **1**

2.0 SITE DESCRIPTION **2**

3.0 FACILITY DESIGN **3**

3.1 BADCT REQUIREMENTS 3

3.2 GEOTECHNICAL INFORMATION 3

3.3 IMPOUNDMENT LAYOUT 3

3.4 IMPOUNDMENT SIZING 4

3.5 IMPOUNDMENT COMPOSITE LINER 5

3.6 LEAK COLLECTION AND REMOVAL SYSTEM 6

3.7 LEAK COLLECTION AND REMOVAL SYSTEM TESTING 6

3.8 STORM WATER DIVERSION AND EROSION PROTECTION 7

4.0 DRAWINGS **8**

5.0 CONSTRUCTION SPECIFICATIONS AND QUALITY ASSURANCE PLAN **9**

5.1 CONSTRUCTION SPECIFICATIONS 9

5.2 CONSTRUCTION QUALITY ASSURANCE PLAN 9

6.0 CONSTRUCTION COST ESTIMATE **10**

7.0 OPERATION AND MAINTENANCE **11**

7.1 IMPOUNDMENT INFLOW 11

7.2 EVAPORATION 12

7.3 SALTS REMOVAL 12

8.0 REFERENCES **13**

TABLE 1 .... **14**

TABLE OF CONTENTS (Continued)

LIST OF TABLES

1. Evaporation Impoundments, Example Inflow Condition

LIST OF FIGURES

1. Evaporation Impoundment Critical Depths
2. Local Floodplain Delineation
3. Stormwater Diversion

LIST OF DRAWINGS

1. Title Sheet
2. Site Plan
3. Impoundment Sections
4. Impoundment & Storm Water Pond Sections
5. Impoundment Sections & Details
6. Leak Collection and Removal System Inspection Sump Detail and Sections
7. Impoundment Details

LIST OF APPENDICES

A. Ninyo & Moore Geotechnical Report

B. Supporting Calculations

C. Construction Specifications

D. Construction Quality Assurance Plan

D-1. Qualifications of Parties

D-2. Property & Test Method Reference Tables

E. Cost Estimate Assumptions

1.0 INTRODUCTION

This report provides the design of the proposed evaporation impoundments at the Gila Bend Power Project (GBPP), which is being developed by Gila Bend Power Partners, LLC. The evaporation impoundments are a component of the planned power generating facility near the town of Gila Bend, Arizona. The impoundments are required to evaporate excess cooling tower water from the generating plant.

Industrial Power Technology has prepared a design for the evaporation impoundment facility for inclusion with the Aquifer Protection Permit (APP) application. The APP will be submitted to the Arizona Department of Environmental Quality (ADEQ) for permit approval. This report will be included as an appendix to the APP.

In order to expedite the permitting process, the design of the impoundment utilizes prescriptive design criteria established under Best Available Demonstrated Control Technology (BADCT) guidelines.

2.0 SITE DESCRIPTION

The evaporation impoundments are located on a site approximately 6 miles northwest of the town of Gila Bend and 1 mile south of the Gila River. As shown on Drawing 1, the evaporation impoundments are situated within Section 19 north and west of the plant site.

The existing ground at the site is generally unimproved desert with level areas intersected by ephemeral washes and drainage. One of the level areas on the western edge of Section 19 includes several abandoned structures. Vegetation on the site consists of scattered grass, brush and occasional trees.

The site is bounded to the north by Sisson Road and on the east by Citrus Valley Road, both paved roads. The impoundments will not be visible from either of the existing roads. The existing drainage washes will be channeled and/or diverted around the facility through the large wash on the eastern boundary of the plant site and through improvements in drainage across the entire property.

3.0 FACILITY DESIGN

3.1 BADCT REQUIREMENTS

It is the intent of this evaporation impoundment design to meet or exceed the prescriptive design criteria established under the BADCT guidelines for qualifying double-lined impoundments. The impoundment meets or exceeds the prescriptive BADCT requirements as follows:

- The liner system used for the impoundment would be a composite system, consisting of a 60-mil HDPE lower liner and an upper 80-mil HDPE liner separated by a leak detection layer. The lower liner will be placed on a 6-inch thick layer of low permeability material with a minimum permeability of 1×10^{-6} cm/sec. The design presented in this report suggests that the soil layer could be replaced with an equivalent geosynthetic clay liner (GCL).

- The leak detection layer shall be geonet with a minimum hydraulic conductivity of 1×10^{-2} cm/sec. The geonet is used instead of a 12-inch thick drainage layer of sand, gravel, or other material, which also achieves a hydraulic conductivity of at least 10 cm/sec. A demonstration of the adequacy of the geonet for conveying solutions to the sump is conducted by comparing the geonet performance to that of the 12-inch thick drainage layer. The leak collection and removal system will be operated to maintain a head over the bottom liner of 1 foot.

- Surface water control for the 100-year, 24-hour storm event would be in the form of a diversion of run-on from upstream watershed areas around the impoundments, and additional capacity in the impoundments to account for direct precipitation.

- Both liners will be secured in an engineered anchor trench at the impoundment berm crest.

3.2 GEOTECHNICAL INFORMATION

Geotechnical information for the site was obtained from 8 soil boring profiles. The borings were drilled as part of a preliminary geotechnical investigation, carried out by others. The boring locations are shown on Drawing No. 2 and the profiles are presented in Appendix A. Information from the profiles indicates that the site is covered by alluvial deposits in excess of 26 ft thick, the maximum depth explored. Groundwater was encountered in soil boring B2 at a depth of approximately 24 feet bgs.

3.3 IMPOUNDMENT LAYOUT

The evaporation impoundment consists of four approximately equal size, 20-acre ponds and one approximately 7-acre pond with a net combined area of approximately 87 acres. The boundaries of the evaporation impoundments have been set by the Section 19 property line on the west, the flowage easements across the north and east of the impoundments and by the plant site location on the south.

Two approximately 20-acre ponds will parallel the western edge of the southeast quarter of Section 19 with a property line setback to allow on-site access to the ponds and berms. Two approximately 20-acre ponds will be directly north and northwest of the plant site occupying the northeast quarter of the southwest quarter of Section 19.

The impoundments are designed to minimize berm elevations and will be surrounded by a security fence. The impoundment cross-section is shown on Drawing No. 3. Access ramps with 8 to l slopes were placed at each of the impoundments to accommodate excavation and hauling equipment into the ponds. The access roads and ramps are shown on Drawing Nos. 2 and 5.

3.4 IMPOUNDMENT SIZING

A water balance was developed in order to determine the critical depths in the evaporation impoundments. A detailed calculation of the water balance is provided in Appendix B. Additional discussion of the operation of the evaporation impoundments is provided in Section 7.0.

The water balance examined both average and wet climatic conditions, coupled with cooling tower inflow, to calculate the operating depths in the impoundments. Average climatic conditions were based on average precipitation and evaporation; wet climatic conditions were based on the wettest year on record for precipitation and minimum evaporation. Precipitation data for the site is based on the Gila Bend gaging station. Evaporation from the impoundments was adjusted to reflect the high TDS water intended for these impoundments. Evaporation data and any adjustments were developed from the following sources:

- Evaporation from open water surfaces (Cooley 1970)
- Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States (NOAA 1982)
- Evaporation Atlas for the Contiguous 48 United States (NOAA 1982)
- The Effect of Salinity on Evaporation (Harbeck 1955)
- Painted Rock Dam Pan Evaporation (U.S. Corp of Engineers 1990-2000)

The critical impoundment depths developed from the water balance are presented on Figure 1. The water balance assumes a 90-day inflow period from the cooling towers with flow rates that can be evaporated 240 days following the inflow period. This allows 30 days to remove salt deposits prior to reuse of the impoundment. The resulting salt deposit depth is calculated to approximately 1-ft.

Based on this operation method, the design depth of the impoundment above the overliner at the junction of the 3:1 and 0.5 percent slopes was estimated to be 7 ft. This depth provides for 2 ft of dry freeboard below the impoundment crest. The water balance for the average year climate conditions incorporates the inflow of the 100-year, 24-hour precipitation over the impoundment area and entire power generating plant. The critical depth design was 4.7 ft, based on the maximum impoundment depth resulting during the wet year climate condition.

3.5 IMPOUNDMENT COMPOSITE LINER

The impoundment composite liner consists of a primary 80-mil HDPE liner and a secondary 60-mil HDPE liner separated by a 0.2-in geonet as shown on Drawing Nos. 3, 5, and 7. The primary liner is covered by a 2-ft of soil overliner material and a 1-ft layer of free draining gravel as Shown on Drawing No. 3, 5, and 7. The gravel layer matches grade at the impoundment berms. The overall intent of the soil cover materials over the composite liner system is to facilitate the cleaning of the impoundments. An overall soil thickness of three (3) ft was deemed necessary in order to sufficiently protect the liner system from being damaged by vehicle traffic. The one-foot free draining gravel layer was incorporated in order to provide a stable base for vehicle traffic and prevent rutting that could occur with soil material.

The secondary liner will be placed on a 6-in layer bedding of 3/8-in minus material and a minimum permeability of 1×10^{-6} cm/sec. The bedding material must be compacted to 95 percent of the Standard Proctor density. A geo-synthetic clay liner (GCL) may be used for this low permeability layer if suitable material is not available on site or as costs dictate. The composite liner ties into anchor trenches located at the impoundment berm crests. A typical anchor trench detail is shown on Drawing No. 7.

Each impoundment has a minimum slope of 0.5 percent towards the impoundment midpoint as shown on Drawing No. 2. This slope was selected to minimize the volume of cut material required for construction as well as to meet the prescriptive BADCT requirements for hydraulic conductivity for the geonet. The geonet drains to a collection sump at the center of the impoundment. Details of the collection sump are shown on Drawing 7. A leak detection outlet, consisting of a 6-in diameter solid HDPE pipe, extends from the impoundment low point to an inspection sump at the impoundment berm.

3.6 LEAK COLLECTION AND REMOVAL SYSTEM

A leak collection and removal system (LCRS), consisting of a geonet placed between the primary and secondary HDPE liners and drain pipe system, will be used to collect any leakage through the primary liner. Details of the liner system are shown on Drawing No. 7. The solutions captured by the LCRS would flow within the geonet by gravity at a slope of approximately 3:1 (H:V) at the sides of the impoundment, and 0.5 percent at the bottom.

The solutions collected by the geonet would flow to the collection sump located at the center of the each impoundment. The collection sump is constructed between the primary and secondary liner, allowing for installation of 6-in diameter drainpipes (see Drawing No. 7). The collection pipes drain to an inspection sump located at the edge of the impoundment. A solution-level sensor would be placed within the inspection sump to prompt the need for sump evacuation. The solution within the sump would then be pumped out and returned to an adjacent impoundment. Due to the high TDS levels of the water contained in the impoundments, a pump cannot be submerged in water within the inspection sump. The pump must be lowered into the sump as needed. Details and sections for the inspection sump are included in Drawing No. 6.

Impoundment drainpipes are used to control solution levels and convey solutions from higher to lower elevation impoundments. Solutions can be conveyed from Impoundment No. 1 to Impoundment No. 2, Impoundment No. 2 to Impoundment No. 3, and Impoundment No. 3 to Impoundment No. 4. A single pipe connects the aforementioned impoundments. The impoundment drainpipes consist of 12-inch diameter HDPE pipe. Location and layout of the drainpipes are shown on Drawings No. 5 and 6.

The primary and secondary liners are welded to the pipe using a factory fabricated pipe boot, which maintains the integrity of the liner system. Butterfly control valves are used to control flow in the pipes.

3.7 LEAK COLLECTION AND REMOVAL SYSTEM TESTING

Upon completion of the installation of the primary 80-mil HDPE liner, secondary 60-mil HDPE liner and geonet separator and prior to the installation of the soil overliner material, the LCRS system will be tested for effectiveness. The test shall be conducted by injecting a specified quantity of a readily identifiable water-soluble liquid into a test port installed in the primary liner of each impoundment leading to the geonet liner area between the primary and secondary liner. The test will be deemed successful when the LCRS alarm is triggered and at least 75% of the injected liquid is collected in the LCRS sump. This test will be repeated for each impoundment and LCRS sump.

3.8 STORM WATER DIVERSION AND EROSION PROTECTION

Based on current site topography, storm water flow across the site will be diverted to existing drainages and will pose no erosion threat to the evaporation impoundments (Figure 3).

4.0 DRAWINGS

The engineering design information discussed in the previous sections is detailed on the 7 drawings presented in this report. The drawings are prepared based on preliminary engineering and design concepts. The drawings provide sufficient detail for review of the BADCT elements required under the APP.

The drawings are prepared using ACAD Version 14.0. These drawings are not considered nor intended to be detailed sufficiently for construction or recording. Although inclusive of formal borders and title blocks, the drawings submitted for this permit application are not suitable for construction or recording.

The 7 sheets of the drawing set represent the scope of work primarily consisting of the evaporation impoundments and any appurtenances. The drawing set will require revision as engineering and design progresses. In addition, the number of drawing sheets will likely increase to allow for more design details.

5.0 CONSTRUCTION SPECIFICATIONS AND QUALITY ASSURANCE PLAN

5.1 CONSTRUCTION SPECIFICATIONS

The Construction Specifications included in this engineering report being submitted with the permit application consist of the technical sections describing the materials and construction requirements for the project. These technical construction specifications are prepared generally following the Construction Specification Institute (CSI) format, typical for the industry. However, because the design is preliminary at this time and the purpose of the engineering report is primarily for permit application, several sections of the technical specifications may be omitted. The bidding documents and general conditions are also omitted at this time and are generally relevant only for purposes of final design for construction.

5.2 CONSTRUCTION QUALITY ASSURANCE PLAN

A Construction Quality Assurance (CQA) Plan has been prepared for inclusion to this engineering report and submission with the permit application (Appendix D). This CQA Plan provides instruction for a quality assurance and quality control (QA/QC) program during construction of this project to ensure conformance to the approved drawings and specifications. The CQA plan is usually carried out by a representative of the Owner to oversee construction activities conducted by contractors and installers. Of primary consideration, the clay and geosynthetic liner system will require continuous observation and QAIQC testing. The CQA Plan also provides the guidelines for defensible conformance testing and written field reports. The information gathered in the execution of this plan is summarized in a final written report.

6.0 CONSTRUCTION COST ESTIMATE

A conceptual-level cost estimate, with an approximate accuracy of ± 25 percent has been developed for the design presented in this report. However, due to confidentiality concerns, the estimate is provided under a separate cover. Some discussion of the cost estimate is provided in this section. Additional detail concerning the cost estimate is provided in the APP application. The assumptions used to develop the cost estimate are provided in Appendix E.

In general, the ± 25 percent approximate accuracy of the cost estimate is typical for the industry given the engineering and design performed to date is preliminary and is being submitted for permitting only, not detailed enough for construction. The cost estimate has many line items to assign costs to the various types of work. However, line items may be inadvertently omitted due to the lack of design detail. In addition, the estimating level of effort for the quantity take-off calculations and the development of unit pricing are commensurate with this level of design.

IPT has relied upon its internal estimating database developed from other projects with similar materials and scope to develop the unit pricing presented in the cost estimate for this project. Accompanying this cost estimate is a list of assumptions that were made regarding the scope or the construction method/approach that somehow impacts the cost of one or more line items (Appendix E).

7.0 OPERATION AND MAINTENANCE

The operation and maintenance (O&M) requirements for the evaporation impoundments have been developed to allow GBPP the greatest amount of flexibility in operation of the power generating plant. There are 3 components involved with operation and maintenance of this facility:

1) Inflow of excess cooling tower water;
2) Evaporation of water contained in the impoundments; and
3) Removal of salt deposits.

Each of these O&M steps is detailed in the following sections.

7.1 IMPOUNDMENT INFLOW

The evaporation impoundments are designed with a maximum operating level 2 ft below the impoundment crest. This design provides 2 ft of dry freeboard and 5 ft to 7.5 ft of operational depth, depending on the location within the impoundment. The inflow from the cooling towers must be managed to ensure the water level in the impoundments does not encroach on the dry freeboard. Impoundment Critical Depths are shown on Figure 1.

The inflow rate from the cooling towers will vary over the course of the year with peak flows during January, February, and March and reduced flows in the remaining months of the year. GBPP currently plans to operate the impoundments on a 90-day inflow cycle. With five impoundments, this leaves 270 days to evaporate and remove salt deposits before an impoundment must again accept inflow. Based on this cycle, an example of inflow based on average climatic conditions, is provided on Table 1. The weighted annual average flow is 725 gallons per minute (gpm).

The operation of the power generation plant is not necessarily restricted to flow rates, but controlled more by maintaining the dry freeboard. During drier than average climatic conditions, flow rates may be increased. During wetter than average climatic conditions, flow rates can be decreased or a process of transferring water between impoundments may allow higher inflow rates. Based on potential inflow rates and the draining capability between impoundments, it is recommended that Impoundment No. 1 is used for January to March, and then moving to Impoundment Nos. 2, 3, 4 and 5 consecutively, as shown on Table 1. The evaporation impoundments should be operated to minimize the volume of water that must be pumped back to Impoundment No. 1 from Impoundment No. 4, as this will only tend to reduce the allowable inflow and potentially cause a cycling affect.

7.2 EVAPORATION

The evaporation of the solution with the five impoundments is based on a one-year cycle. The impoundments are individually filled for 90 days and then allowed to evaporate for 240 days. The remaining 30 days of the one-year cycle will be used to remove the accumulated salt from the impoundments. The water balance used to develop the sizing of the impoundments is based on this operational cycle (see Appendix B). Therefore, from the time the impoundments are filled with solution to their operational depth there is a 270-day evaporation and removal time until they are ready for reuse. In the event that the water has not evaporated in the allotted 240-day period (due to wet year or higher operational inflow rates), drainpipes have been designed to decant additional solution into the adjacent impoundments.

7.3 SALTS REMOVAL

After the 240-day evaporation period, the salt accumulated will be removed from the evaporation impoundment. The calculated accumulation depth of salts is approximately 2 inches (see Appendix B). This accumulation of salt will be excavated using a rubber tire loader and subsequently placed in end-dump trucks in order to be hauled to a nearby landfill for proper disposal.

In order to facilitate the salt removal process, a site access road will be constructed to access at least one side of each impoundment. The access roads will serve as the truck access and provide access to each impoundment ramp to allow the loader equipment and trucks to access the impoundments and minimize the haul length for the loader.

8.0 REFERENCES

ADEQ 1998. Model

Expedited Aquifer Protection Permit for Qualifying Double Lined Impoundments. Technical Bulletin 98-6. Arizona Department of Environmental Quality. August 5, 1998.

Cooley, Keith 1970

Evaporation From Open Water Surfaces. University of Arizona. April l970.

Harbeck, Earl G. Jr.

The Effect of Salinity on Evaporation. Department of the Interior. 1955.

NOAA 1982.

Evaporation Atlas for the Contiguous 48 United States U.S. Department of Agriculture. June 1982.

Desert Research Institute, 2000

Climate Summaries for Gila Bend 1892 - 2000

U.S. Army Corp of Engineers 1990 – 2000.

Painted Rock Dam Pan Evaporation Rates.

TABLE 1

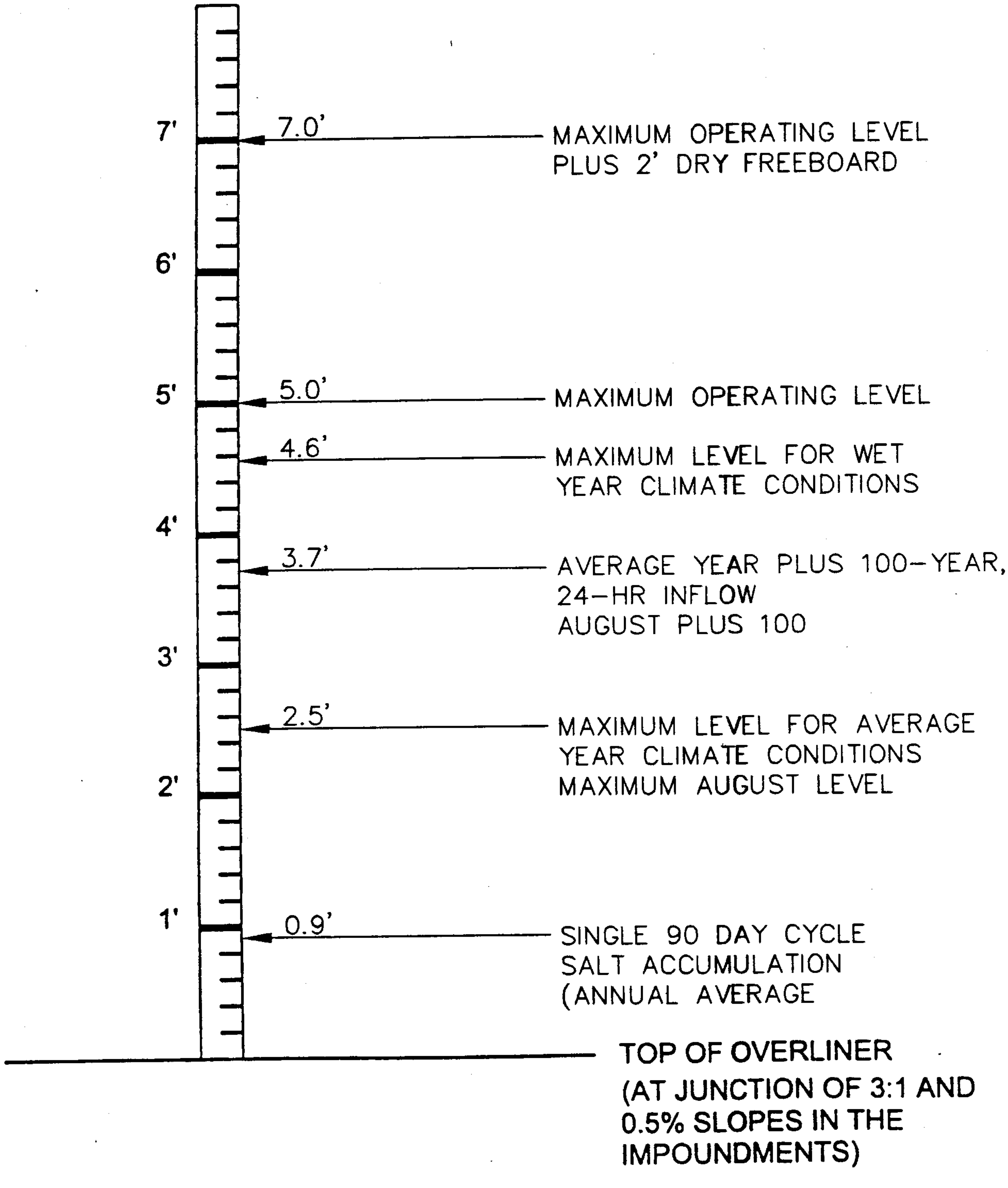
EVAPORATION IMPOUNDMENTS
EXAMPLE INFLOW CONDITIONS

Inflow Period	Inflow Rate to Impoundment (gpm) [1, 2] (Assumes Uniform Rate of Power Production)	Recommended Impoundment For Inflow
January, February & March	800	1
April, May & June	700	2
July, August & September,	650	3
October, November & December	750	4
Maintenance & Emergency	[4]	5
Weighted Average Flow [3]	**725**	

Notes:

1. Inflow values are estimated using a water balance based on average power production and climatic conditions and the evaporation area typical for impoundments 1 through 4.
2. The example inflow rates are based on the assumption that the water contained in the impoundments will naturally evaporate in 240 days after inflow stops, leaving I month to remove salt deposits.
3. The flow rates presented in this table do not suggest any daily maximum or minimum flow restrictions. During drier than average climatic conditions, flow rates may be increased. During wetter than average climatic conditions, flow rates can be decreased or a process of transferring water between ponds may allow higher inflow rates. Aeration and other evaporation enhancements may be employed on a seasonal basis.
4. Impoundment pond 5, with an area of approximately 7 acres, will be utilized to facilitate cleaning schedules or, in any circumstance which would preclude flowing wastewater to any other impoundment.

FIGURES



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Consultants

OSHPD No.

No.	Revisions	Date

GILA BEND
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EVAPORATION IMPOUNDMENT
CRITICAL DEPTHS

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DESIGN DRAWN ENG.

Job Number: 147100
Date: 8/1/00

Sheet Number

Fig. 1

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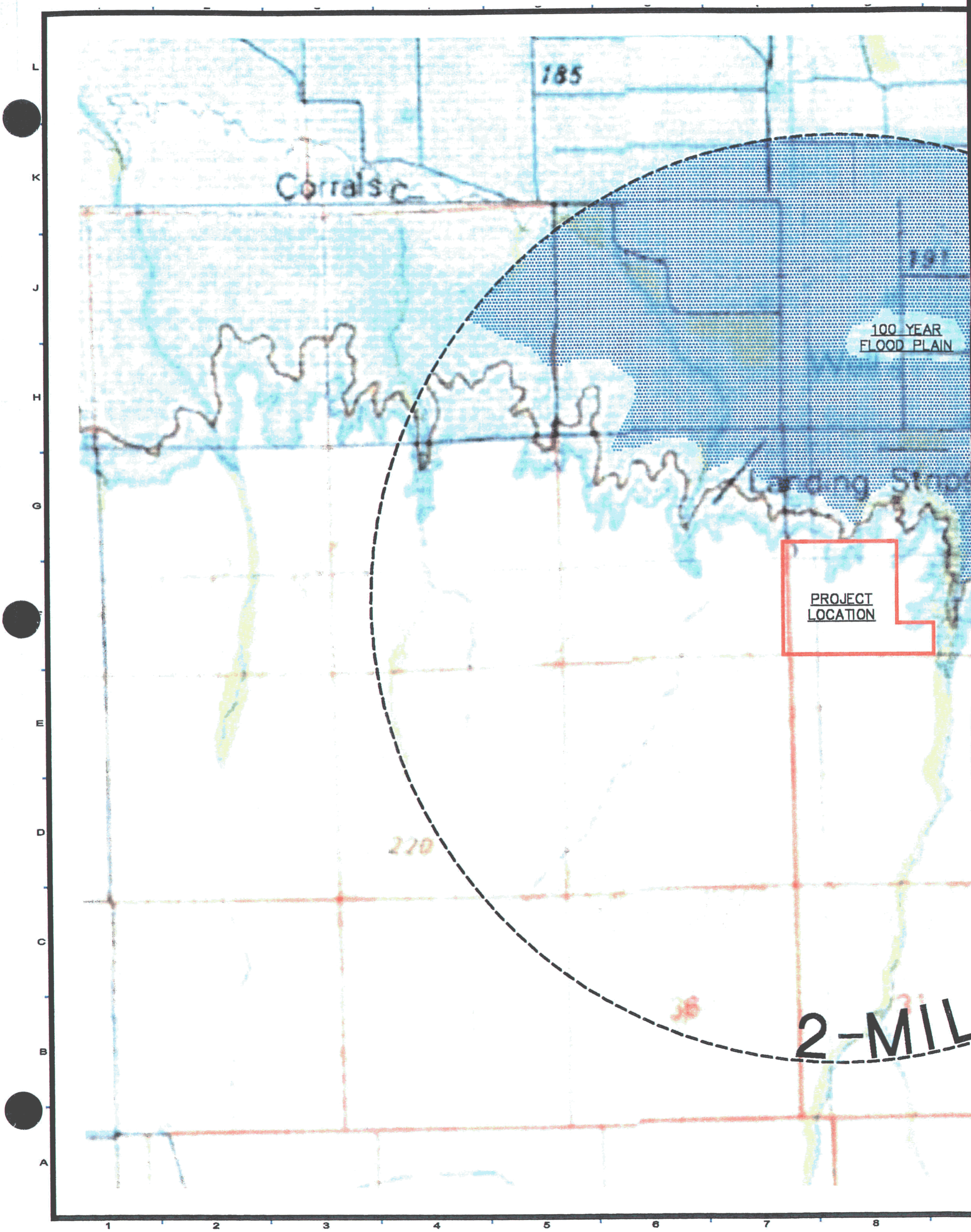
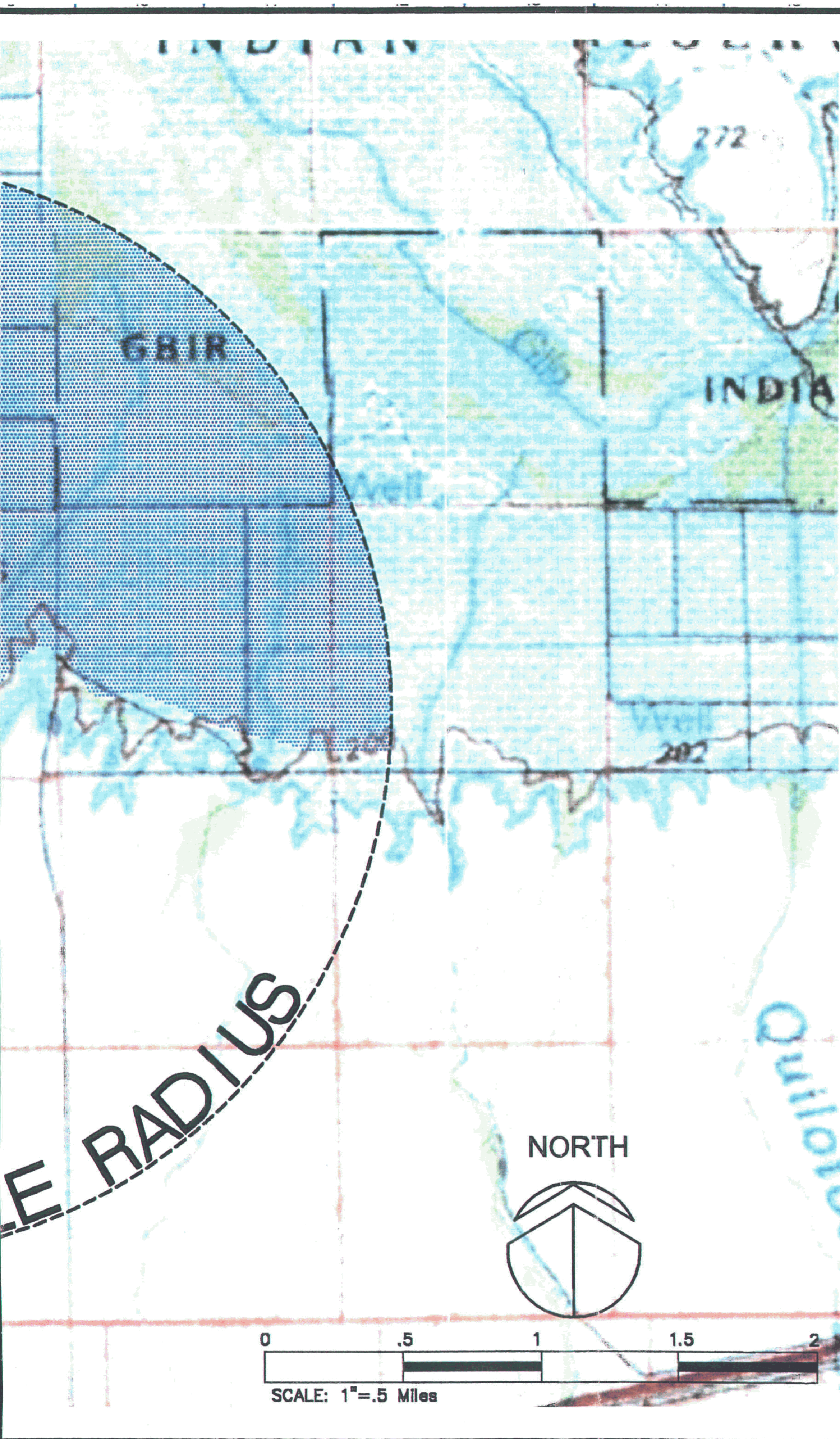

185
Corrals C
191
100 YEAR FLOOD PLAIN
Landing Strip
PROJECT LOCATION
220
2-MIL
L
K
J
H
G
E
D
C
B
A
1
2
3
4
5
6
7
8



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LOCAL FLOODPLAIN DELINEATION
Figure 2

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147100	10/3/00

Sheet Number

Fig. 2

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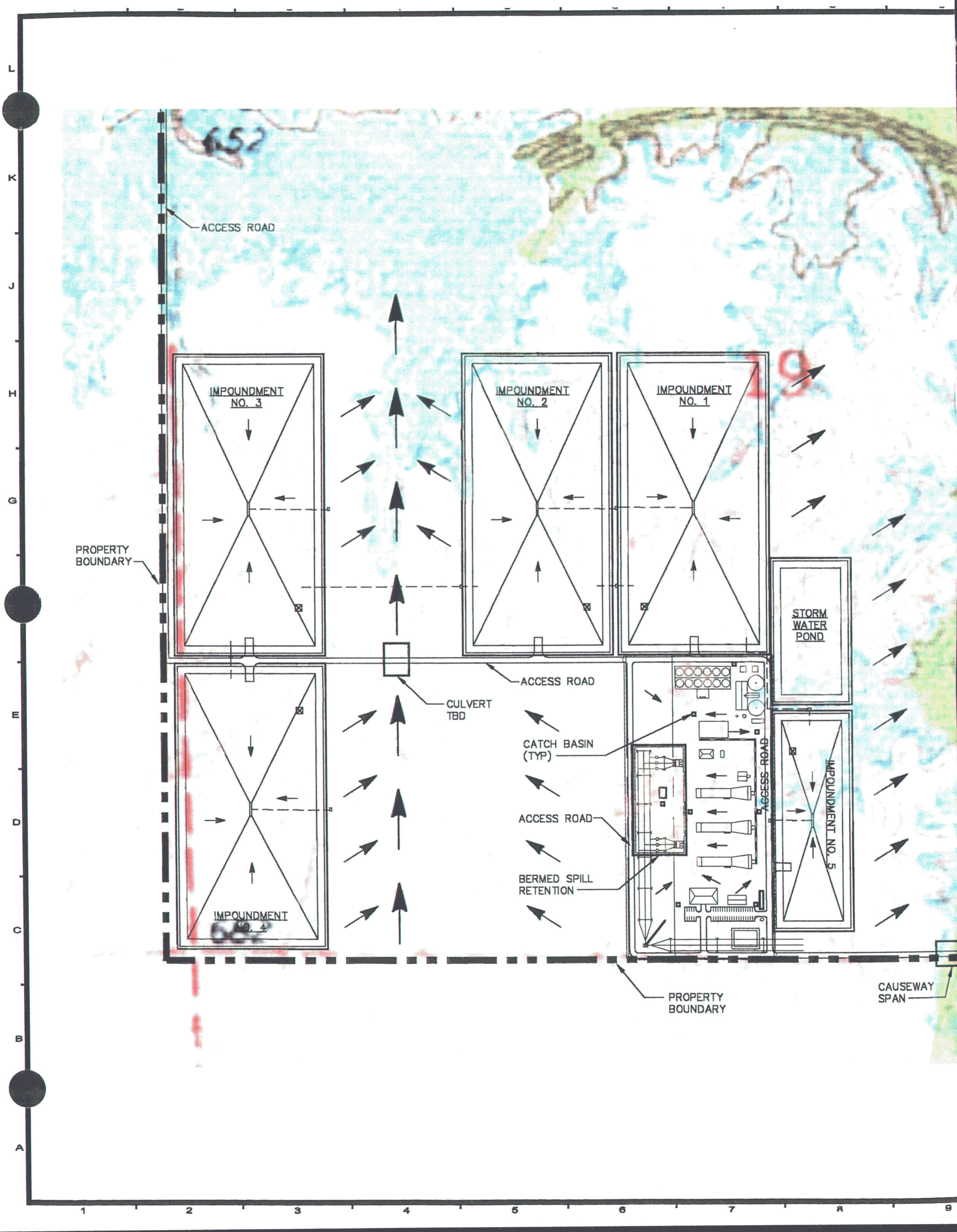
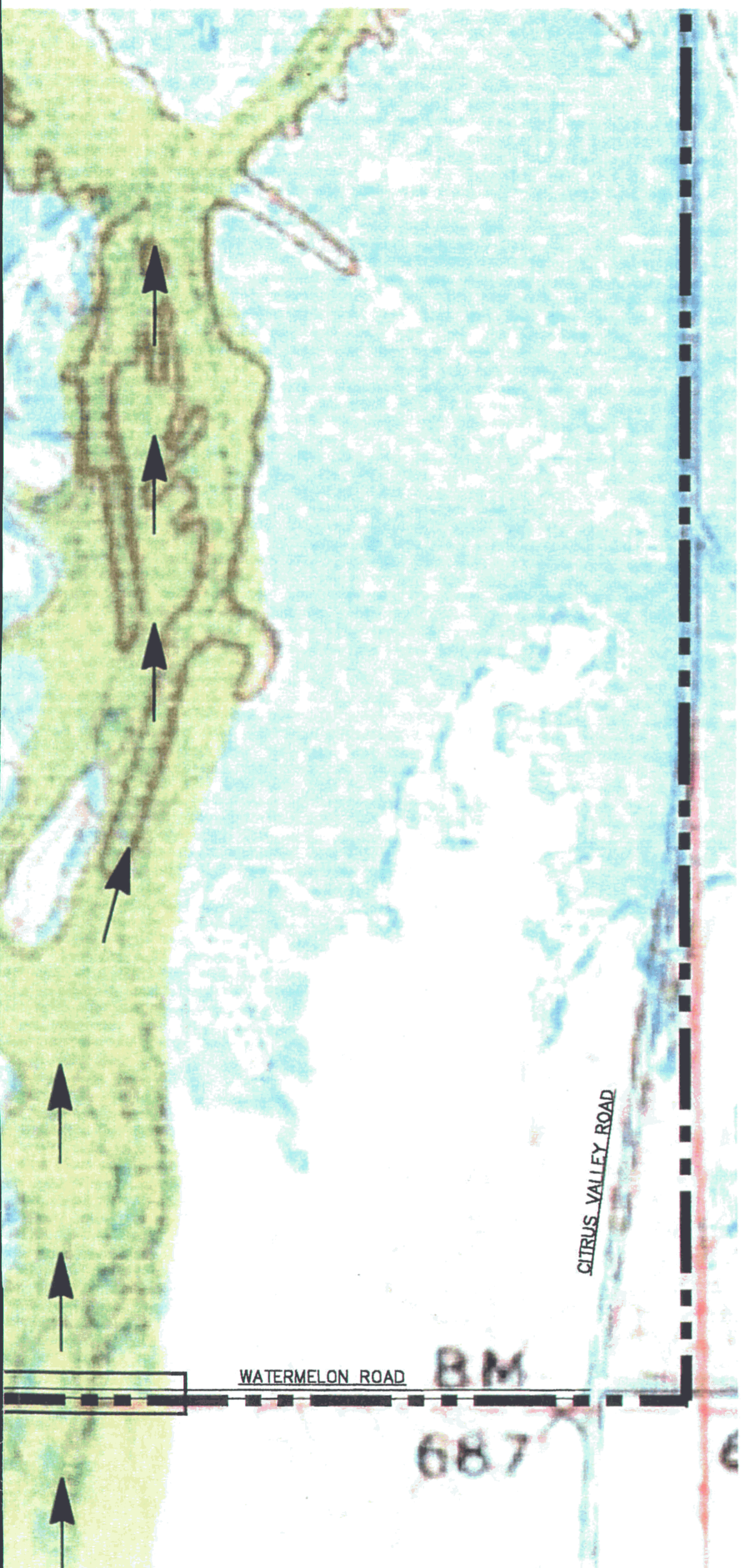


652
ACCESS ROAD
IMPOUNDMENT NO. 3
IMPOUNDMENT NO. 2
IMPOUNDMENT NO. 1
PROPERTY BOUNDARY
STORM WATER POND
ACCESS ROAD
CULVERT TBD
CATCH BASIN (TYP)
ACCESS ROAD
ACCESS ROAD
IMPOUNDMENT NO. 5
BERMED SPILL RETENTION
IMPOUNDMENT NO. 4
PROPERTY BOUNDARY
CAUSEWAY SPAN



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STORM WATER DIVERSION PLAN

DESIGN DRAWN ENG.

Job Number: 147100

Date: 10/27/00

Sheet Number

Fig. 3

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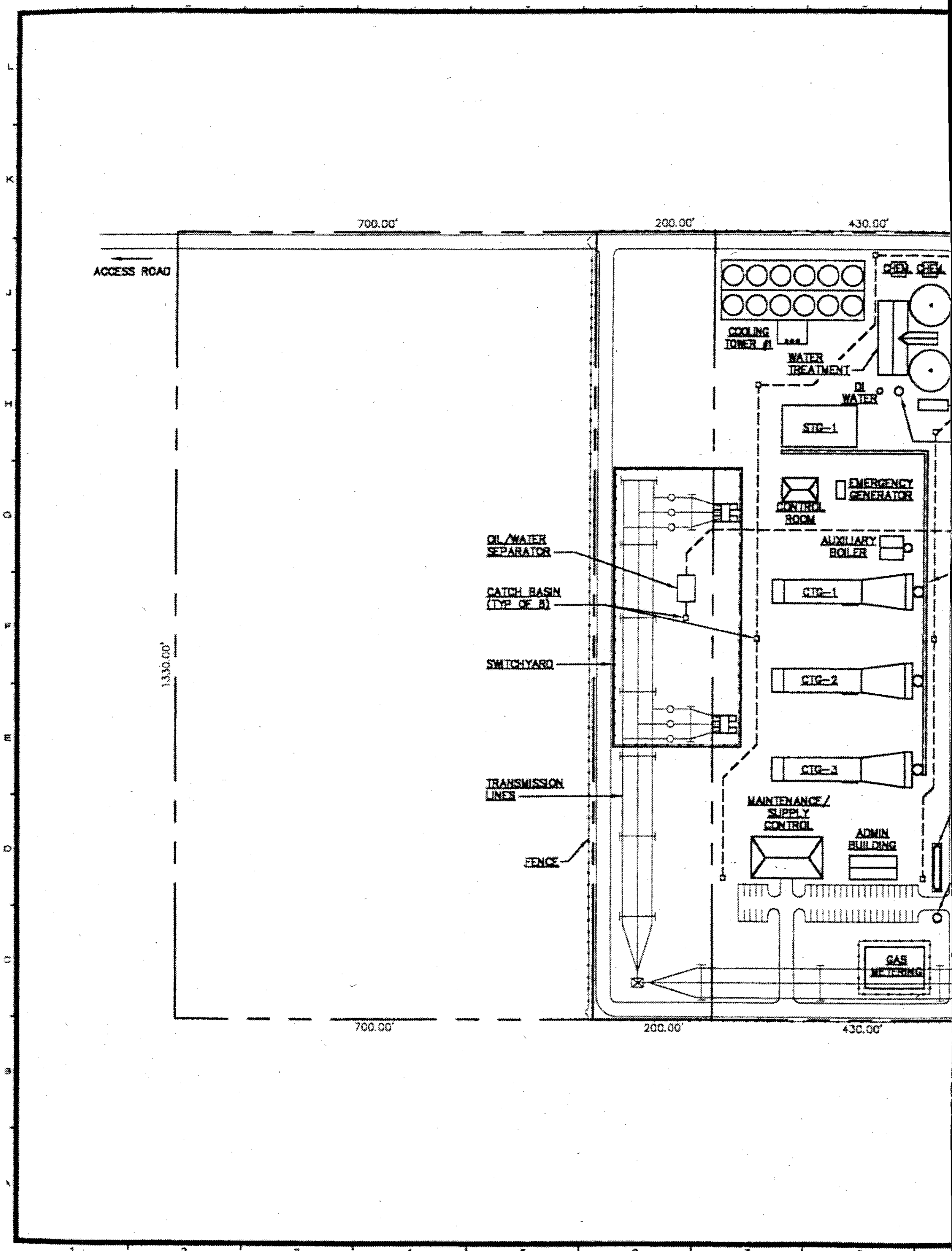
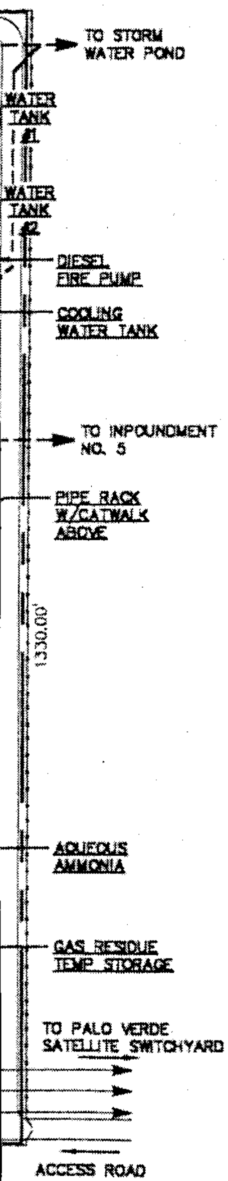
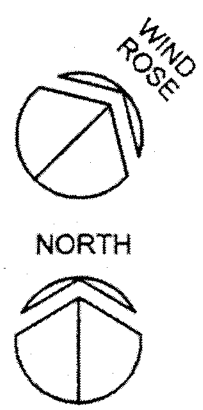
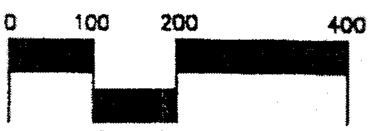


700.00'
200.00'
430.00'
ACCESS ROAD
COOLING TOWER #1
CHEM CHEM
WATER TREATMENT
DI WATER
STG-1
EMERGENCY GENERATOR
CONTROL ROOM
AUXILIARY BOILER
OIL/WATER SEPARATOR
CATCH BASIN (TYP OF 8)
SWITCHYARD
1330.00'
CTG-1
CTG-2
CTG-3
TRANSMISSION LINES
MAINTENANCE/ SUPPLY CONTROL
ADMIN BUILDING
FENCE
GAS METERING
700.00'
200.00'
430.00'



COOLING TOWER:	240'x100'x50'
CTG 1-3:	250'x60'x55'
CTG STACK:	18' DIA.x165'
AUX. BOILER BLDG.:	40'x40'x20'
AUX. BOILER STACK:	45'x31"
WATER TANK:	70' DIA.x40'
WATER TREATMENT BLDG.:	125'x50'x20'
CONTROLS ROOM:	40'x60'x20'
STG 1:	125'x70'x30'
MAINT./SUPPLY CONTROL:	120'x60'x30'
ADMIN. BLDG.:	80'x40'x25'
COOLING WATER TANK:	15' DIA.x15'
DI WATER TANK:	10' DIA.x10'
AQUEOUS AMMONIA TANK:	10' DIA.x75'
GAS RESIDUE TEMPORARY STORAGE:	15' DIA.x15'





SCALE: 1"=200'-0"

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GILA BEND POWER PROJECT

ENLARGED STORM WATER DIVERSION PLAN

DESIGN DRAWN ENGR.

Job Number: 147100 | Date: 11/1/00

Sheet Number

Fig. 3a

1 of 1 sheets

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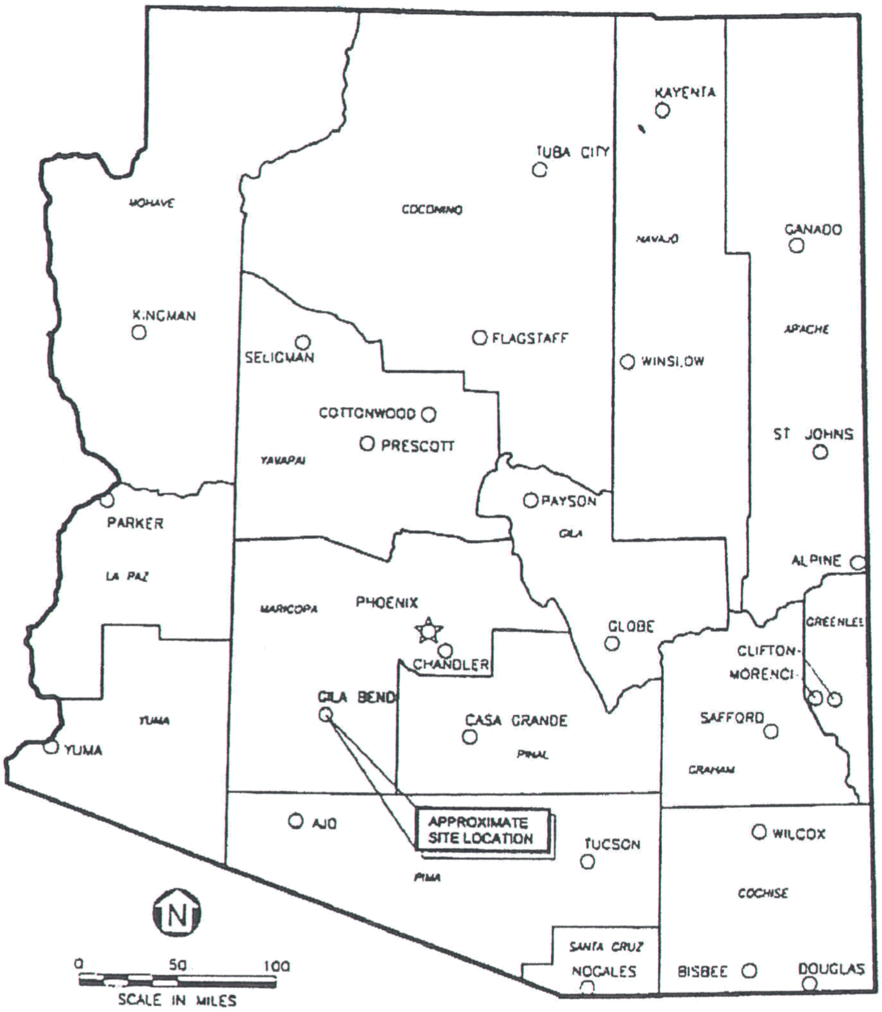
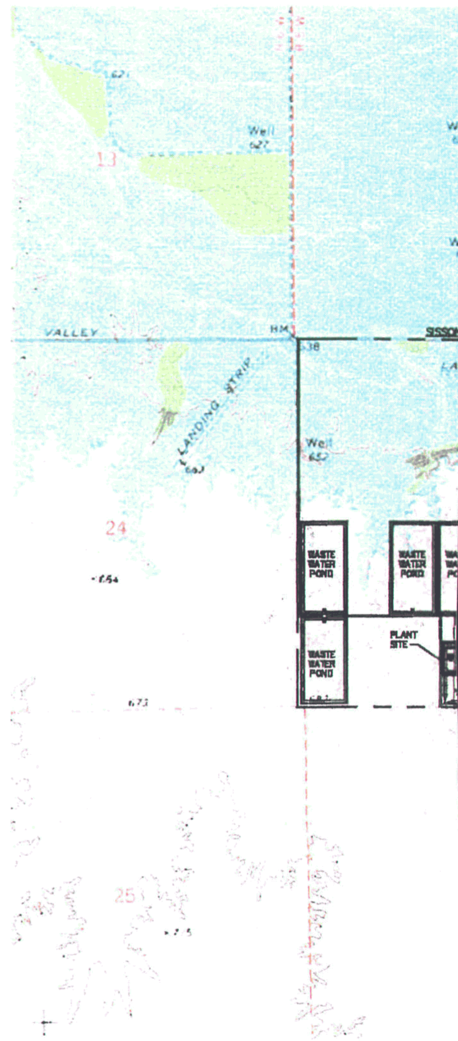


LOCATION MAP

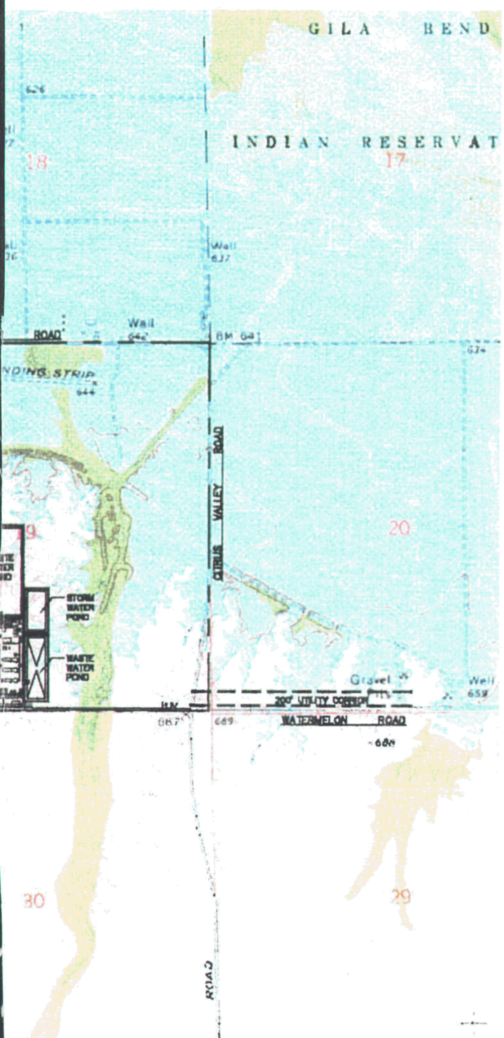


VICIN

DESIGN DRAWING

GILA BEND POWER PA
GILA BEND POWER
EVAPORATION IMPO

GILA BEND, ARIZO



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DRAWING INDEX

SHEET NO.	TITLE
1	TITLE SHEET
2	SITE PLAN
3	IMPOUNDMENT SECTIONS
4	IMPOUNDMENT AND STORM WATER POND SECTIONS
5	IMPOUNDMENT SECTIONS AND DETAILS
6	LEAK COLLECTION AND REMOVAL SYSTEM INSPECTION SUMP DETAIL AND SECTIONS
7	IMPOUND DETAILS

PRELIMINARY
NOT FOR CONSTRUCTION

INDUSTRIAL POWER TECHNOLOGY
2227 CAPRICORN WAY SUITE 101
SANTA ROSA, CALIFORNIA 95407
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GILA BEND
POWER PROJECT

TITLE SHEET

DESIGN DRAWN ENG.

Job Number: 147100
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Sheet Number
1
1 of 7 sheets

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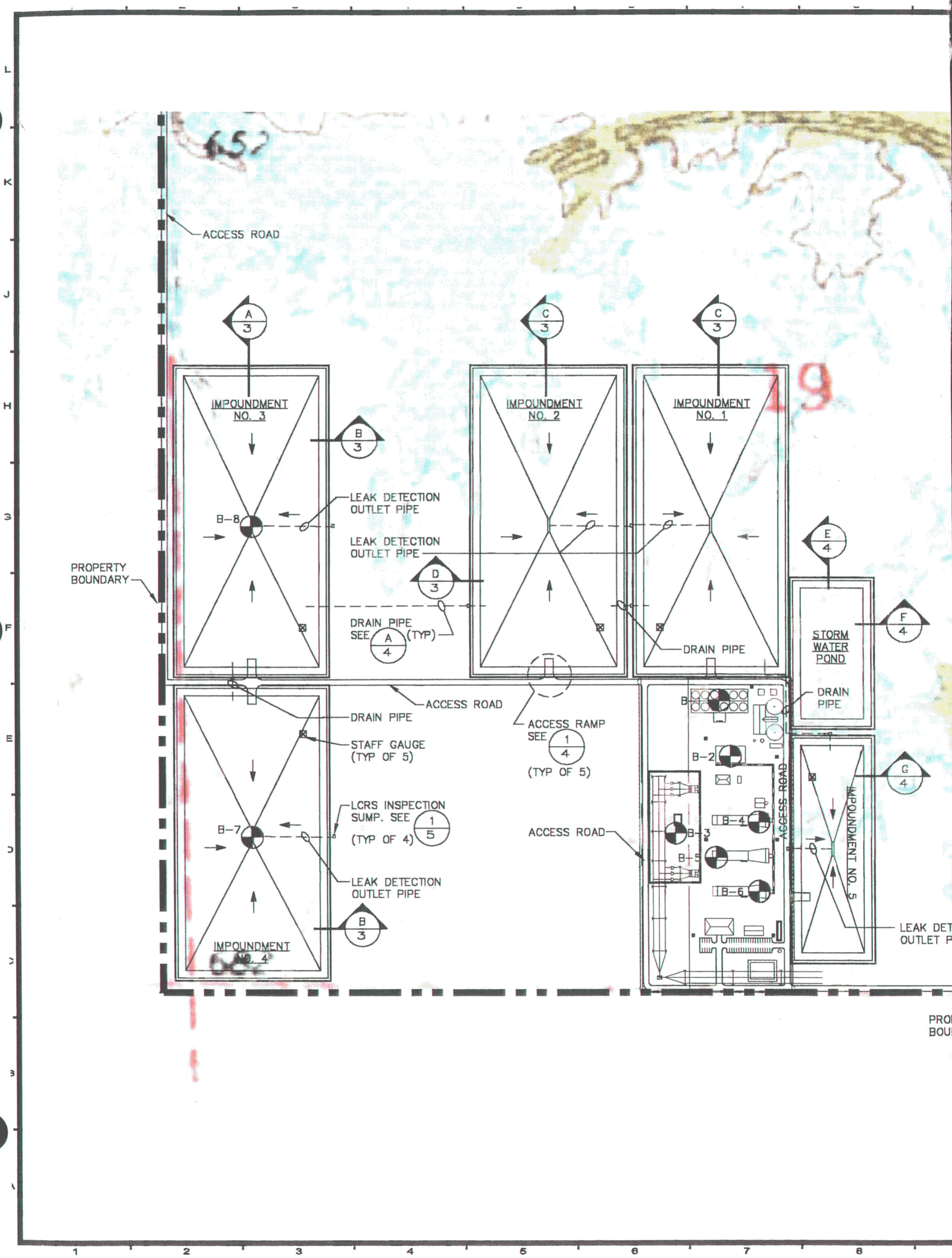
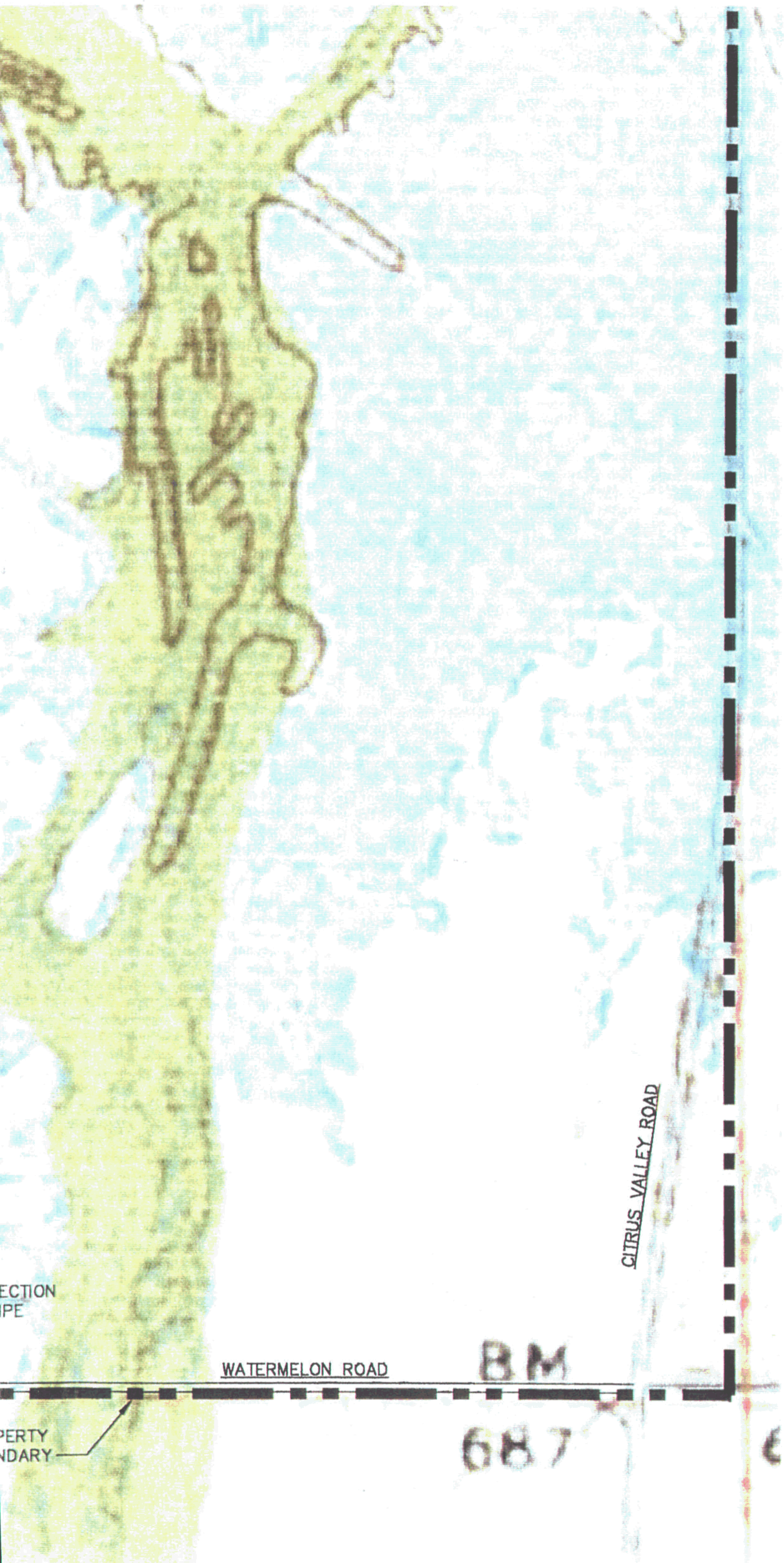


ACCESS ROAD
A 3
C 3
C 3
IMPOUNDMENT NO. 3
IMPOUNDMENT NO. 2
IMPOUNDMENT NO. 1
B 3
LEAK DETECTION OUTLET PIPE
B-8
LEAK DETECTION OUTLET PIPE
E 4
PROPERTY BOUNDARY
D 3
DRAIN PIPE SEE A 4 (TYP)
DRAIN PIPE
F 4
STORM WATER POND
DRAIN PIPE
ACCESS ROAD
DRAIN PIPE
ACCESS RAMP SEE 1 4 (TYP OF 5)
STAFF GAUGE (TYP OF 5)
B-2
G 4
LCRS INSPECTION SUMP. SEE 1 5 (TYP OF 4)
B-7
ACCESS ROAD
ACCESS ROAD
B-3
B-4
B-5
B-6
IMPOUNDMENT NO. 5
LEAK DETECTION OUTLET PIPE
LEAK DET OUTLET P
B 3
IMPOUNDMENT NO. 4
PRO BOU
19
652



BORING DEPTHS

B-1	20.1'
B-2	24.0'
B-3	19.1'
B-4	18.0'
B-5	20.4'
B-6	20.5'
B-7	20.4'
B-8	20.4'

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SITE PLAN

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Sheet Number
2
2 of 7 sheets

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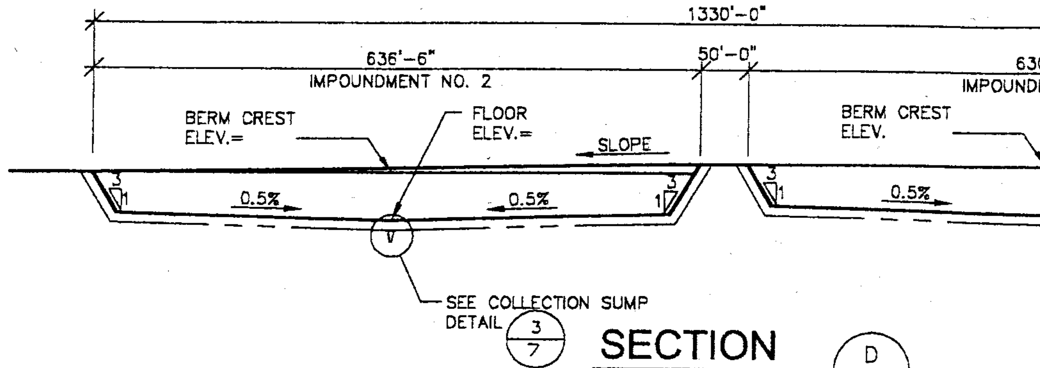

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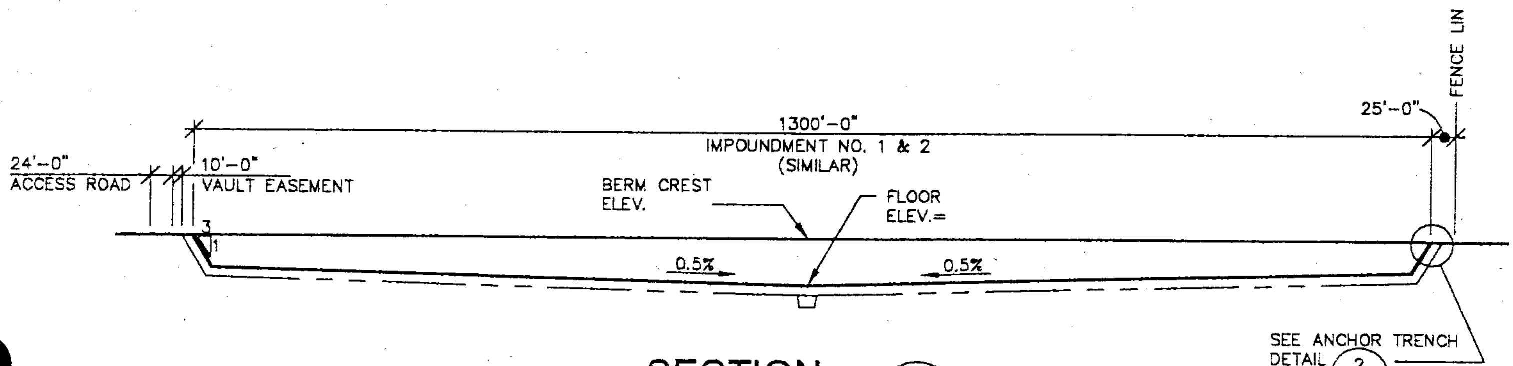

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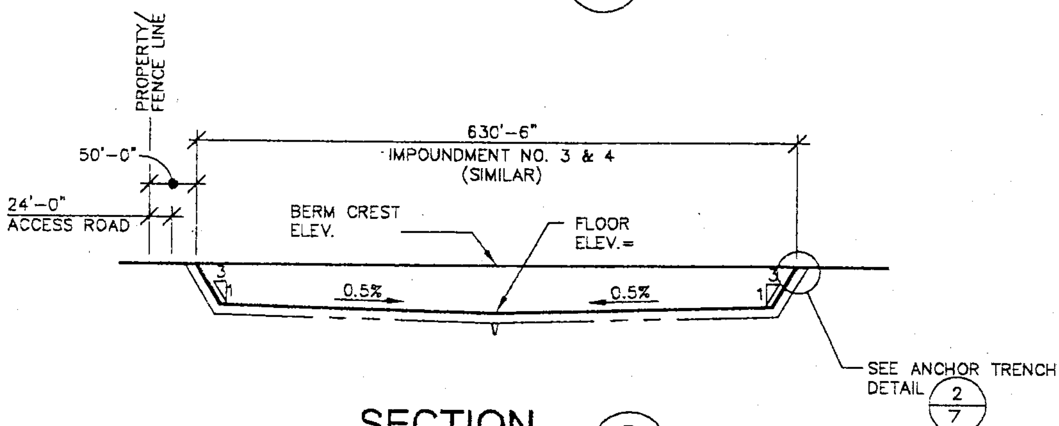

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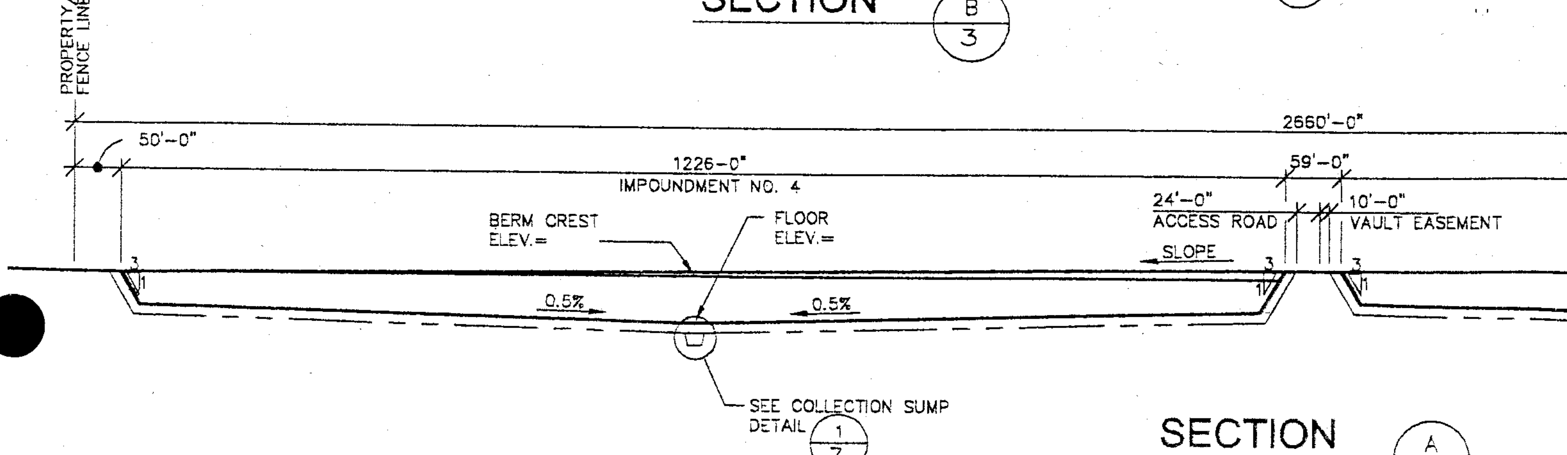

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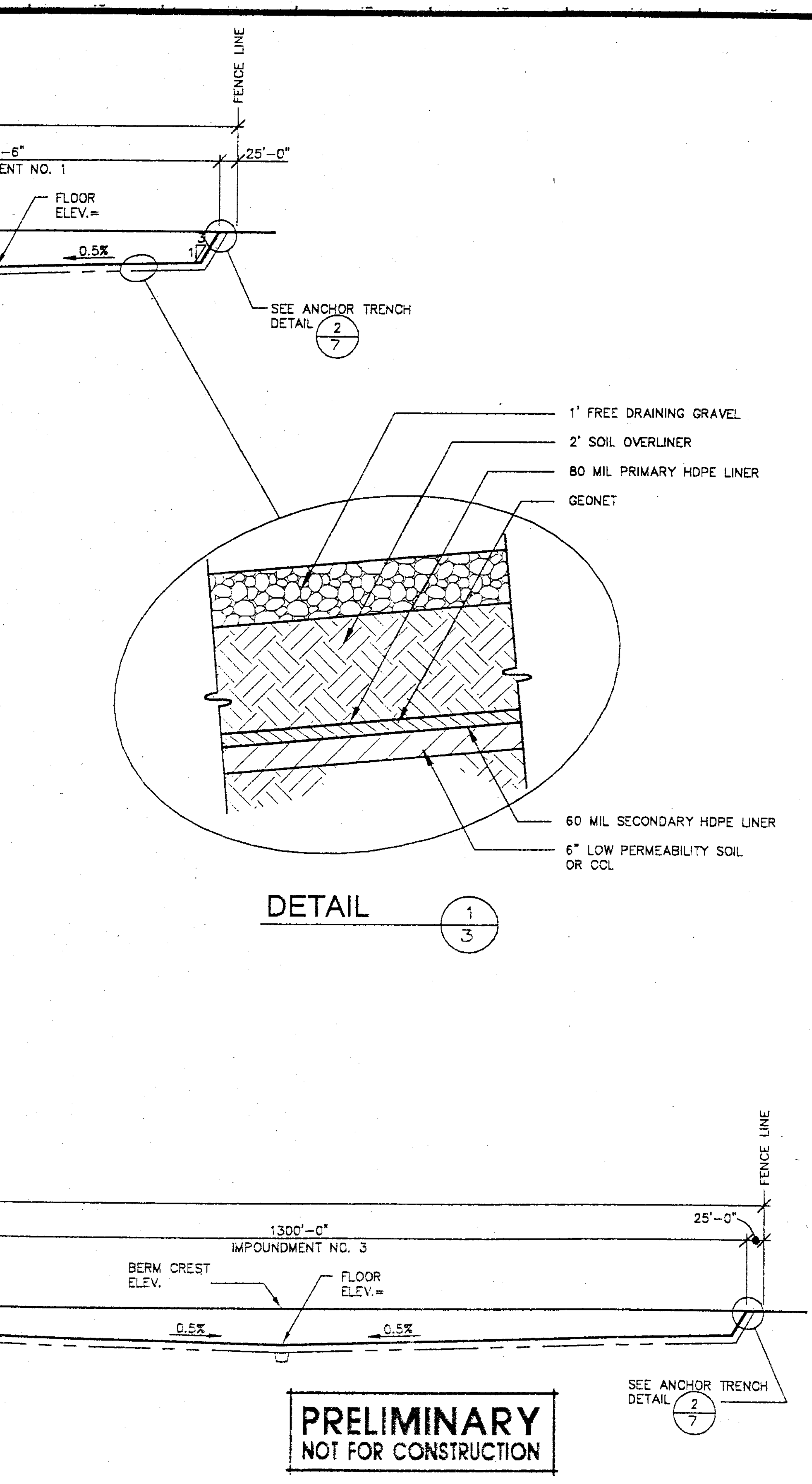

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GILA BEND POWER PROJECT

IMPOUNDMENT SECTIONS

DESIGN DRAWN ENG.

Job Number: 147100

Date: 8/1/00

Sheet Number

3

3 of 7 sheets

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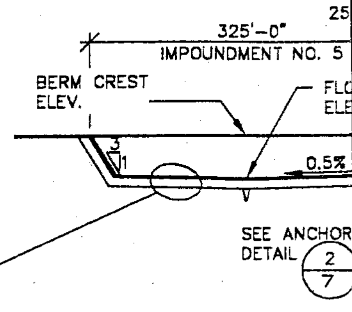

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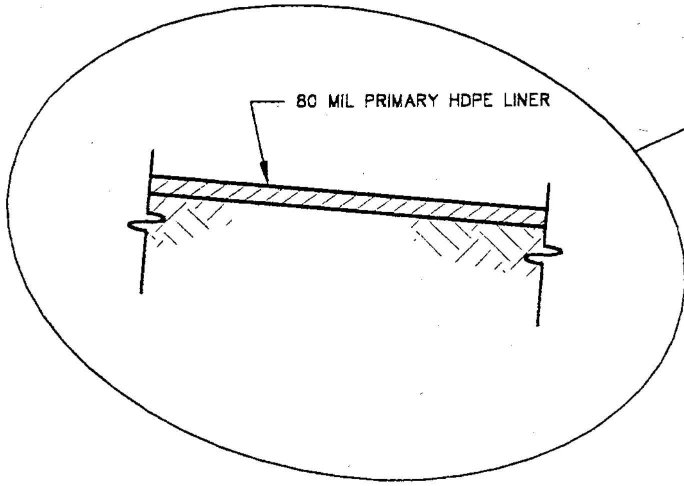
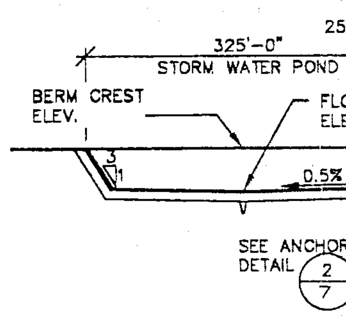


DETAIL 1/4



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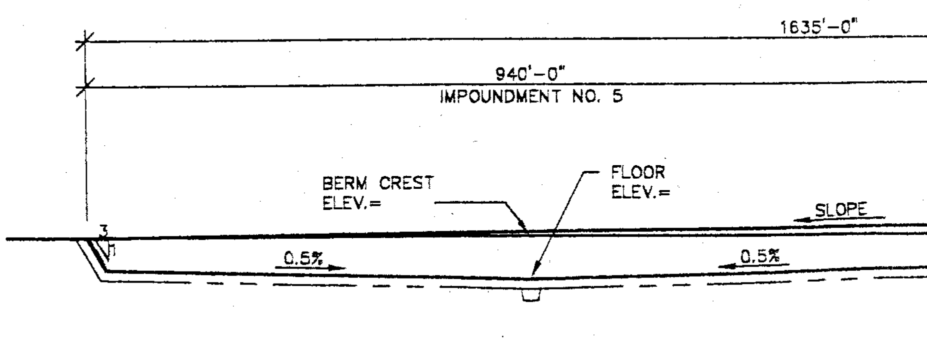

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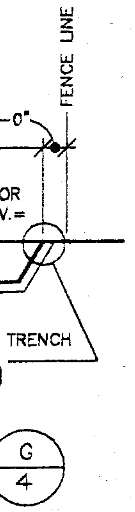

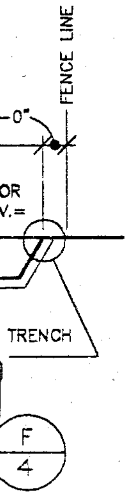

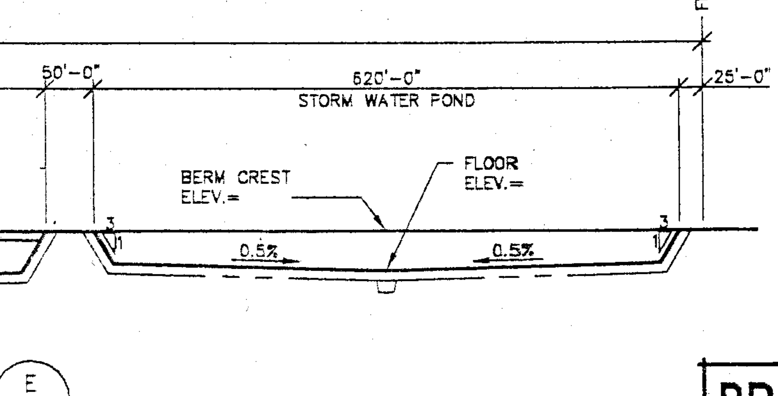

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No.	Revisions	Date

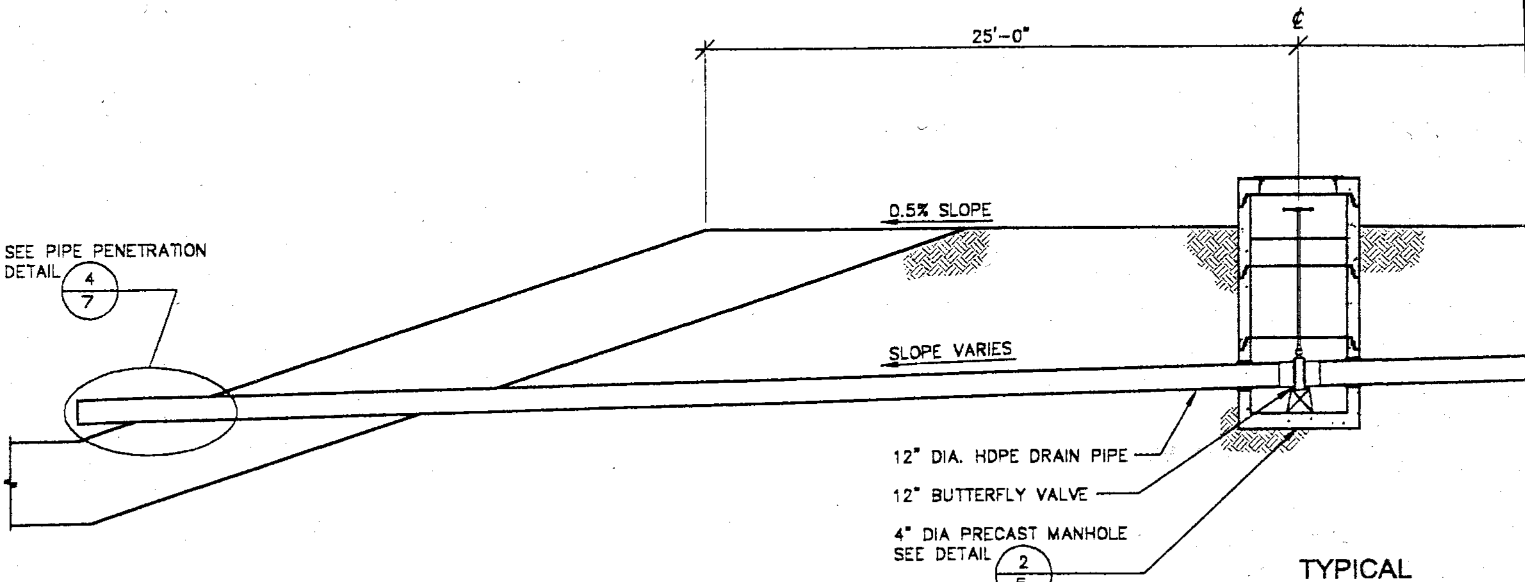
GILA BEND POWER PROJECT

IMPOUNDMENT AND STORM WATER POND SECTIONS

DESIGN DRAWN ENG.

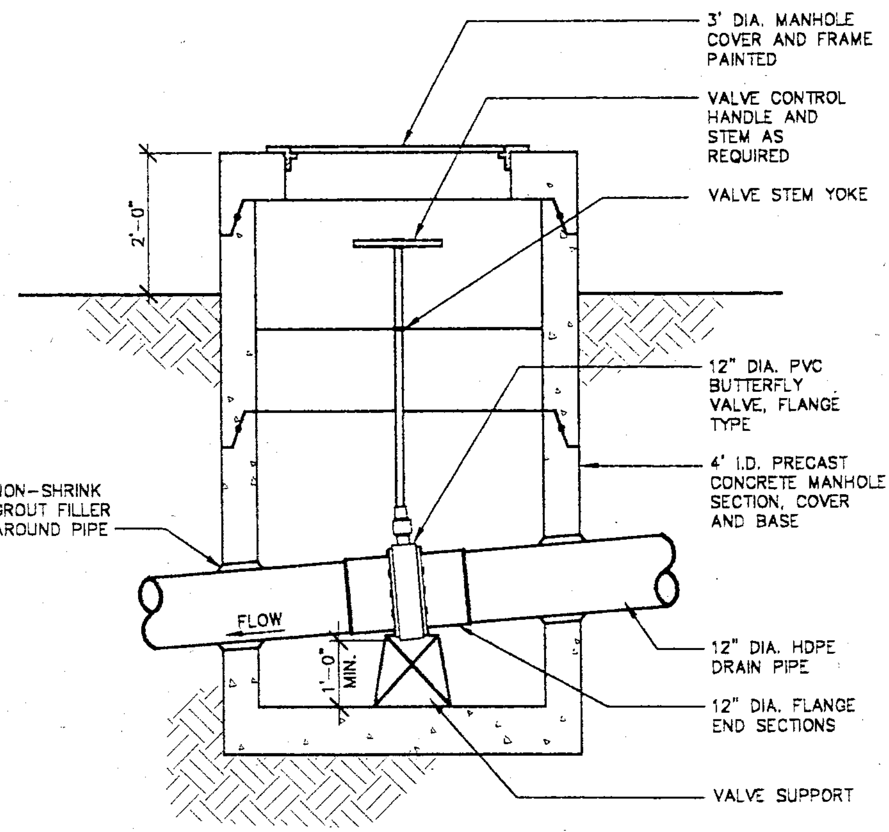
Job Number: 147100
Date: 8/1/00

Sheet Number
4
4 of 7 sheets



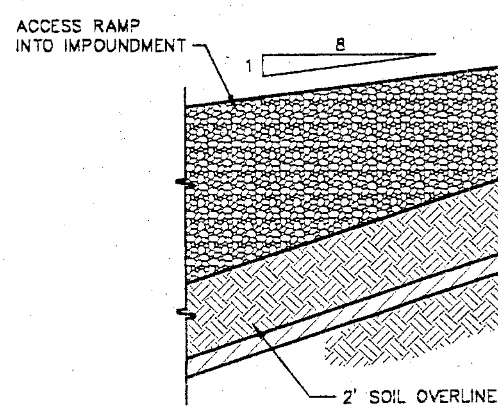
TYPICAL DRAIN PIPE

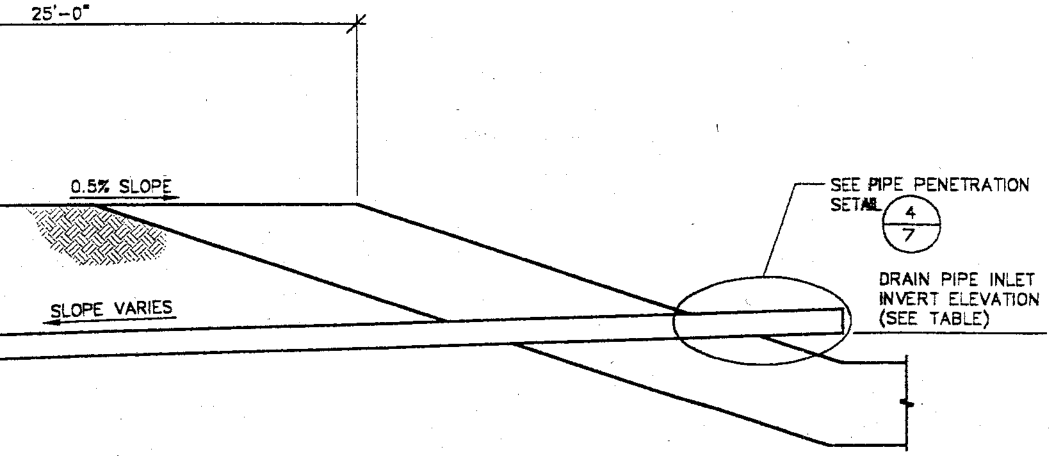
SECTION A/5



DRAIN VALVE CONTROL VAULT

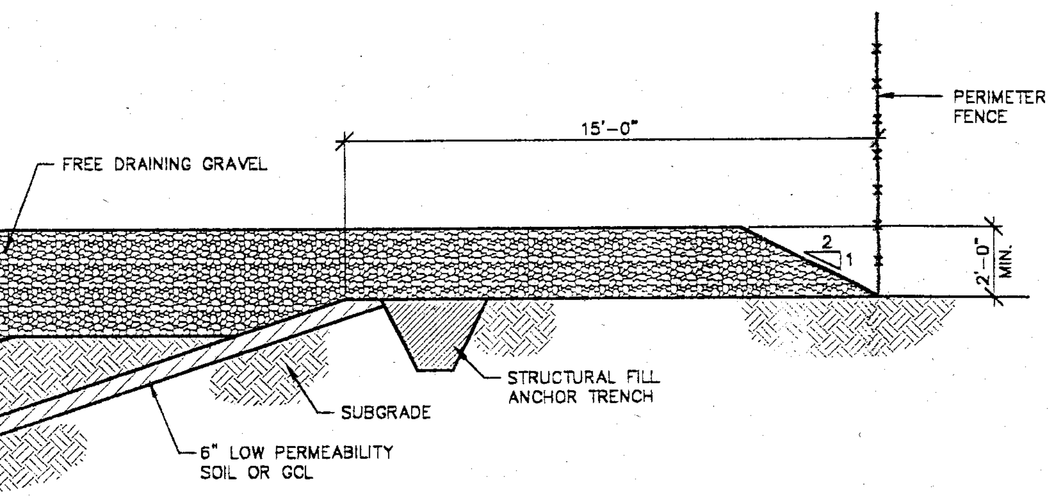
DETAIL 2/5





DRAIN PIPE TABLE

BETWEEN IMPOUNDMENTS	DRAIN PIPE INLET INVERT ELEVATION	DRAIN PIPE OUTLET INVERT ELEVATION
1 & 2	*	*
2 & 3	*	*
3 & 4	*	*
5 & 1	*	*



TYPICAL ACCESS RAMP INTO IMPOUNDMENT

DETAIL 1/5

LEGEND:

- HDPE LINER
- GEONET
- SOIL OVERLINER
- FREE DRAINING GRAVEL
- COMPACTED LOW–PERMEABILITY SOIL
- STRUCTURAL FILL

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GILA BEND POWER PROJECT

IMPOUNDMENT SECTIONS AND DETAILS

DESIGN DRAWN ENG.

Job Number: 147100
Date: 8/1/00

Sheet Number 5

5 of 7 sheets

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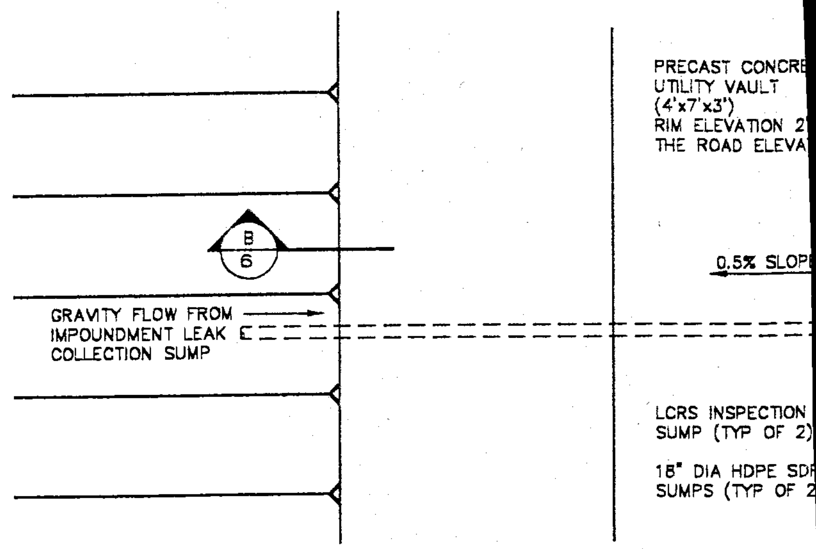
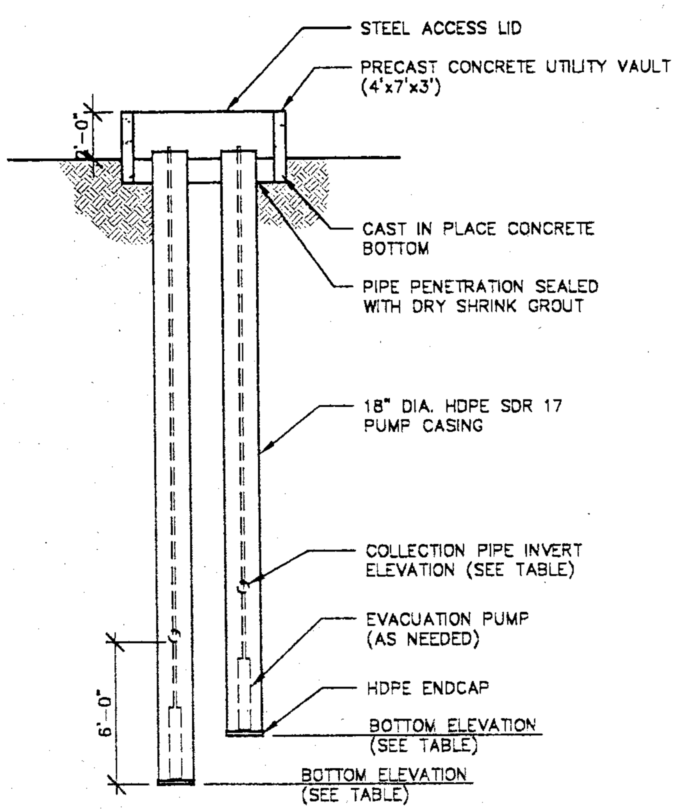
INSPECTION SUMP

IMPOUNDMENT NO.	BOTTOM ELEVATION	COLLECTION PIPE INVERT ELEVATION
1	*	*
2	*	*
3	*	*
4	*	*
5	*	*

NOTE: INSPECTION POINT IS IN THE PIPE SUMP.

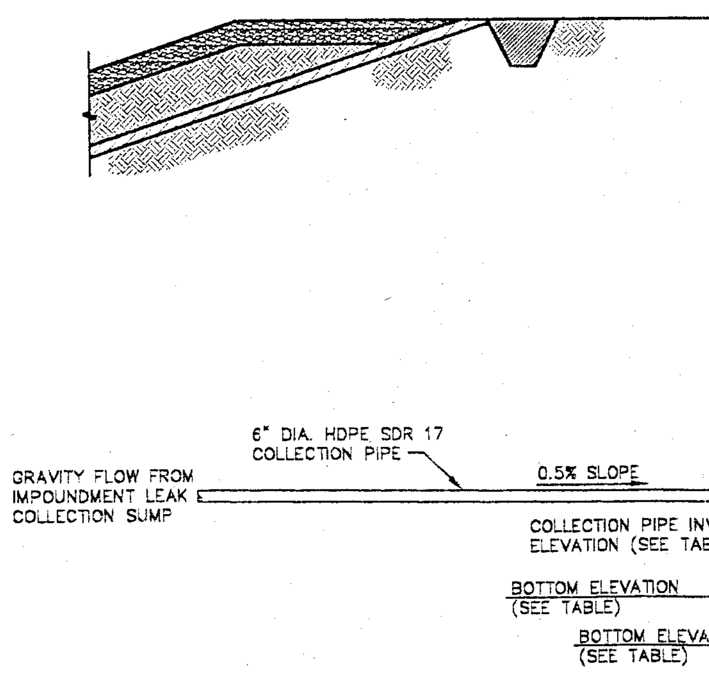


LEAK COLL



LEAK COLLECTION AND REMOVAL SYSTEM
INSPECTION SUMP

SECTION A/6



LEAK COL

PRELIMINARY
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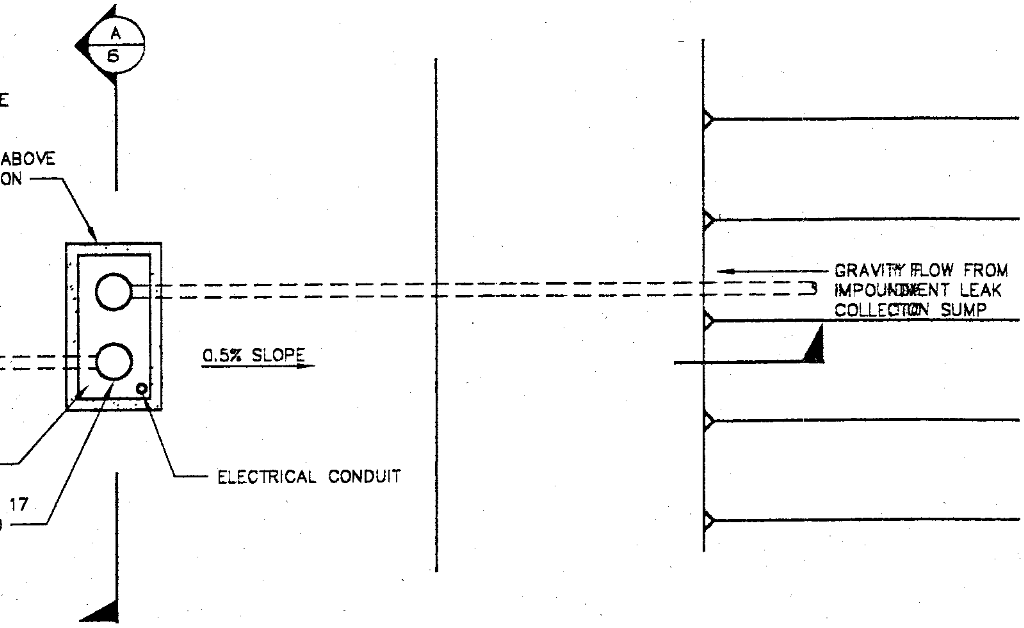
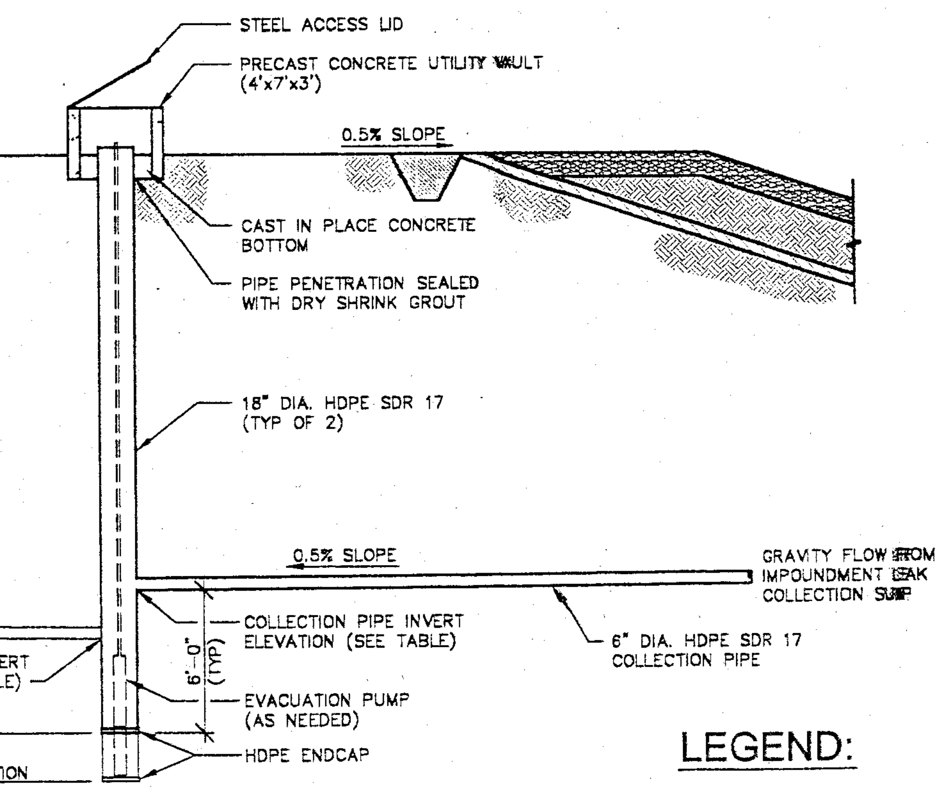


ECTION AND REMOVAL SYSTEM
INSPECTION SUMP
DETAIL 1/6



LECTION AND REMOVAL SYSTEM
INSPECTION SUMP
SECTION B/6

LEGEND:

- HDPE LINER
- GEONET
- SOIL OVERLINER
- FREE DRAINING GRAVEL
- COMPACTED LOW-PERMEABILITY SOIL
- STRUCTURAL FILL

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GILA BEND POWER PROJECT

LEAK COLLECTION AND REMOVAL SYSTEM INSPECTION SUMP DETAIL AND SECTIONS

DESIGN DRAWN ENG.

Job Number: 147100 | Date: 8/1/00

Sheet Number 6

6 of 7 sheets

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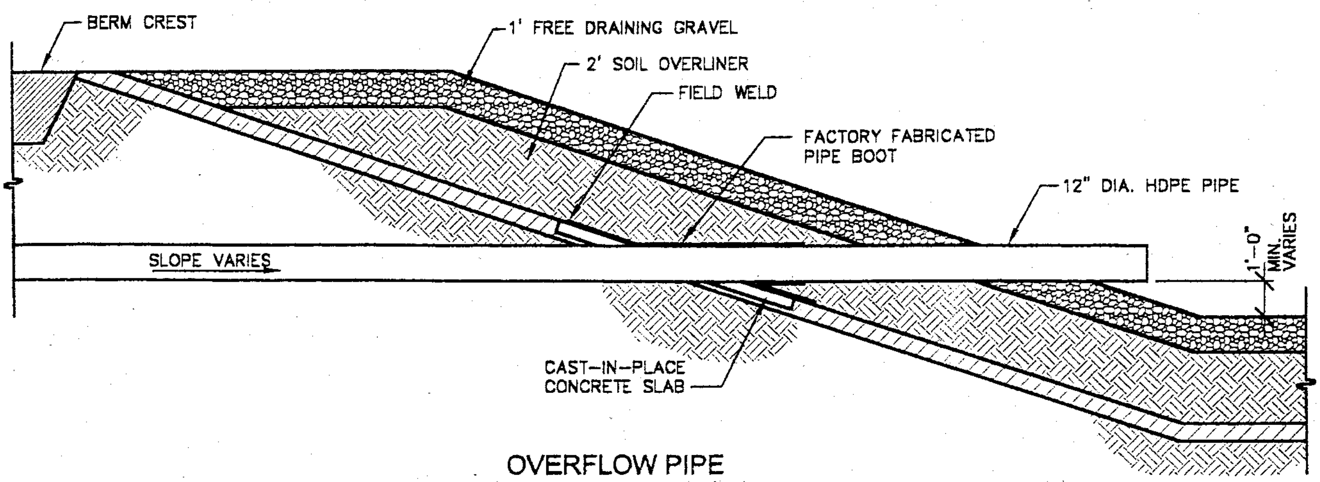
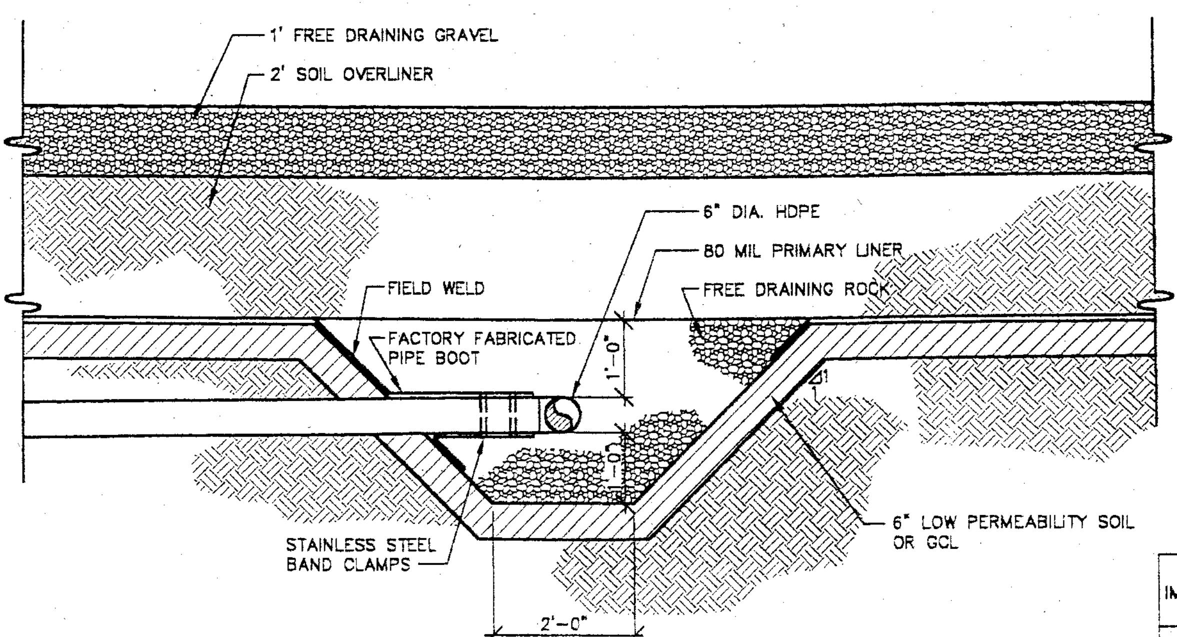


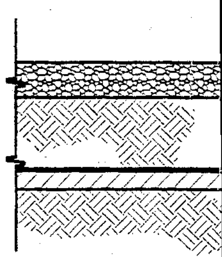
OVERFLOW PIPE
PENETRATION

DETAIL 4/7



COLLECTION SUMP

DETAIL 3/7

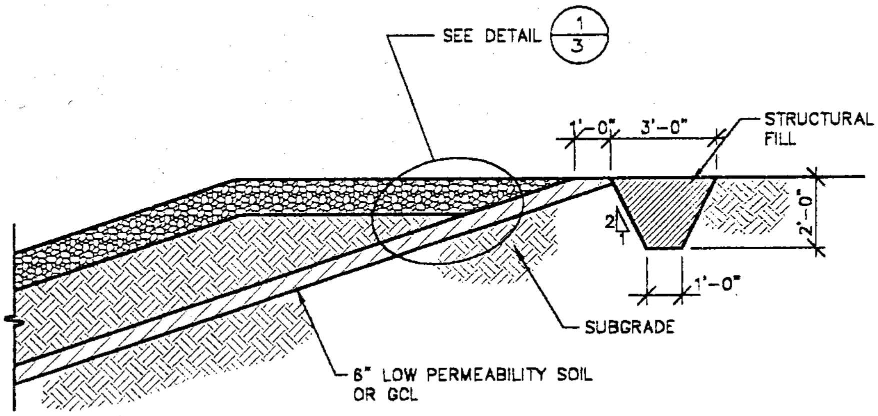


6" DIA. PERFO
HDPE COLLECT
PIPE. PIPE SL
AT 0.5% MIN.

INSPECTION SU

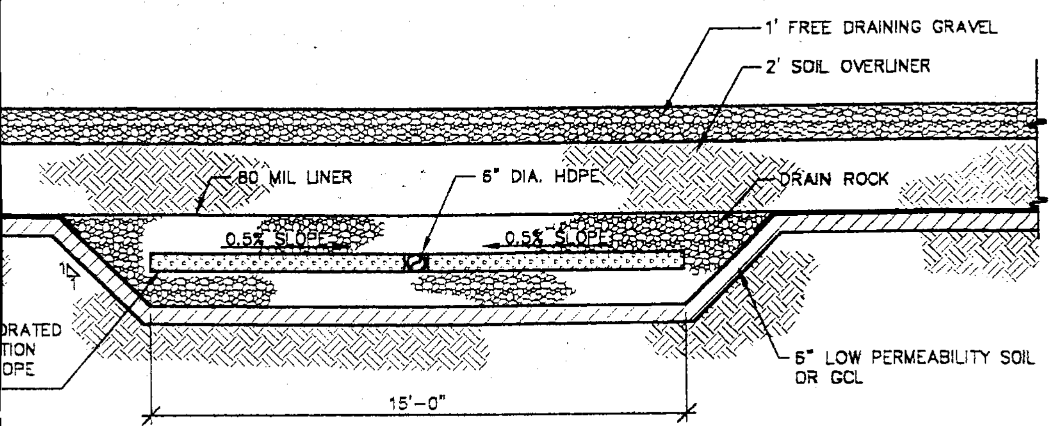
IMPOUNDMENT NO.	BOTTOM ELEVATION
1	*
2	*
3	*
4	*
5	*

NOTE: INSPECTION POINT IS IN TH



TYPICAL ANCHOR DETAIL

DETAIL 2/7



COLLECTION SUMP

DETAIL 1/7

MP

COLLECTION PIPE INVERT ELEVATION
*
*
*
*
*

E PIPE SUMP.

PRELIMINARY
NOT FOR CONSTRUCTION

LEGEND:

- HDPE LINER
- GEONET
- SOIL OVERLINER
- FREE DRAINING GRAVEL
- COMPACTED LOW–PERMEABILITY SOIL
- STRUCTURAL FILL

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GILA BEND POWER PROJECT

IMPOUND DETAILS

DESIGN DRAWN ENG.

Job Number: 147100 Date: 8/1/00

Sheet Number 7

7 of 7 sheets

20001016.142502

APPENDIX A

NINYO & MOORE REPORT

PRELIMINARY GEOTECHNICAL EVALUATION
PROPOSED GILA BEND POWER PLANT
GILA BEND, ARIZONA

PREPARED FOR:
Gila Bend Power Partners, L.L.C.
5949 Sherry Lane, Suite 1880
Dallas, Texas 75225

PREPARED BY:
Ninyo & Moore Geotechnical and Environmental Sciences Consultants
5035 South 33rd Street
Phoenix, Arizona 85040

November 3, 2000
Project No. 600150-01

Ninyo & Moore
Geotechnical and Environmental Sciences Consultants

November 3, 2000
Project No. 600150-01

Mr. Robert Innamorati
Gila Bend Power Partners, L.L.C.
5949 Sherry Lane, Suite 1880
Dallas, Texas 75225

Subject: Preliminary Geotechnical Evaluation
Proposed Gila Bend Power Plant
Gila Bend, Arizona

Dear Mr. Innamorati:

Ninyo & Moore is pleased to submit this report on our preliminary geotechnical evaluation for the proposed Gila Bend Power Plant to be constructed near Gila Bend, Arizona. This report presents our findings, conclusions, and geotechnical recommendations for the project. The purpose of our evaluation was to develop preliminary geotechnical information to be used by potential engineering, procurement and construction contractors in the preparation of their proposals.

We appreciate the opportunity to be of service on this project. Should you have any questions related to this report, please contact the undersigned at your convenience.

Sincerely,
NINYO & MOORE

Steven D. Nowaczyk, P.E.
Project Engineer

Robert W. McMichael, P.E.
Manager/Chief Engineer

SDN/RM/RI/avv

Distribution: (4) Addressee
(1) Mr. Thom Shelton – Industrial Power Technology

5035 South 33rd Street • Phoenix, Arizona 85040 • Phone (602) 243-1600 • Fax (602) 243-2699
Phoenix • Irvine • San Diego • Los Angeles • Oakland • Las Vegas • Salt Lake City • Ontario

TABLE OF CONTENTS

Page

1. INTRODUCTION 1
2. SCOPE OF SERVICES 1
3. PROJECT DESCRIPTION 1
4. SITE DESCRIPTION 3
5. SUBSURFACE EXPLORATION 4
6. GEOTECHNICAL LABORATORY TESTING 5
7. GEOLOGIC CONDITIONS 5
7.1. GEOLOGIC SETTING 5
7.2. SUBSURFACE CONDITIONS 6
7.2.1. Alluvium 6
7.2.2. Groundwater 6
8. GEOLOGIC HAZARDS 7
8.1. Land Subsidence and Earth Fissures 7
8.2. Faulting and Seismicity 8
9. GENERAL DESIGN CONSIDERATIONS 9
10. RECOMMENDATIONS 10
10.1. Earthwork 10
10.1.1. Pre-Construction Conference 11
10.1.2. Construction Observation and Testing 11
10.1.3. Excavation 11
10.1.4. Grading, Fill Placement, and Compaction 12
10.1.5. Imported Fill Material 13
10.2. Settlement 14
10.3. Expansion Potential 15
10.4. Shallow Foundations (Isolated and Continuous) 15
10.5. Mat Foundations 16
10.6. Above Ground Storage Tank Foundations 16
10.7. Deep Foundations 17
10.8. Slabs-On-Grade 17
10.9. Earth Pressures and Retaining Structures 18
10.10. Pavement Sections and Resurfacing 19
10.10.1. Asphalt Concrete Pavement 19
10.10.2. Portland Cement Concrete Pavement 20
10.10.3. Pavement Subgrade Preparation 20
10.11. Corrosion Potential 21
10.12. Concrete 22

10.13. Site Drainage 23
11. LIMITATIONS 23
12. SELECTED REFERENCES 25

Tables

Table 1 – Anticipated Loading Conditions 2
Table 2 – Anticipated Settlement Criteria 3
Table 3 – Seismic Design Parameters 9
Table 4 – Lateral Earth Pressures 18
Table 5 – Recommended Asphalt Concrete Pavement Sections 19
Table 6 – Recommended Portland Cement Concrete Pavement Sections 20

Figures

Figure 1 – Site Location Map
Figure 2 – Boring Location Map

Appendices

Appendix A – Boring Logs
Appendix B – Geotechnical Laboratory Results
Appendix C – Field Resistivity Measurements

1. INTRODUCTION

This report presents the results of our preliminary geotechnical evaluation for the proposed Gila Bend Power Plant (Plant) to be located near Gila Bend, Arizona. The objective of this evaluation was to develop preliminary geotechnical information to be of used to potential engineering, procurement, and construction (EPC) contractors as they prepare their proposals. Therefore, our evaluation was limited in scope and is not sufficient for final design purposes. Additional geotechnical evaluation(s) will be needed prior to final design.

2. SCOPE OF SERVICES

Our scope of services for this project included:

- Reviewing readily available aerial photographs, and published geologic literature, including maps and reports pertaining to the project site and vicinity.
- Drilling, logging, and sampling eight exploratory borings to depths of up to 26.4 feet below the ground surface (bgs). Relatively undisturbed split-barrel drive samples, Standard Penetration Test (SPT) samples, and bulk samples were obtained and transported to our laboratory in Phoenix for testing. We also performed a field resistivity test at the site.
- Performing laboratory testing of soil samples, including in-situ moisture content and dry density, sieve analysis, Atterberg limits, hydro-consolidation, minimum electrical resistivity, soluble sulfates and chlorides, and pH testing.
- Geotechnical engineering and geological analysis of the data obtained.
- Preparation of this report presenting our findings, conclusions, and preliminary geotechnical recommendations for the project.

The scope of services did not include environmental consulting services at the site.

3. PROJECT DESCRIPTION

The general arrangement of the proposed site features is schematically depicted on Figure 2. In general, the components of the Plant will consist of combustion turbine generators (CTG), heat recovery steam generators (HRSG) with stacks, steam turbine generators (STG), and cooling towers. Common facilities will include support buildings, a plant switchyard, storage tanks, transmission lines, water treatment facilities, waste water ponds and accessory equipment.

Based on information we received from Mr. Thom Shelton of Industrial Power Technology (IPT), we understand the approximate loading conditions for some of the facilities listed above are as follows:

Table 1 – Anticipated Loading Conditions

Structure	Anticipated Foundation Type and Size	Anticipated Load/Contact Pressure
Gas Turbine/Generator	Mat: 21' x 125' x 5' thick	2,000 psf
HRSGs	Mat: 34' x 160' x 3' thick	2,000 psf
Stream Turbine/Generator	Mat: 25' x 80' x 5' thick	2,000 psf
Storage Tanks	Ring Wall: 50' diameter	2,500 psf
Steam Turbine Building	Unknown	Column loads of 10 to 100 tons, Floor loads of 200 psf
Cooling Tower	60' x 580' slab with 4' high perimeter wall	Column loads of 5,000 pounds, Floor loads of 200 psf

In addition to the above loading information, we were also given the anticipated settlement criteria for each of these structures. The following table details the settlement criteria we were given.

Table 2 – Anticipated Settlement Criteria

Structure	Anticipated Settlement Criteria
Gas Turbine / Generator	0.5" total
HRSGs	1.0" total, 0.5" in 10' differential
Stream Turbine / Generator	0.5" total
Storage Tanks	4.0" total
Steam Turbine Building	1.0" total
Cooling Tower	1.0" in 20' differential

We assume the grades within the proposed power block footprint will be balanced. Based on topographic information at the site, we anticipate that the cuts within the power block area could be as much as about 5 to 10 feet and the fills could be as much as about 5 to 10 feet.

4. SITE DESCRIPTION

The study site is located in Section 19 of T. 5 S, R. 5 W, approximately 7 miles northwest of Gila Bend. The site encompasses roughly 160 acres. At the time of our evaluation, the study site was vacant, except for several small structures near the northwest boundary. The ground surface was somewhat rolling, with several variable-sized washes crossing the area. These washes were typically orientated in a north-south direction and generally flowed from the south to the north. The vegetation we observed while on site typically consisted of low-lying desert brush (primarily Creosote bushes). We also observed unsurfaced roads bordering the site on the west and south sides.

According to the *Smurr, Arizona 7.5-Minute USGS Topographic Quadrangle Map (1973),* the site lies at an average elevation of roughly 680 feet relative to mean sea level (MSL). Based on the information from the quadrangle map, it appears the project site slopes very gently from the south to the north, with approximately 20 to 30 feet of relief across the site.

Two aerial photographs were reviewed for this project. A 1981 aerial photograph from the *United States Geological Survey (USGS)* depicts the site as undeveloped desert, with several washes crossing the site and no evidence of construction. Another USGS aerial photograph from 1996 show no significant changes from the 1981 photograph, with the exception of some unpaved roads bordering the site to the west and south. The photographs did not indicate large disturbed areas that might be indicative of past development or filling.

5. SUBSURFACE EXPLORATION

In accordance with state law, Arizona Blue Stake was notified 72 hours in advance of subsurface exploration activities to evaluate potential utility conflicts at the boring locations.

Enviro-Drill, Inc. (EDI) of Phoenix, Arizona, was retained by Ninyo & Moore to drill the exploratory borings. The borings were advanced using 8-inch diameter continuous flight, hollow-stem augers (HSA). The purpose of the borings was to observe and collect samples of the underlying earth materials. The general soil boring locations are depicted in Figure 2 and the boring logs are presented in Appendix A.

The drilling occurred on October 12, 2000. The target boring depths ranged from 30 to 50 feet bgs. However, while drilling the first boring, perched groundwater was unexpectedly encountered at a depth of about 24 feet bgs. Accordingly, we drilled the remaining borings to shallower depths and notified the Arizona Department of Water Resources (ADWR) that groundwater had been encountered.

Soil samples were obtained by driving a split-spoon sampler approximately 18 inches into the soil at the bottom of the borehole using a 140-pound hammer falling approximately 30 inches. Ring samples were obtained with a modified sampler (American Society for Testing and Materials [ASTM] D 3550-84) and bag samples were obtained using an unlined SPT sampler (ASTM

D 1586-84). Modified ring and SPT samplers were used alternately at intervals of 2.5 or 5.0 feet. The equipment and sampling methodology are described in detail in Appendix A.

Soil resistivity information of the subsurface materials was also obtained at the site near the location of boring B-4. The data was collected in general accordance with ASTM G57 using a MINIRES Resistivity Meter and four electrodes in a Wenner configuration. Soil resistivity measurements were collected at electrode spacings of 5, 10, 20, and 40 feet, along two perpendicular traverses at each of the locations. The results of the resistivity surveys and details regarding the data collection are presented in Appendix C. In general, the resistivity data collected are of good quality, with good agreement between orthogonal traverses.

6. GEOTECHNICAL LABORATORY TESTING

The soil samples were transported to the Ninyo & Moore laboratory in Phoenix, Arizona, for geotechnical laboratory analysis The analysis included in-situ moisture content and dry density, sieve analysis, Atterberg limits, hydro-consolidation, and corrosivity testing (including minimum electrical resistivity, soluble sulfates and chlorides, and pH). The results of the in-situ moisture content and dry density testing are presented on the boring logs in Appendix A. A description of each test method and the laboratory results are presented in Appendix B.

7. GEOLOGIC CONDITIONS

The following sections provide information regarding the geologic conditions of the project site.

7.1. GEOLOGIC SETTING

The project site is located in the Sonoran Desert Section of the Basin and Range physiographic province, which is typified by broad alluvial valleys separated by steep, discontinuous, subparallel mountain ranges. The mountain ranges generally trend north-south and northwest-southeast. The basins consist of alluvium with thickness extending to several thousands of feet.

The surface geology of the area is described as Quaternary to Tertiary alluvial deposits composed of sand, gravel and conglomerate (Wilson et al. 1957). In general, the subsurface materials consist of unconsolidated to consolidated Quaternary to Tertiary alluvial deposits underlain by Precambrian granite, gneiss, schist, and breccia. The basins and surrounding mountains were formed approximately 10 to 13 million years ago during the mid- to late-Tertiary. Extensional tectonics resulted in the formation of horsts (mountains) and grabens (basins) with vertical displacement along high-angle normal faults. Intermittent volcanic activity also occurred during this time. The Gila River basin filled with alluvium from the erosion of the surrounding mountains as well as from deposition from the ancestral and modern Gila River. Coarser-grained alluvial material was deposited at the margins of the basins near the mountains.

7.2. SUBSURFACE CONDITIONS

Our knowledge of the subsurface conditions at the project site is based on our field exploration and laboratory testing, and our understanding of the general geology of the area. The following sections provide generalized descriptions of the materials encountered. More detailed descriptions are presented on the boring logs in Appendix A.

7.2.1. Alluvium

Alluvial materials were encountered in each of the exploratory borings to the total depth explored. As encountered, the materials generally consisted of a silty fine to coarse sand, with varying in-place densities and moistures.

7.2.2. Groundwater

Groundwater was encountered in one of our borings at approximately 24 feet below the existing ground surface. The groundwater encountered is interpreted as perched groundwater, most likely from agricultural activities on nearby properties. Based on well data provided by the Arizona Department of Water Resources (ADWR), the regional groundwater table in Section 19, Township 5 South, Range 5 West as 50 to

70 feet bgs. Groundwater levels can fluctuate due to seasonal variations, irrigation, groundwater withdrawal or injection, and other factors.

8. GEOLOGIC HAZARDS

The following sections describe potential geologic hazards at the site, including land subsidence and earth fissures, faulting and seismicity, surface rupture, and liquefaction.

8.1. Land Subsidence and Earth Fissures

Groundwater depletion, due to groundwater pumping, has caused land subsidence and earth fissures in numerous alluvial basins in southern Arizona. It has been estimated that subsidence has affected more than 3,000 square miles and has caused damage to a variety of engineered structures and agricultural land (Schumann and Genualdi, 1986). From 1948 to 1983, excessive groundwater withdrawal has been documented in several alluvial valleys such as the Maricopa-Stanfield basin, where groundwater levels have been reportedly lowered by up to 500 feet, and in the Eloy basin, where groundwater levels were lowered by about 250 to 300 feet. With such large depletions of groundwater, the alluvium has undergone consolidation resulting in large areas of land subsidence.

In southern Arizona earth fissures are generally associated with land subsidence and pose an on-going geologic hazard. Earth fissures generally form near the margins of geomorphic basins where significant amounts of groundwater depletion have occurred. Reportedly, earth fissures have also formed due to tensional stress caused by differential subsidence of the unconsolidated alluvial materials over buried bedrock ridges and irregular bedrock surfaces (Schumann and Genualdi, 1986).

As previously discussed, land subsidence and earth fissure hazards have been acknowledged in several portions of southern Arizona. The closest earth fissure zone is mapped approximately 35 miles east of the subject site, near Stanfield. Well data obtained near the project site indicates there has been a decrease in the water level of 0 to 100 feet (Schumann and Genualdi, 1986). Based on our field reconnaissance and review of referenced material, there are no known earth fissures underlying the subject site. However, continued groundwater withdrawal may result in the expansion of the current subsidence and earth fissure zones and/or the creation of new subsidence and earth fissure zones. In general, however, earth fissures are not expected to be a constraint to the construction of this project.

8.2. Faulting and Seismicity

The site lies within the Sonoran zone, which is a relatively stable tectonic region located in southwestern Arizona, southeastern California, southern Nevada, and northern Mexico (Euge et al., 1992). This zone is characterized by sparse seismicity and few Quaternary faults. Based on our field observations, review of pertinent geologic data, and analysis of aerial photographs, faults are not located on or adjacent to the property. The closest fault to the site is the Sand Tank Fault, which is approximately 8 miles to the southeast and was last active in the Late Quaternary (<130 ,000 years).

Based on a Probabilistic Seismic Hazard Assessment for the Western United States, issued by the United States Geological Survey (1999), the site is located in a zone where the peak ground accelerations that have a 10%, 5%, and 2% probability of being exceeded in 50 years are 0.05g, 0.07g and 0.11g, respectively. Based on these relatively low accelerations, seismicity is not anticipated to govern slope stability analysis.

Seismic design parameters according to the 1997 Uniform Building Code (UBC) are presented in the following table.

Table 3 – Seismic Design Parameters

Parameter	Value	1997 UBC Reference
Seismic Zone Factor, Z	0.15	Table 16 – I
Soil Profile Type	S_D	Table 16 – J
Seismic Coefficient C_a	0.22	Table 16 – Q
Seismic Coefficient C_v	0.32	Table 16 – R
Near-Source Factor, N_a	1.0	Table 16 – S
Near-Source Factor, N_v	1.0	Table 16 – T
Seismic Source Type	C	Table 16 – U

9. GENERAL DESIGN CONSIDERATIONS

It is our opinion that there are no known geotechnical or geologic constraints that would preclude construction of the proposed facility provided that the geotechnical and geologic recommendations discussed in this report are considered, and the appropriate evaluation, design, and construction criteria are followed. However, it is emphasized that our evaluation was preliminary in nature and that the subsurface conditions have been characterized through widely spaced borings and limited laboratory testing. Additional geotechnical evaluation is recommended prior to final design of this project.

The geotechnical design and construction considerations are described in the following sections.

- Based on our soil borings, the explored depth (upper to about 26 feet) at the site consists of naturally occurring alluvium. The alluvium generally consisted of silty fine to coarse sand, with scattered layers of gravel and occasional cobbles encountered. Laboratory testing on collected samples indicated that these sandy materials exhibit a low to negligible potential for hydrocollapse upon wetting. Even though our preliminary laboratory test results do not indicate a highly collapsible soil profile at this site, some improvement of the near-surface soils, prior to construction, should be anticipated.

- The proposed construction can be supported on shallow spread foundations or mats that bear on pads of engineered fill. Higher column loads (over about 250 kips) could be supported using a deep foundation system. Preferred deep foundation systems include drilled piers or auger-cast piles.

- Based on our findings, the on-site soils should generally be suitable for re-use as fill material, provided that they meet with the approval of the geotechnical consultant and are compacted to specified criteria. In addition, the on-site soils should generally be excavatable with conventional earth moving construction equipment to reasonable foundation depths (less than about 10 feet). However, deeper excavations could encounter gravel layers or cobbles.

- It should be anticipated that the clayey near-surface soil materials disclosed at the site will offer relatively poor pavement support characteristics, could be expansive, and may be difficult to compact under adverse moisture conditions.

- The existing on-site soils were found to be corrosive to ferrous materials. Given the importance of the project, and the anticipated service lifetime, a corrosion specialist should be consulted to provide site and project-specific recommendations for the protection of structures against corrosion.

- No known geologic hazards are reported underlying, or adjacent, to the site.

10. RECOMMENDATIONS

The following sections present our preliminary geotechnical recommendations for the proposed project. It is important to note that the site grading plans were not available at the time of our evaluation. The preliminary nature of our evaluation and our recommendations is emphasized; additional geotechnical evaluation will be needed to support final design.

10.1. Earthwork

The following sections provide our preliminary earthwork recommendations. Other preliminary recommendations for grading and earthwork are included in our Earthwork Specifications Recommendations, Appendix D. If there are conflicting recommendations, those provided in this report supersede those in Appendix D.

10.1.1. Pre-Construction Conference

We recommend that a pre-construction conference be held. Representatives of the owner, civil engineer, the geotechnical consultant, and the contractor should be in attendance to discuss the plans and the project.

10.1.2. Construction Observation and Testing

During construction operations, we recommend that a qualified geotechnical consultant perform observation and testing services for the project. These services should be performed to evaluate exposed subgrade conditions, including the extent and depth of overexcavation, the suitability of proposed borrow materials for use as fill, and placement and testing of fill soil. Construction of proposed improvements should be performed by qualified subcontractors using appropriate techniques and construction materials.

If a geotechnical consultant other than Ninyo & Moore is selected to perform observation and testing services for the project, we request that the selected consultant provide a letter to the owner, with a copy to Ninyo & Moore, indicating that they fully understand our recommendations, and that they are in agreement with the recommendations contained in this report.

It is important that the site preparation activities (prior to fill placement) be conducted in a careful and thorough manner. The site preparation should be continuously monitored and documented by the project's geotechnical consultant.

10.1.3. Excavation

Our evaluation of the excavation characteristics of the on-site materials is based on the results of eight widely spaced exploratory borings, our site observations, and our experience with similar materials. In our opinion, excavation of the on-site materials can generally be accomplished with conventional earthmoving equipment in good operating condition, to reasonable foundation depths (less than about 10 feet). However, deeper excavations could encounter gravel layers or cobbles, which may be more difficult to excavate.

Excavated on-site materials which exhibit 1.5 percent or less swell as evaluated by method ASTM D 4546-96 when remolded at 98 percent of its standard Proctor (ASTM D 698-91) maximum dry density and at a moisture content of two percent below their optimum may generally be re-used as compacted fill. Such materials should be free of organic or other deleterious materials, should contain 30 percent or less by weight passing a No. 200 sieve, have a plasticity index of 20 or less and not contain cobbles or other irreducible materials greater than 3 inches in dimension. Particles greater than 3 inches should be removed from the excavated soil, if the soil is to be re-used as fill material. Many of the soil samples collected were judged to be acceptable for re-use as engineering fill, however, localized pockets of existing on-site materials may prove to be unsuitable for reuse as structural fill. This determination should be made during the earthwork activities by the project geotechnical consultant. With the approval of the geotechnical consultant, the unsuitable material should be disposed off site or used in non-structural fill areas.

10.1.4. Grading, Fill Placement, and Compaction

As stated previously, naturally occurring alluvium was encountered at the site to the total depth explored (approximately 26 feet). The alluvium generally consisted of silty fine to coarse sand, with scattered layers of clayey material and gravel noted at some depths and locations, and occasional cobbles. Laboratory testing on collected samples indicated that the sandy materials exhibit a low to negligible potential for hydrocollapse upon wetting. Even though our preliminary laboratory test results do not indicate a highly collapsible soil profile at this site, our knowledge of the surrounding area soils and the preliminary nature of this evaluation suggests that some soil remediation is needed.

Accordingly, we preliminarily recommend that the structures and other settlement-sensitive construction be supported on pads of engineered fill. The depths of the fill should be carefully considered on the basis of additional geotechnical evaluations. It is anticipated that the appropriate thickness of engineered fill or overexcavation beneath shallow foundations will be less than about 10 feet. For pavement, flatwork and grade slab subgrade preparation, it is anticipated that the appropriate thickness of overexcavation beneath the pavement sections will be less than about 2 feet.

Vegetation and debris from the clearing operation should be removed and wasted away from the construction area. Demolition debris (if any) should be removed from the site and disposed of at a legal dumpsite. Obstructions that extend below finish grade, if present, should be removed and the resulting holes filled with compacted soil.

As mentioned previously, we assume the grades within the proposed power block footprint will be balanced. Based on topographic information at the site, we anticipate the cuts within the power block area could be as much as about 5 to 10 feet and the fills could be as much as about 5 to 10 feet. The overexcavation recommendation given above should be imposed within both cut and fill areas, prior to the grading operations.

Following removal of any unsuitable materials and overexcavation as described above, the exposed subgrade should be carefully evaluated for weak, excessively dry or moist, or otherwise unsuitable materials prior to the placement of fill. The new fill should be placed in horizontal lifts approximately 8 inches in loose thickness and compacted by appropriate mechanical methods. Compaction of the new fill within the overexcavation area should be to 98 percent or more relative compaction in accordance with ASTM D 698-91 or to 95 percent or more relative compaction in accordance with ASTM D 1557-91, at a moisture content within 2 percent of optimum. For on-site soils, we estimate the shrinkage factor will be on the order of 15 to 20 percent.

10.1.5. Imported Fill Material

Where imported materials are to be used for structural applications on site, they should meet the criteria detailed in Section 10.1.3 of this report. The import material should have a water-soluble sulfate content of 1,000 parts per million or less. Import material should be of uniform consistency and free of deleterious materials such as non-soil objects, organic matter, or irreducible particles greater than 3 inches in dimension.

10.2. Settlement

It is anticipated that the soils exposed in the proposed construction areas will consist predominantly of silty fine to coarse sands. Our limited laboratory testing program indicated that the near-surface soils exhibit a low to negligible (up to approximately 0.2 percent) potential for hydrocollapse upon inundation. Under the circumstances, we recommend that the bearing conditions be improved by supporting buildings and any exterior settlement-sensitive construction on pads of engineered fill, as described in Section 10.1.4.

Based on our laboratory tests and SPT values obtained in the field and the loading conditions provided by IPT, the anticipated static, total and differential settlements of the granular soils from building and equipment loads under dry conditions are not expected to exceed the criteria given, provided that the recommendations presented in this report are followed.

The total settlement for large mat foundations is estimated to exceed the settlement tolerance given by IPT. However, as mentioned earlier in this report, the upper soil units are generally granular in nature and as such the dry compression of this material is expected to occur with load placement (i.e. as the equipment is placed on the mat). We would expect that the total settlement due to static load after placement of the equipment will be on the order of one-half inch or less and the differential settlement due to static load after placement of the equipment will about one half of the total settlement.

Settlement-sensitive equipment (e.g., the turbines and generators and structures) should be isolated from adjacent structures, or connected through flexible joints and connections, and founded on mat foundations to reduce the effects of differential soil settlement. Structures that have a higher tolerance for total and differential settlement (e.g., support buildings) may be founded on continuous footings and slabs-on-grade with tie beams. Although not as effective as mat foundations in reducing the effects of differential settlement, continuous footings with longitudinal and transverse tie beams provide some reduction in differential settlement effects.

10.3. Expansion Potential

Our evaluation suggests that the expansion potential of near-surface soils will generally be low to negligible. However, some localized pockets of higher expansive materials may be encountered during grading, particularly where clayey soils were encountered near the surface. Expansive materials, if encountered, should be removed from the site or placed in non-structural and non-pavement fill areas.

10.4. Shallow Foundations (Isolated and Continuous)

It is anticipated that shallow foundations will be supported on new engineered fill materials, as described in Section 10.1.4. For light to moderate loadings (up to about 250 kips/column for columns and 4 kips per lineal foot for walls), an allowable net soil bearing pressure in the range of 2,000 to 3,000 pounds per square foot (psf), can be used. The recommended bearing pressure is for static loading conditions and is based on an assumed foundation width of 2 feet or more, and an embedment depth of 18 inches or more. More rigorous analysis may be appropriate in later geotechnical phases.

The allowable bearing pressure can generally be increased by one-third when considering loads of a short duration such as wind or seismic forces. An allowable coefficient of friction of 0.3 against sliding between the foundation base and the underlying compacted material is estimated. Passive pressures are provided in Section 10.9 "Earth Pressures and Retaining Structures."

Under no circumstances should foundations be established upon non-engineered site fill, dry, soft or disturbed natural site soils, loose or disturbed structural fill, rubbish, construction debris, or within standing water. If the soils upon which the footings are to be established become soft or disturbed, or if unsuitable materials are encountered at footing elevations, these materials should be removed and replaced with acceptable structural fill or lean concrete.

10.5. Mat Foundations

As mentioned previously, settlement-sensitive construction could be supported on a structurally rigid mat foundations to limit the effects of differential settlement. Areas to receive mat foundations should be prepared in a manner similar to that described in Section 10.1.4.

The appropriate allowable contact pressure(s) beneath the bases of mat foundations will vary with their size, shape, and other factors. The contact pressure beneath the mats should not exceed the allowable bearing pressure for shallow spread foundations (in the range of 2,000 to 3,000 pounds per square foot). The mat foundations may be designed using a coefficient of subgrade reaction, $\mathbf{K_{v1}}$, of 250 kips per cubic foot (kcf). The coefficient of subgrade reaction $\mathbf{K_{b1}}$ for a mat of a specific width, may be evaluated using the following equation:

$$\mathbf{K_b = K_{v1}[(b+1)/2b]^2 \times [m+.5/1.5m]}$$

where **b** is the width of the foundation and **m** is the ratio of foundation length to its width.

10.6. Above Ground Storage Tank Foundations

Based on the soil conditions observed, it is recommended that the storage tanks be supported on concrete ring-walls. A ring-wall foundation should reduce the extent of the differential settlements. For light to moderate loadings, an allowable net soil bearing pressure in the range of 2,000 to 3,000 psf can be used. The ringwall should have a width of 2 or more feet, and an embedment depth of 18 or more inches. It should be proportioned to provide the same contact pressure as produced under the central portion of the tank. For a tank that is 50 feet in diameter and imposes a contact pressure equal to 2,500 psf, it is estimated that the immediate static total settlement under the center of the tank could be as high as about 4.0 inches, but will depend upon the actual contact pressure and size of the tank, as well as other location specific factors. Settlements around the perimeter of the tank will be less than in the center.

As with the other structures associated with this project, we recommend the overexcavation recommendations detailed in Section 10.1.4 be followed prior to construction of the ring-wall foundation. However, we recommend that the overexcavation be extended laterally across the plan area of the tank, so that the ring wall foundation and the interior tank slab is supported on moisture-conditioned, compacted fill. In addition, we recommend that the tank be filled prior to the time that the final connections are made.

10.7. Deep Foundations

Deep foundations may be considered as an alternative to shallow foundations. Viable deep foundation systems for this project include drilled piers and auger-cast piles. Buildings with column loads over 250 kips or structures with significant ground line shear forces and over-turning moments could be supported on deep foundations. While there are a wide variety of deep foundation types available, we recommend using drilled shaft or auger-cast concrete piles as a deep foundation alternative for this project because significant shaft friction that could be developed.

Because our field drilling program was limited to eight widely-spaced and relatively shallow borings (the deepest being about 26 feet), detailed deep foundation recommendations for this project are not available. However, typical depths of drilled piers and auger-cast piles for similar projects range from about 30 to 60 feet, with axial loading typically varying from about 25 to 100 tons.

10.8. Slabs-On-Grade

Concrete slabs-on-grade should be designed by a structural engineer for the anticipated loading conditions, with appropriate steel reinforcement and joints at closely spaced intervals to help reduce random cracking of the slab. Slabs-on-grade should be underlain by a pads of compacted engineered fill materials (as described above).

The slabs should rest on a capillary break blanket consisting of clean, coarse sand or crushed rock with a thickness of 4 inches or more. This blanket material should have 100 percent of its particles passing the 3/4-inch sieve, no more than 10 percent passing the No. 16 sieve, and no more than 5 percent passing the No. 200 sieve.

10.9. Earth Pressures and Retaining Structures

Earth pressures are calculated to compute the lateral forces acting on retaining structures and foundations. These pressures can be classified as at-rest, active, and passive. The direction and magnitude of the soil/wall movement just before failure, controls the resulting pressure condition. At-rest conditions exist when there is no movement. The active stresses are exerted when the wall moves out and the soil moves toward the wall away from the mass, thereby mobilizing the shear strength of the soil. The active pressures are fully mobilized at movements of 0.1 percent of the wall height for cohesionless soils such as sands and gravel. The passive stresses exist when the wall moves toward the soil mass. Movement typically needed to mobilize passive pressures greatly exceeds that needed to mobilize active pressures. The passive pressures are, therefore, rarely fully mobilized and are often overestimated when used to compute resistance forces. The recommended pressures in Table 4 assume horizontal, free-draining, unsaturated granular backfill, with an angle of internal friction (ϕ) of 34 degrees and static conditions.

Table 4 - Lateral Earth Pressures

Active Pressure (pcf)	At-Rest Pressure (pcf)	Passive Pressure – (pcf)
34	54	250

Measures should be taken so that moisture does not build up behind retaining walls. Back drainage measures should include free-draining backfill material and perforated drain pipes. Drain pipes should outlet away from structures, and retaining walls should be waterproofed in accordance with the recommendations of the project civil engineer or architect. To reduce the potential for water- and sulfate/salt-related- damage to the retaining walls, particular care should be taken in selection of the appropriate type of waterproofing material to be utilized and in the application of this material.

We recommend that the upper 12 inches of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance. For frictional resistance to lateral loads, we recommend that an allowable coefficient of friction of 0.30 be used between soil and concrete. The recommendations for shallow footings apply to foundations for retaining walls.

10.10. Pavement Sections and Resurfacing

Although pavement traffic information and proposed pavement type was not known at the time of preparation of this report, general recommendations are provided for flexible (asphalt concrete) and rigid (portland cement concrete [PCC]) pavement areas for parking and Plant traffic based on our experience with similar projects.

10.10.1. Asphalt Concrete Pavement

Table 5 provides recommended asphalt concrete (AC) pavement sections for "low", "medium" and "high" traffic level as defined in Chapter 4 *AASHTO Guide for Design of Pavement Structures*, 1993.

Table 5 - Recommended Asphalt Concrete Pavement Sections

Proposed Facility	18-kip ESAL Applications	Asphalt Concrete (inches)	Aggregate Base (inches)
Car Parking Areas	10,000 to 30,000	3	8
Light Truck Loading Areas	30,000 to 60,000	3	10
Moderate Truck Loading Areas	60,000 to 100,000	5	12

It should be recognized that some maintenance of the pavement is likely. This is particularly true where significant turning occurs or where heavy vehicles are stored. The aggregate base should have an 'R' value of 78 or more, and should be compacted to 98 percent or more of its maximum dry density as evaluated by ASTM D 698-91. The asphalt and aggregate base (AB) materials and construction should conform to Section 702 Maricopa Association of Governments (MAG) Uniform Standard Specifications.

10.10.2. Portland Cement Concrete Pavement

Table 6 provides recommended portland cement concrete (PCC) pavement sections for "low", "medium" and "high" traffic level as defined in Chapter 4 *AASHTO Guide for Design of Pavement Structures*, 1993.

Table 6 - Recommended Portland Cement Concrete Pavement Sections

Proposed Facility	18-kip ESAL Applications	PCC Section Thickness (inches)
Car Parking Areas	10,000 to 30,000	6
Light Truck Loading Areas	30,000 to 60,000	6
Moderate Truck Loading Areas	60,000 to 100,000	8

The edges of the PCC pavement section should be 2 inches or more in excess of the above-recommended values. The concrete should have a 28-day strength of 3,000 pounds per square inch (psi) or more. The pavement reinforcement should be designed by the project structural engineer. The concrete pavements should have longitudinal and transverse joints that meet the applicable requirements of the MAG Uniform Standard Specifications. Concrete pavements in truck zones should be underlain by 8 inches or more of aggregate base that meets MAG Specifications Section 702.

10.10.3. Pavement Subgrade Preparation

It is anticipated that the clayey near-surface soil materials disclosed in some of the borings will offer relatively poor pavement support characteristics and may be difficult to compact under adverse moisture conditions. The ground surface should be prepared by removing organic matter, obstructions, or subsurface structures that may interfere with compaction of the areas to be paved. Subsurface obstructions should be removed and replaced with compacted fill. The pavement sections should be supported pads of compacted engineered fill materials, as described in Section 10.1.4

If upon grading, the subgrade materials are found to differ from anticipated subgrade materials, the pavement section recommendations provided in this report may not be valid. The project geotechnical engineer should observe the finished subgrade materials and evaluate whether the recommendations provided in this report apply. Positive site drainage should be considered in the design and construction of the facility. Water should not be allowed to pond or seep into the ground near pavement sections. If planters or landscaping are located adjacent to paved areas, measures should be taken to reduce the potential for water to enter the pavement section.

10.11. Corrosion Potential

The corrosion potential of the on-site materials was analyzed to evaluate its potential effect on the foundations and structures. The corrosion potential was evaluated using the results of laboratory testing on representative samples obtained during our subsurface evaluation.

Our laboratory corrosivity testing consisted of analyzing one sample for pH, minimum electrical resistivity, and chloride and soluble sulfate content. The pH and minimum electrical resistivity tests were performed in accordance with Arizona Test 2366, while sulfate and chloride tests were performed in accordance with Arizona Test 733 and 736, respectively. The results of the laboratory corrosivity tests are presented in Appendix B.

Test results indicate a pH value of 7.4, which are indicative of alkaline conditions. The minimum resistivity was evaluated as 214 ohm-cm, indicate that the soils tested may be corrosive to ferrous materials. The measured water-soluble chloride concentrations was 1,140 parts per million (ppm), indicating a corrosion potential.

Based on the above test results, the importance of the project, and service lifetime, we recommend that a corrosion specialist be consulted for project and site-specific recommendations for the protection of structures against corrosion. Recommendations for mitigating sulfate attack on concrete are presented in Section 10.12.

10.12. Concrete

Concrete in contact with soil, or water that contains high concentrations of soluble sulfates, can be subject to chemical and/or physical deterioration. Based on the UBC criteria (UBC, 1997), the potential for sulfate attack is negligible for water-soluble sulfate contents in soil ranging from 0.00 to 0.10 percent by weight (0 to 1,000 ppm), and moderate for water-soluble sulfate contents ranging from 0.10 to 0.20 percent by weight (1,000 to 2,000 ppm). The potential for sulfate attack is severe for water-soluble sulfate contents ranging from 0.20 to 2.00 percent by weight (2,000 to 20,000 ppm), and very severe for water-soluble sulfate contents over 2.00 percent by weight (greater than 20,000 ppm).

The soil samples tested for this evaluation using Arizona Test 733 indicated a water-soluble sulfate content of 0.029 percent. Accordingly, the soils are considered to have a negligible potential for sulfate attack.

Based on the test results and in accordance with Table 19-A-3 of the 1997 UBC, Type II cement may be used in the construction of the concrete structures at the site. However, we recommend Type V cement be considered, as the near-surface soils may contain higher sulfate contents due to sulfur emissions from plant processes and facility operations. Concrete for foundations and slabs–on–grade should have a water-cementitious materials ratio no greater than 0.5 by weight for normal weight aggregate concrete and a 28-day compressive strength of 4,000 pounds per square inch (psi) or more.

In order to reduce the potential for shrinkage cracks in the concrete during curing, we recommend that the slabs-on-grade be placed with a slump in accordance with specifications provided by the project structural engineer. If a higher slump is needed for screeding and leveling, a super plasticizer is recommended to achieve the higher slump without changing the water to cement ratio. The slump should be checked periodically at the site prior to concrete placement. We also recommend that crack control joints be provided in slabs in accordance with the recommendations of the structural engineer to reduce the potential for distress due to minor soil movement and concrete shrinkage. We further recommend that concrete cover over reinforcing steel for slabs-on-grade and foundations should be in accordance with UBC 1907.7.1. The structural engineer should be consulted for concrete specifications.

10.13. Site Drainage

Surface drainage should be provided to divert water away from structures and off pavement surfaces. Surface water should not be permitted to drain toward the structures or to pond adjacent to footings or on pavement areas. Positive drainage is defined as a slope of 2 percent or more for a distance of 5 feet or more away from the structures. Roof gutters should be installed on structures. Downspouts should discharge to controlled drainage systems away from structures, pavements, and flatwork.

11. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

The objective of this evaluation was to develop preliminary geotechnical information to be of used to potential engineering, procurement, and construction (EPC) contractors as they prepare their proposals for this project. Therefore, our evaluation was limited in scope and is not sufficient for final design purposes. Additional geotechnical evaluation(s) will be needed prior to final design. The additional evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

12. SELECTED REFERENCES

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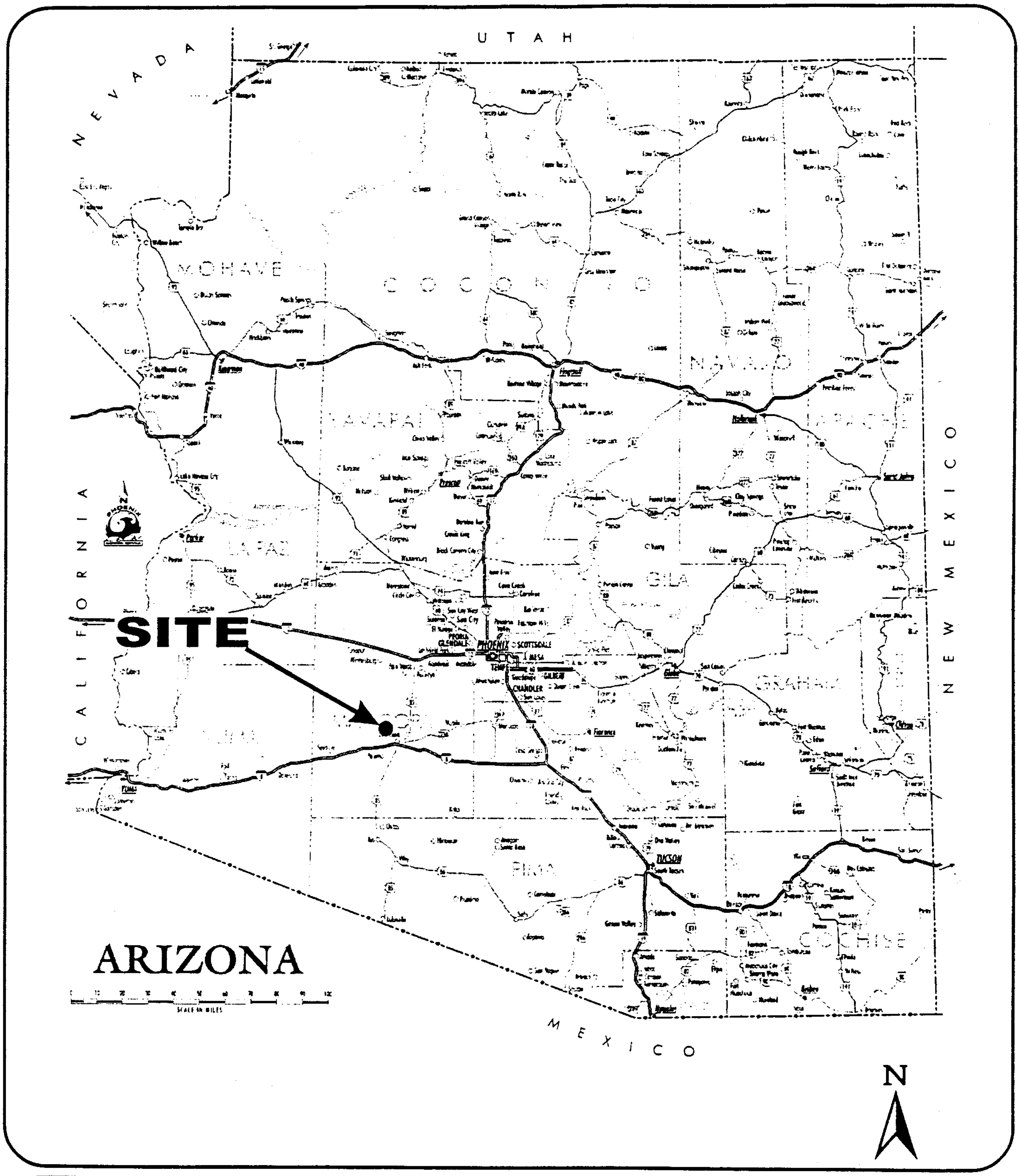
AERIAL PHOTOGRAPHS

Source	Date	Scale/Resolution
United States Geological Survey	7/1/81	16 meter
United States Geological Survey	6/8/96	16 meter



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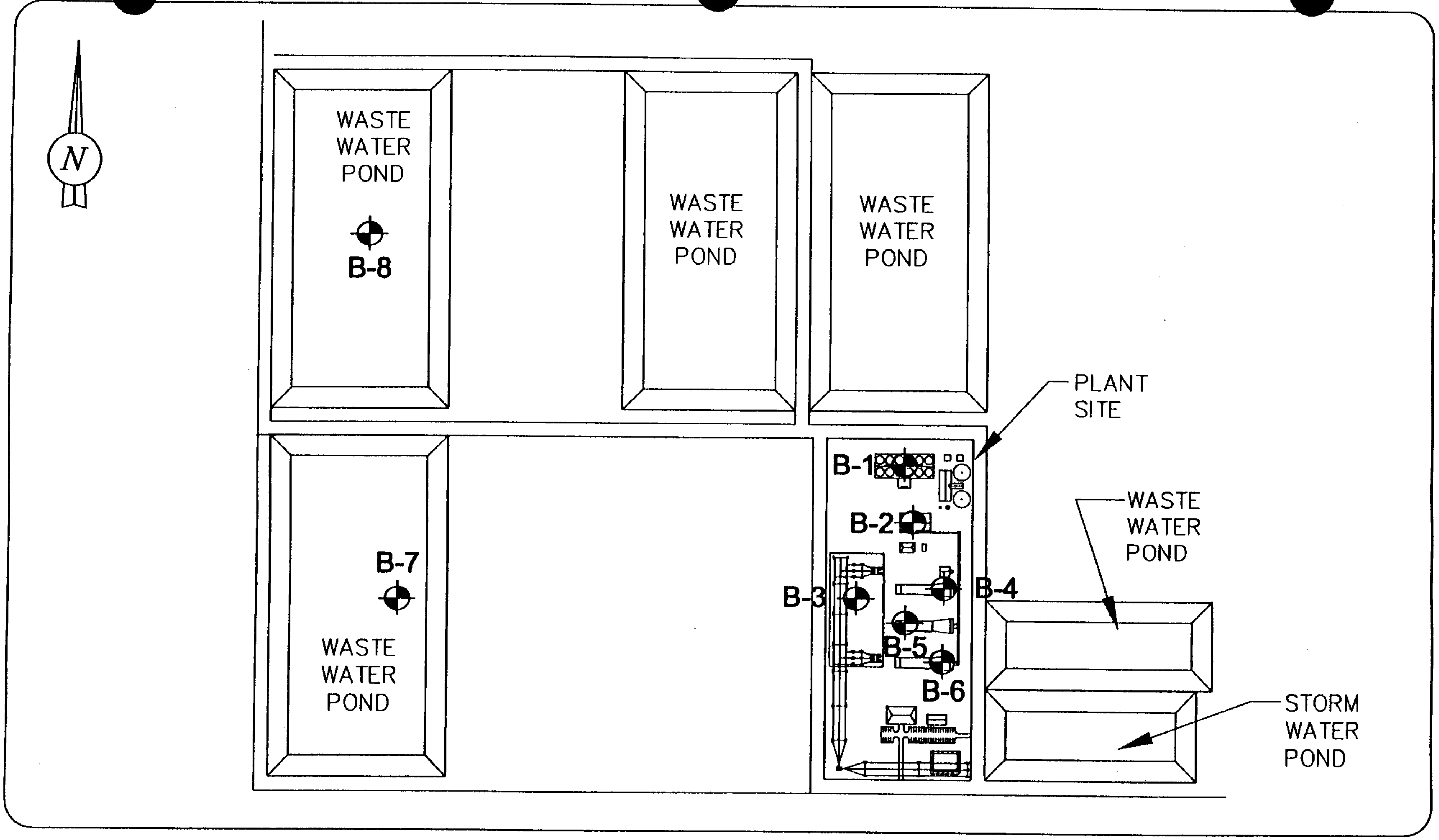
Ninyo & Moore

SITE LOCATION MAP

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	1



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LEGEND

B-8 BORING LOCATIONS

0 500 1000
APPROX. SCALE FEET

BORING LOCATION MAP

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE
600150-01	11/00

FIGURE 2

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples
Disturbed soil samples were obtained in the field using the following methods.

The Standard Penetration Test Spoon (Borings)
Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test spoon sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The spoon was driven up to 18 inches into the ground with a 140-pound or a 280-pound hammer free falling from a height of 30 inches in general accordance with ASTM D 1586-84. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the spoon, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples
Relatively undisturbed soil samples were obtained in the field using the following methods.

The Modified Split-Barrel Drive Sampler (Borings)

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound or a 280-pound hammer free falling from a height of 30 inches in general accordance with ASTM D 3550-84. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer or bar, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED ______ BORING NO. PATTERNS GROUND ELEVATION ______ SHEET 1 OF 1 METHOD OF DRILLING ______ DRIVE WEIGHT ______ DROP ______ SAMPLED BY ______ LOGGED BY ______ REVIEWED BY ______ **DESCRIPTION/INTERPRETATION**
0								SOILS
							GW	(GW:G3N) = well graded GRAVEL
							GP	(GP:G) = poorly graded GRAVEL, sandy gravel, aggregate base
							GM	(GM:GZ) = silty GRAVEL
							GC	(GC:OG) = clayey GRAVEL
							SW	(SW:D) = well graded SAND
							SP	(SP:S) = poorly graded SAND
							SM	(NZ) = silty SAND
6							SC	(NO) = clayey SAND
							CL	(O) = low plasticity CLAY or just CLAY
							ML	(Z) = silt
							OL	(4) = low plasticity organic SILT
							CH	(C) = high plasticity CLAY
							MH	(M) = plastic SILT
							OH	(5) = high plasticity organic CLAY
							PT	(Q) = peat
								ROCKS AND CONCRETE
12								(I) = SILTSTONE (clayey SILTSTONE, sandy SILTSTONE, etc.)
								(1) = SANDSTONE (silty SANDSTONE, clayey SANDSTONE, etc.)
								(H) = CLAYSTONE (sandy CLAYSTONE, silty CLAYSTONE, etc.)
								(O12) = BRECCIA rock with angular and/or gravel- or cobble-sized clasts
								(B) + (1) = CONGLOMERATE
								(>) = SHALE or SLATE
								(/) = GRANITIC ROCK or BONSALL TONALITE
								(2) = METAVOLCANIC (or VOLCANIC) ROCK
								(2+I) = VOLCANIC TUFF
18								(V) = GABBROIC ROCK or other intrusive igneous rock
								(P) = ASPHALT CONCRETE
								(9) = CONCRETE
				▽				(WATER) Water table during drilling.
				▼				(FWATER) Water table at boring completion.
								(%) = CALICHE
								(.) = GYPSUM
								(S) = SCHIST
24								

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BORING LOG

LEGEND FOR BORING LOGS

PROJECT NO.	DATE	FIGURE
PATTERNS	REV. 5/99	A-i

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.

DATE DRILLED ______ BORING NO. SYMBOL SAMPLES

GROUND ELEVATION ______ SHEET 1 OF 1

METHOD OF DRILLING ______

DRIVE WEIGHT ______ DROP ______

SAMPLED BY ______ LOGGED BY ______ REVIEWED BY ______

DESCRIPTION/INTERPRETATION

Depth (feet)	Blows/Foot	Description/Interpretation
0		Solid line denotes unit change.
		Dashed line denotes material change.
		Modified split-barrel drive sampler.
		No recovery with modified split-barrel drive sampler.
5		Seepage.
		Groundwater encountered during drilling.
		Groundwater measured after drilling.
		Standard Penetration Test (SPT).
10		No recovery with a SPT.
	XX/ XX	Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
		No recovery with Shelby tube sampler.
15		Bulk sample.
20		The total depth line is a solid line that is drawn at the bottom of the boring.

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BORING LOG

EXPLANATION OF BORING LOG SYMBOLS

PROJECT NO.	DATE	FIGURE
SYMSAMP	Rev. 5/99	A-ii

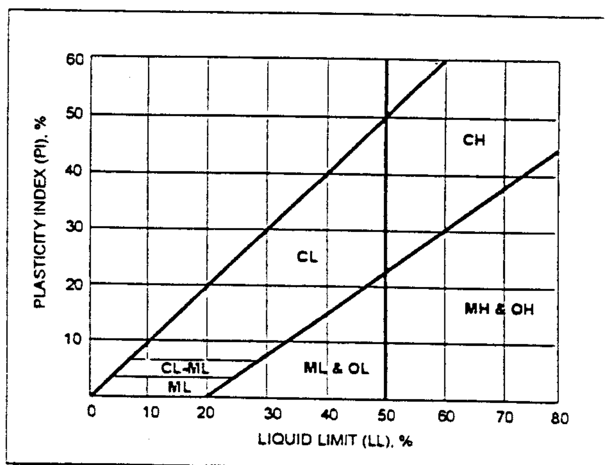
U.S.C.S. METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (More than 1/2 of soil >No. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction <No. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than 1/2 of soil <No. 200 sieve size)	SILTS & CLAYS Liquid Limit <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS Liquid Limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

CLASSIFICATION CHART (Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL Coarse Fine	3" to No.4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND Coarse Medium Fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

GRAIN SIZE CHART



PLASTICITY CHART

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SP-SC	ALLUVIUM: Light brown, damp, very dense, fine to coarse SAND; little gravel; few clay.
			39					
5			28	2.1	101.0			Medium dense.
			70/7"				SM	Light brown, dry to damp, very dense, silty SAND; little gravel.
10			86/11"					
15			71/11"	1.6	124.0		SP	Light brown, dry to damp, very dense, fine to coarse SAND; little gravel.
20								

DATE DRILLED 10/12/00 BORING NO. B-1

GROUND ELEVATION ______ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-1

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 10/12/00 BORING NO. B-1 GROUND ELEVATION ______ SHEET 2 OF 2 METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30" SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______ **DESCRIPTION/INTERPRETATION**
20			50/1"				SP	ALLUVIUM: (Continued) Light brown, damp, very dense, fine to coarse SAND.
								Total Depth = 20.1 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-2

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	<u>ALLUVIUM</u>: Light brown, damp, very dense, silty SAND; some gravel.
			45					
5			40					Less fines.
			34					
10			80					
15			48					
								Very difficult drilling between 18' and 20'; large cobbles.

DATE DRILLED 10/12/00 BORING NO. B-2

GROUND ELEVATION ______ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.

DATE DRILLED 10/12/00 BORING NO. B-2

GROUND ELEVATION ______ SHEET 2 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DESCRIPTION/INTERPRETATION

Depth (feet)	Blows/Foot	Classification U.S.C.S.	Description/Interpretation
20	50/1"	SM	ALLUVIUM: (Continued) Light brown, damp, very dense, silty SAND; large cobbles. Very difficult drilling between 20' and 23'; large cobbles. Moist.
25	77/11"	SP	Brown, saturated, very dense, fine to coarse SAND; little gravel.
			Total Depth = 26.4 feet. Groundwater encountered at approximately 24 feet. Backfilled on 10/12/00.
30			
35			
40			

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-4

DATE DRILLED 10/12/00 BORING NO. B-3
GROUND ELEVATION ______ SHEET 1 OF 1
METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger
DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"
SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							GC	ALLUVIUM: Brown, dry to damp, very dense, clayey GRAVEL; some sand.
		X	64					
5							SP-SM	Brown, damp, medium dense, fine to coarse SAND; little gravel; few silt.
		X	33					
		X	35					
10		X	50/5"					Very dense.
15		X	50/6"					
								Difficulty drilling between 17' to 19'.
		X	50/1"					
								Total Depth = 19.1 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
20								

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-5

DATE DRILLED	10/12/00	BORING NO.	B-4
GROUND ELEVATION		SHEET 1 OF 1	
METHOD OF DRILLING	CME 75, 8" Diameter Hollow-Stem Auger		
DRIVE WEIGHT	140 lb. (Auto Trip Hammer)	DROP	30"
SAMPLED BY CRP	LOGGED BY CRP	REVIEWED BY	

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Light brown, dry to damp, very dense, silty SAND; few gravel; trace clay.
			71/11"	2.3	135.6			
5			70/11"					
			62	1.4				Less fines with depth.
			59					
15			75/9"					
								Very difficult drilling between 16' to 18'.
			50/1"					
								Total Depth = 18 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-6

DATE DRILLED	10/12/00	BORING NO.	B-5
GROUND ELEVATION		SHEET 1 OF 2	
METHOD OF DRILLING	CME 75, 8" Diameter Hollow-Stem Auger		
DRIVE WEIGHT	140 lb. (Auto Trip Hammer)	DROP	30"
SAMPLED BY CRP	LOGGED BY CRP	REVIEWED BY	

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Light brown, dry to damp, very dense, silty fine to medium SAND; little gravel.
			80/9"	2.8	116.1			
							GP	Light brown, dry to moist, medium dense, fine to coarse, sandy GRAVEL; few silt.
5			24	1.2				
			50					
10			50/5"					Very dense.
15								Medium dense.
			50/5"					
								Difficult drilling between 16' and 20'.
20								

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-7

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		X	50/5"				GP	ALLUVIUM: (Continued) Light brown, dry to damp, very dense, fine to medium sandy GRAVEL; few silt.
								Total Depth = 20.4 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								
40								

DATE DRILLED 10/12/00 BORING NO. B-5

GROUND ELEVATION ______ SHEET 2 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-8

DATE DRILLED 10/12/00 BORING NO. B-6

GROUND ELEVATION ______ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SP-SC	ALLUVIUM: Light brown, dry to damp, very dense, fine to coarse SAND; little gravel; few clay.
		79					
5		41	2.5	114.9			Medium dense.
						SM	Brown, dry to damp, very dense, silty fine to coarse SAND; some gravely small weakly cemented zones.
		63/10"					
10		61	1.1			SP	Brown, damp, dense, fine to coarse SAND; some gravel; trace silt and clay.
15		50/6"					Very dense; rock stuck in sampler; weakly cemented chunk in sampler.
							Difficulty drilling between 16' and 18'.
20							

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-9

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		X	50/6"				SP	ALLUVIUM: (Continued) Brown, dry to damp, very dense, fine to coarse SAND; some gravel.
								Total Depth = 20.5 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								
40								

DATE DRILLED 10/12/00 BORING NO. B-6

GROUND ELEVATION ______ SHEET 2 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-10

DATE DRILLED 10/12/00 BORING NO. B-7

GROUND ELEVATION ______ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Light brown, dry to damp, very dense, silty SAND; some gravel; little clay.
			82					
5			65					Dense.
			29					Medium dense.
10			21					Dense; decrease in fines.
15			17	1.8	120.2		SP	Brown, damp, medium dense, fine to coarse SAND; some gravel; trace silt.
20								

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-11

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 10/12/00 BORING NO. B-7 GROUND ELEVATION ______ SHEET 2 OF 2 METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30" SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______ **DESCRIPTION/INTERPRETATION**
20		☒	50/4"				SP	ALLUVIUM: (Continued) Brown, moist, very dense, fine to coarse SAND; some gravel.
								Total Depth = 20.4 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								
40								

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BORING LOG		
GILA BEND POWER PLANT GILA BEND, ARIZONA		
PROJECT NO. 600150-01	DATE 11/00	FIGURE A-12

DATE DRILLED 10/12/00 BORING NO. B-8

GROUND ELEVATION ______ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SP	ALLUVIUM: Light brown, damp, loose, fine to medium SAND; some gravel; trace silt.
			6					
5			23	2.2	113.4			Medium dense.
			48	1.4	121.3			Dense.
10			25					Medium dense.
15			30					

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-13

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 10/12/00 BORING NO. B-8 GROUND ELEVATION ______ SHEET 2 OF 2 METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30" SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______ DESCRIPTION/INTERPRETATION
20		/	50/5"				SP	ALLUVIUM: (Continued) Brown, damp, very dense, fine to coarse SAND; some gravel; trace silt.
								Total Depth = 20.4 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								
40								

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-14

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System in general accordance with ASTM D 2488-93. Soil classifications are indicated on the logs of the exploratory excavations in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory excavations were evaluated in general accordance with ASTM D 2937-94. The test results are presented on the logs of the exploratory excavations in Appendix A.

Gradation Analysis

A gradation analysis test was performed on a selected representative soil sample in general accordance with ASTM D 422-63. The grain-size distribution curves are shown on Figures B-1 through B-9. The test result was utilized in evaluating the soil classifications in accordance with the Unified Soil Classification System.

Atterberg Limits

Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318-98. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System. The test results and classifications are shown on Figure B-10.

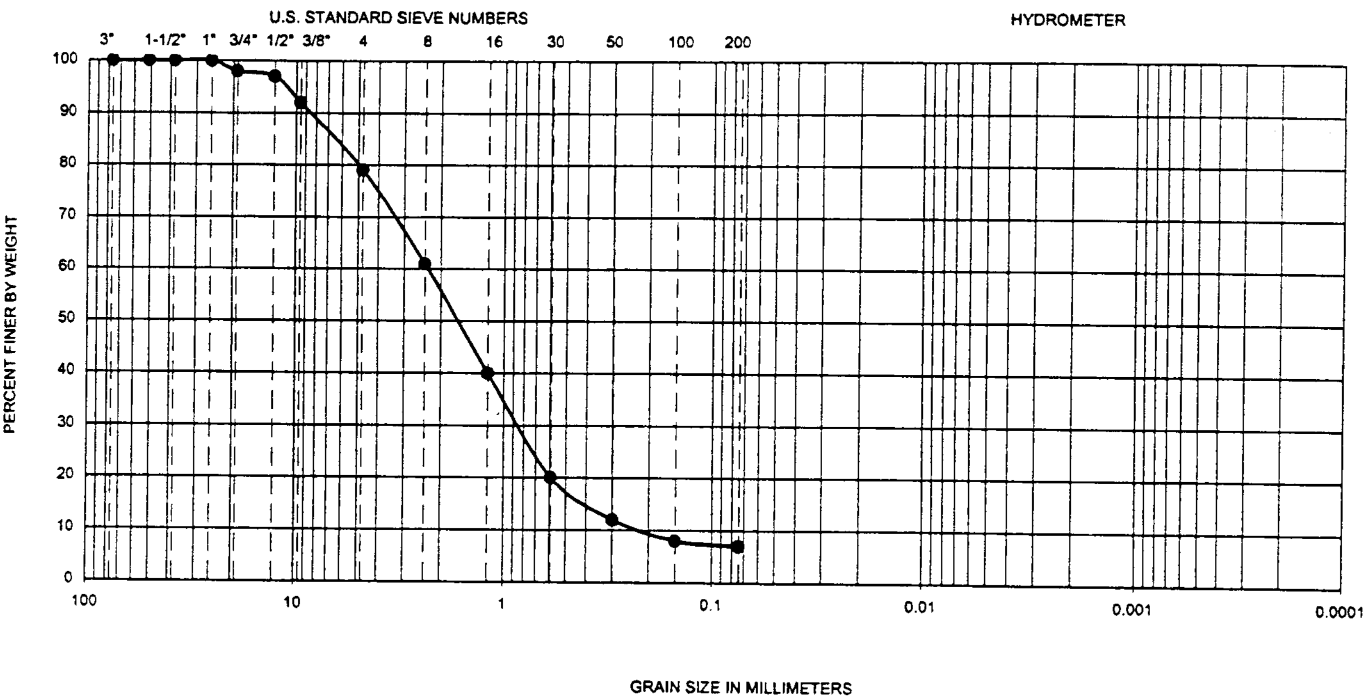
Consolidation Tests

Consolidation tests were performed on selected relatively undisturbed soil samples in general accordance with ASTM D 2435-90. The samples were inundated during testing to represent adverse field conditions. The percent of consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. The results of the tests are summarized on Figures B-11 and B-12.

Soil Corrosivity Tests

Soil pH, and minimum resistivity tests were performed on representative samples in general accordance with Arizona Test 2366. The chloride content of selected samples was evaluated in general accordance with Arizona Test 736. The sulfate content of selected samples was evaluated in general accordance with Arizona Test 733. The test results are presented on Figure B-13.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-1	5-6.5	—	—	NP	0.20	0.90	2.40	12.0	1.7	7	SP-SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

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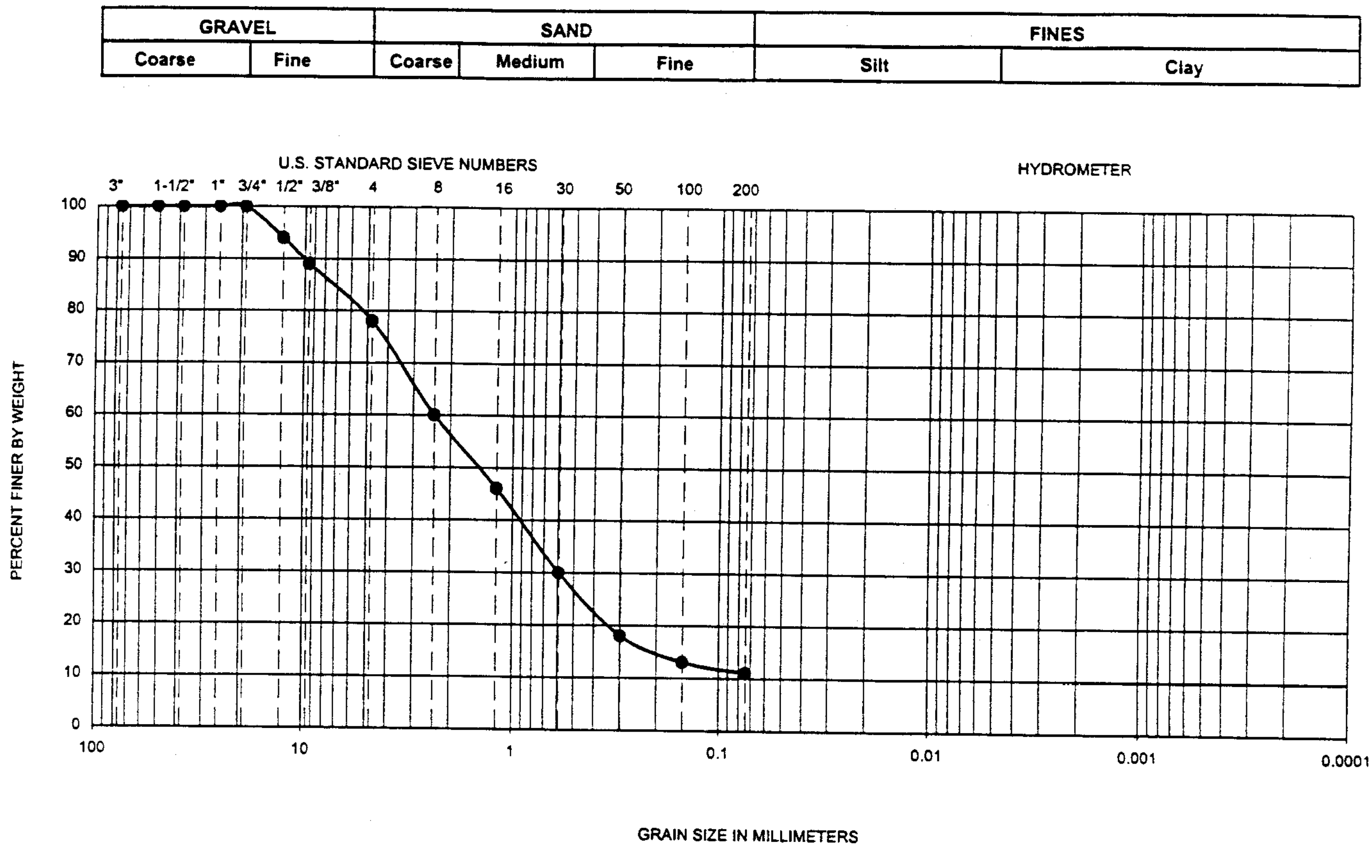
GRADATION TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA
CITY, STATE

PROJECT NO.	DATE
600150-01	11/2000

FIGURE
B-1

SIEVE B-1, 5'.xls



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-3	10-10.4	—	—	NP	0.07	0.60	2.40	34.3	2.1	11	SP-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

Ninyo & Moore

GRADATION TEST RESULTS

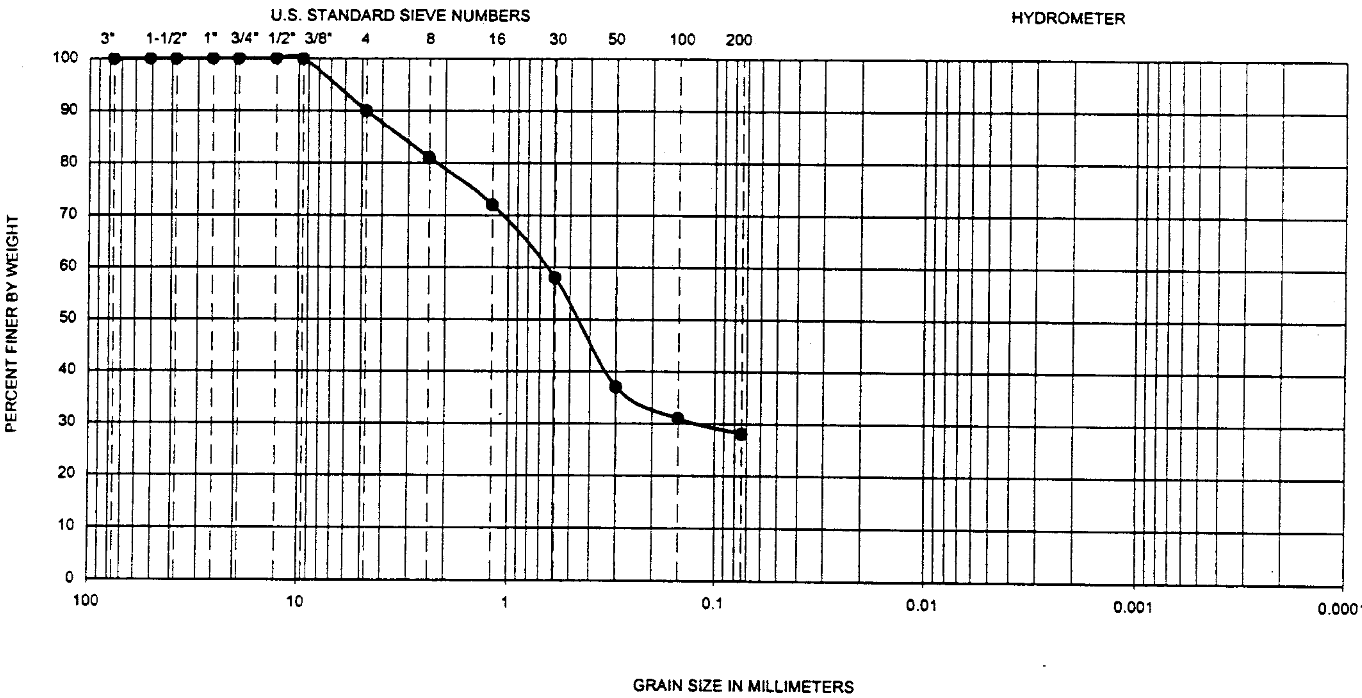
GILA BEND POWER PLANT
GILA BEND, ARIZONA
CITY, STATE

PROJECT NO.	DATE
600150-01	11/2000

FIGURE B-2

SIEVE B-3,10'.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-4	7.5-8.5	—	—	NP	–	–	–	–	–	28	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

Ninyo & Moore

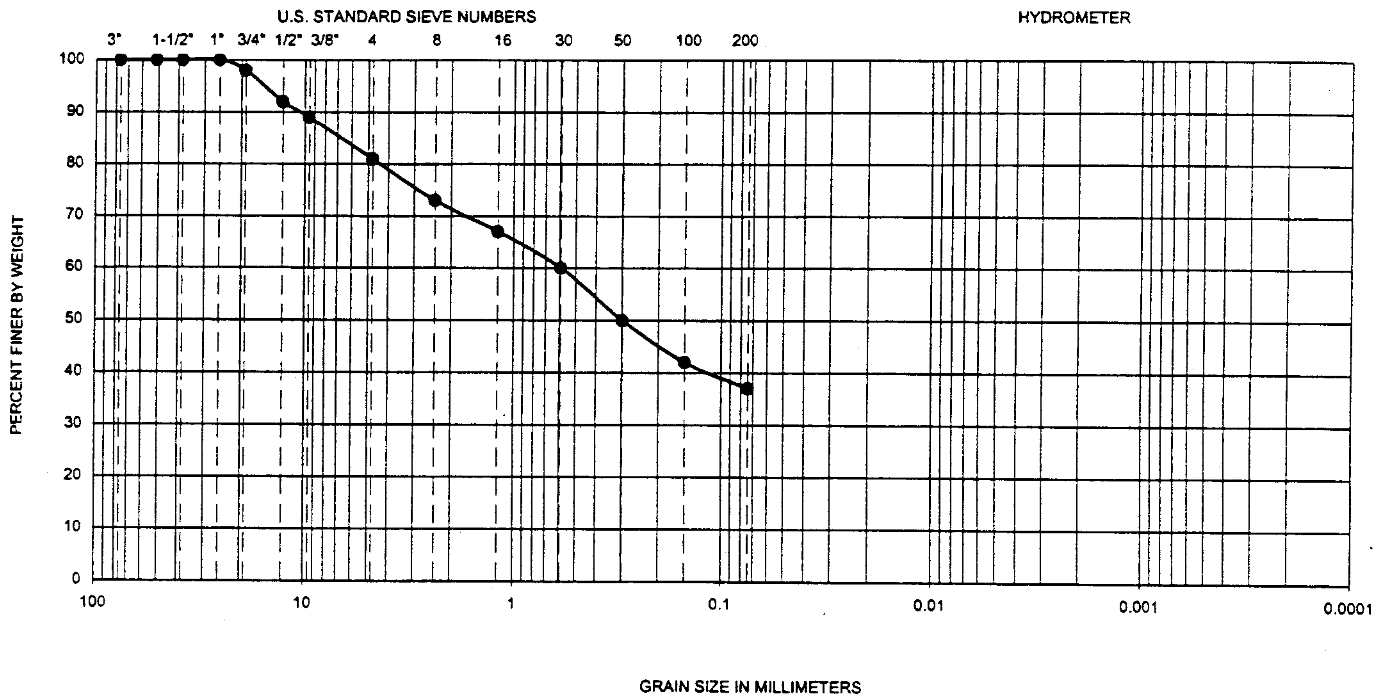
GRADATION TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA
CITY, STATE

PROJECT NO.	DATE	FIGURE
600150-01	11/2000	B-3

SIEVE B-4, 7.5'.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-5	2.5-3.2	—	—	NP	0.07	0.60	2.40	34.3	2.1	37	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

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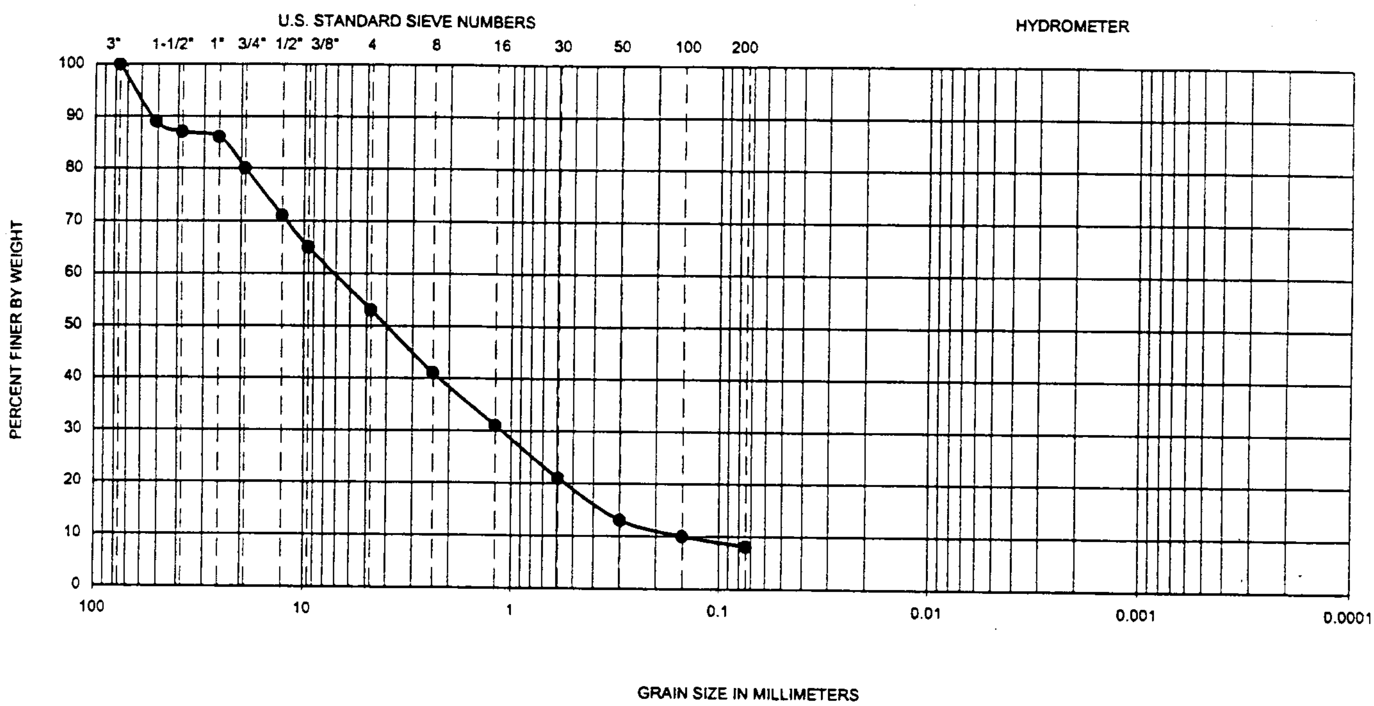
GRADATION TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA
CITY, STATE

PROJECT NO.	DATE	FIGURE
600150-01	11/2000	B-4

SIEVE B-5, 2.5'.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-5	5-6.5				0.15	1.10	7.10	47.3	1.1	8	GP

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

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GRADATION TEST RESULTS

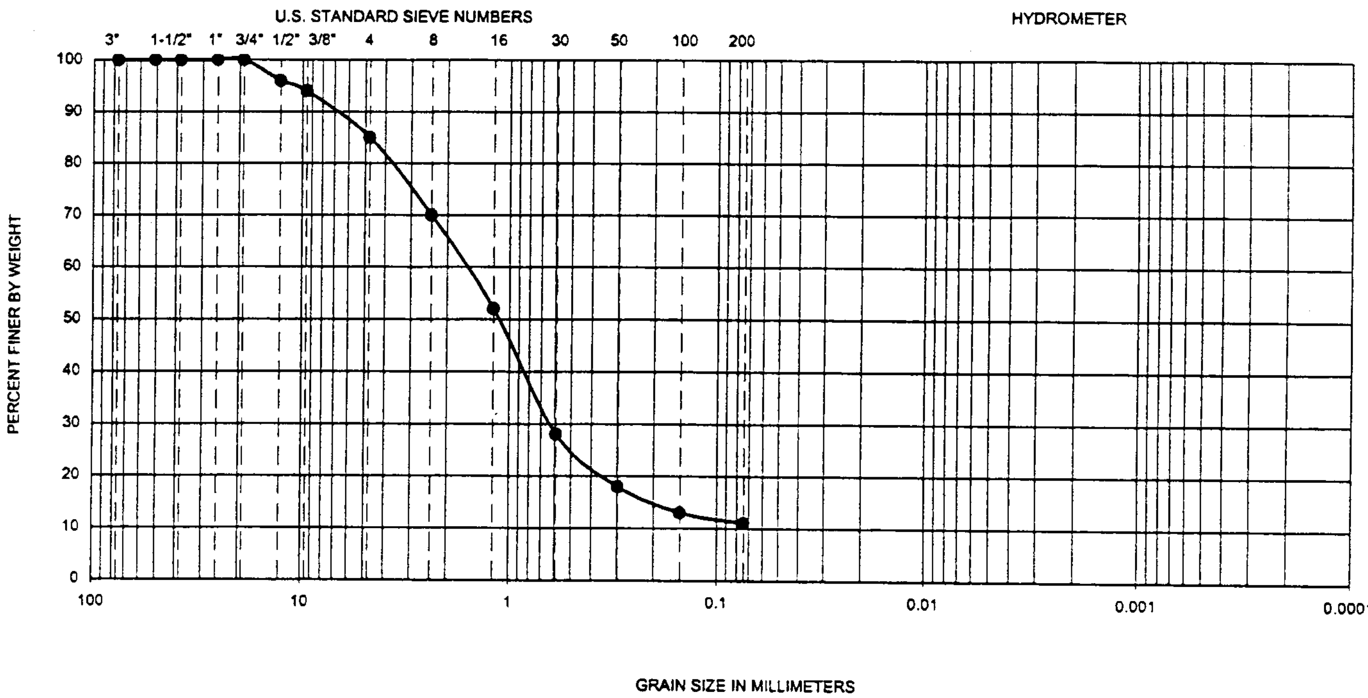
GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE
600150-01	11/2000

FIGURE
B-5

SIEVE B-5, 5'.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-6	5-6.5	---	---	NP	0.07	0.62	1.50	21.4	3.7	11	SP-SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

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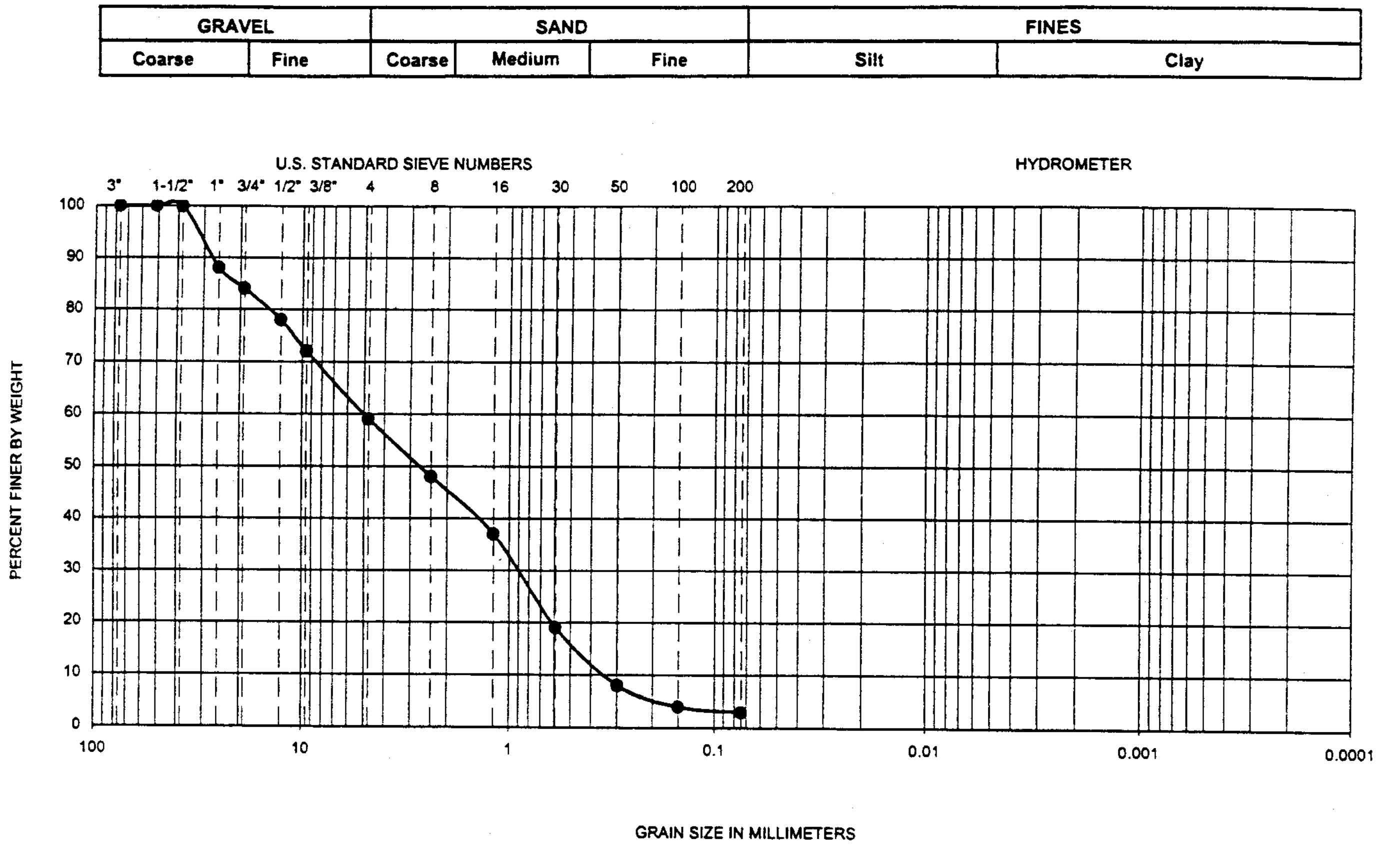
GRADATION TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/2000	B-6

SIEVE B-6. 5'.xls



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-6	10-11.5				0.35	0.90	4.76	13.6	0.5	3	SP

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

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GRADATION TEST RESULTS

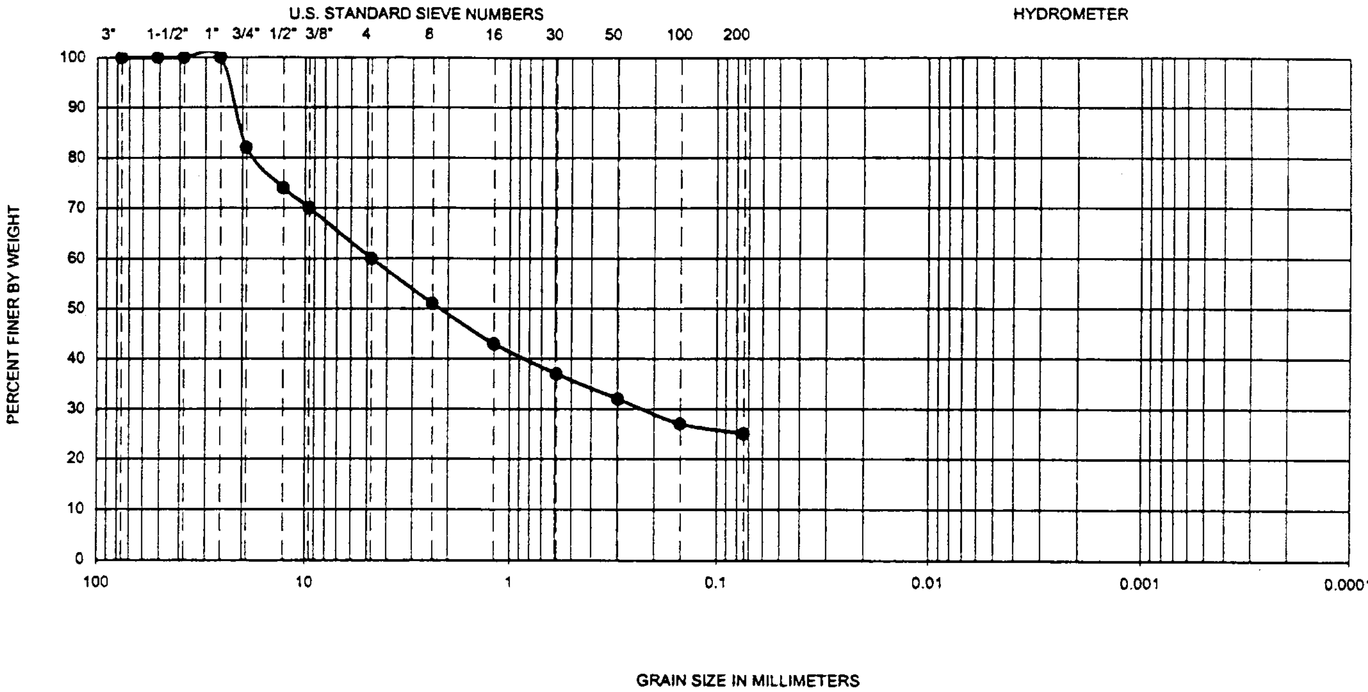
GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE
600150-01	11/2000

FIGURE B-7

SIEVE B-6, 10'.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-7	2.5-3.5				--	--	--	--	--	25	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

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GRADATION TEST RESULTS

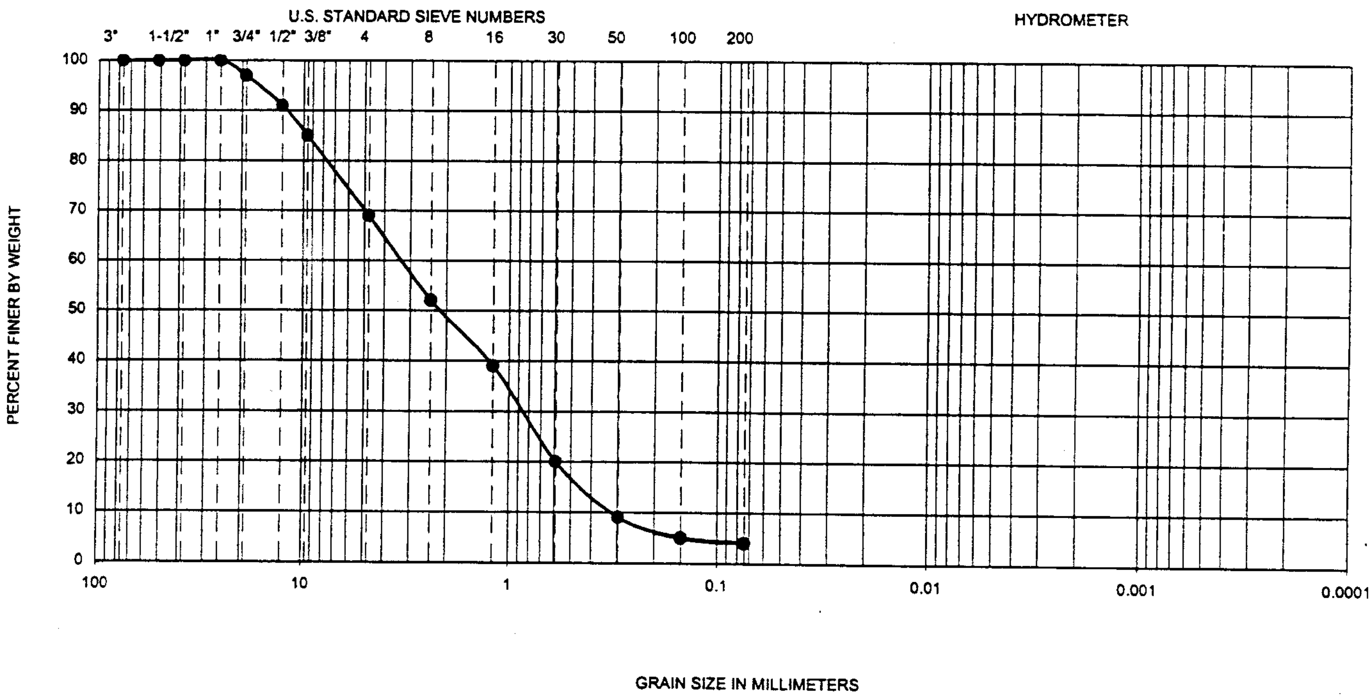
GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE
600150-01	11/2000

FIGURE
B-8

SIEVE B-7, 2.5'.xls

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-8	5-6.5				0.30	0.90	3.50	11.7	0.8	4	SP

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

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GRADATION TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA

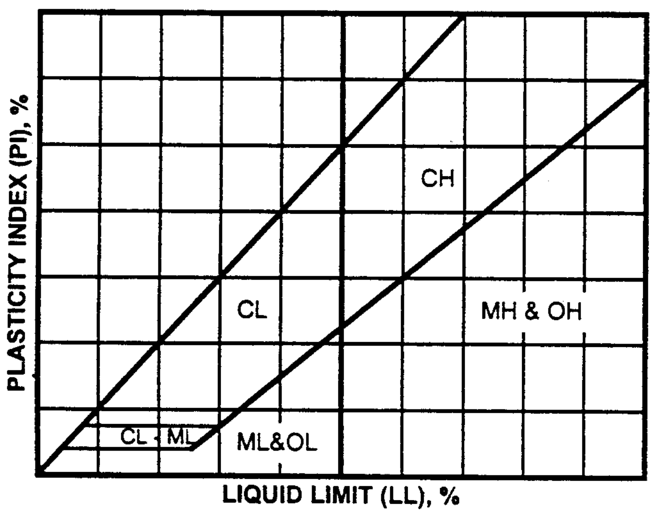
PROJECT NO.	DATE
600150-01	11/2000

FIGURE
B-9

SIEVE B-8, 5'.xls

SYMBOL	LOCATION	DEPTH (FT)	LL (%)	PL (%)	PI (%)	U.S.C.S. CLASSIFICATION (Minus No. 40 Sieve Fraction)	U.S.C.S. (Entire Sample)
	B-1	5-6.5	----	----	----	NP	SP-SC
	B-3	10-10.4	----	----	----	NP	SP-SM
	B-4	7.5-8.5	----	----	----	NP	SM
	B-5	2.5-3.2	----	----	----	NP	SM
	B-6	5-6.5	----	----	----	NP	SP-SC

NP - Indicates non-plastic



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318-98

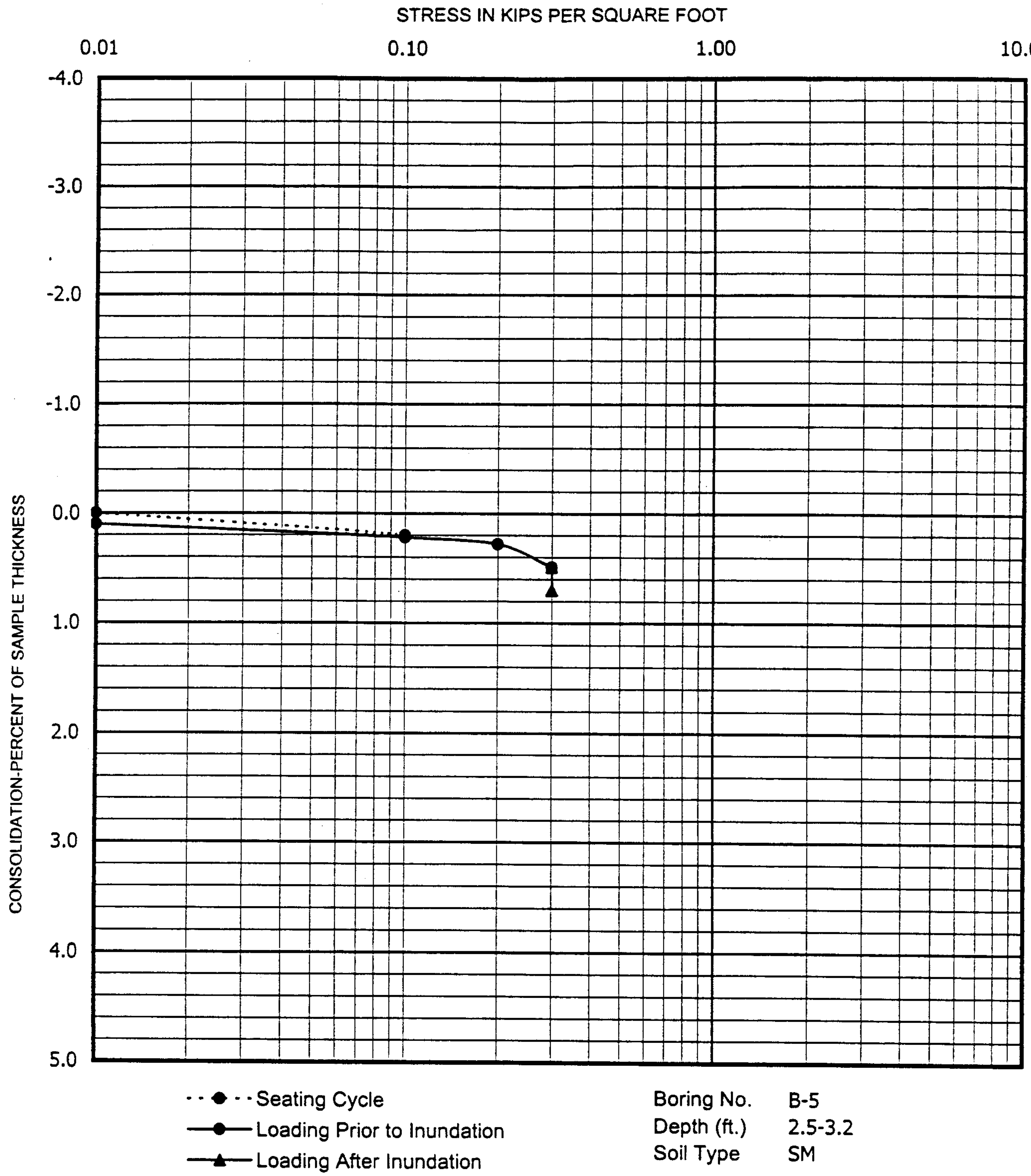
Ninyo & Moore

ATTERBERG1.xls

ATTERBERG LIMITS TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/2000	B-10



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435-90

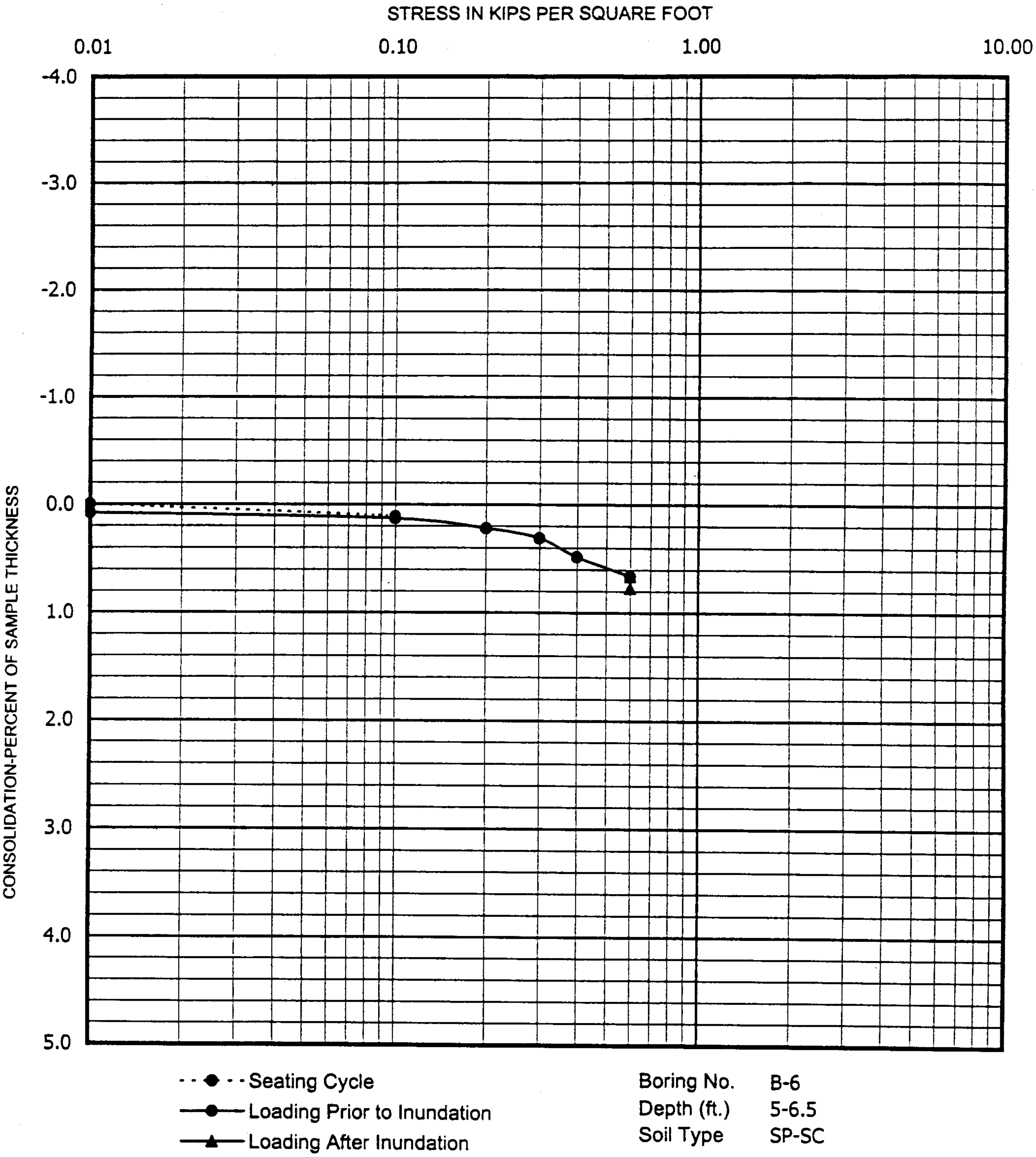
Ninyo & Moore

CONSOLIDATION B-5, 2.5'.xls

CONSOLIDATION TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/2000	B-11



Boring No. B-6
Depth (ft.) 5-6.5
Soil Type SP-SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435-90

Ninyo & Moore

CONSOLIDATION B-6, 5'.xls

CONSOLIDATION TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE
600150-01	11/2000

FIGURE B-12

CORROSIVITY TEST RESULTS

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH *	RESISTIVITY * (ohm-cm)	WATER-SOLUBLE SULFATE CONTENT IN SOIL ** (%)	CHLORIDE CONTENT *** (ppm)
B-1	0-5	7.4	214	0.029	1140

* PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD 2366
** PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD 733
*** PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD 736

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CORROSIVITY1.xls

CORROSIVITY TEST RESULTS

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/2000	B-13

APPENDIX C

FIELD RESISTIVITY MEASUREMENTS

Soil resistivity information of the subsurface materials was obtained at the site near boring location B-4. The data were collected in general in accordance with ASTM G57 using a MINIRES Resistivity Meter and four electrodes in a Wenner configuration. The MINIRES can generate up to 500 volts and 5 mA, at a switching frequency of 30 Hertz. The instrument allows for the direct measurement of resistance in ohms.

Soil resistance measurements were collected at electrode spacings of 5, 10, 20, and 40 feet, along two perpendicular traverses, generally oriented north-south and east-west, at each of the locations. The accompanying table presents the results of the resistance measurements, at each electrode spacing, along with the calculated apparent resistivity. In general, good agreement between orthogonal traverses was noted indicating a fairly homogenous medium.

Line No. (Boring)	Spacing (ft)	Resistance (ohms)	Apparent Resistivity (ohm-cm)	Apparent Resistivity (ohm-ft)
1 (north/south)	5	73.00	69,898	2,293
(B-4)	10	14.00	26,810	880
	20	7.00	26,810	880
	40	2.00	15,320	503
1 (east/west)	5	48.00	45,960	1,508
(B-4)	10	14.00	26,810	880
	20	8.00	30,640	1,005
	40	2.00	15,320	503

APPENDIX B

SUPPORTING CALCULATIONS

Gila Bend Power Project **Preliminary Water Balance Worksheet**			**10/20/00**
Inlet Cooling Water - (gal/yr) (total gpm) (gpm/unit)	21,759,840	75	25
Inlet Cooling Water Blowdown - (gal/yr) (total gpm) (gpm/unit)	4,351,968	15	5
CT Water Wash - (gal/yr) (gpm/unit)	300000		200
Boiler Makeup - (gal/yr) (gpm) (lb/hr)	24,142,613	50	25,000
Boiler Blowdown - (gal/yr) (gpm) (lb/hr)	1,207,131	2	
Auxilliary Process Blowdown - (gal/yr) (gpm)	21,759,840	45	
Cooling Tower Flow - (gpm)		161,600	
Tower Evaporation/Drift - (gal/yr) (gpm)	1,562,840,064	3,232	
Tower Blowdown - (gal/yr) (gpm)	390,710,016	808	
Total Tower Loss - (gal/yr) (gpm)	1,953,550,080	4,040	
Total Water Consumption - (gal/yr) (gpm)	2,021,512,373	4,181	
Total Water Consumption - (ac.ft./yr)	6,204		
Total Water to Ponds - (gal/yr) (gpm)	416,821,824	862	
Total Water to Ponds - (ac.ft./yr)	1,279		
Total Water to Ponds - (ac.ft./day)	3.505		
Total Water to Pond - (in/day)	0.513		
Natural Evaporation - (in/day)	0.328		
Augmented Evaporation - (in/day)	0.184		

Gila Bend Power Project Preliminary Water Balance Assumptions	10/20/00
Plant Availability =	**92.0%**
Operating Hours =	**8,059**
Inlet Cooling Hours =	**4,836**
CT Water Wash Frequency/Yr =	**50**
CT Water Wash Duration/Min =	**10**
Combustion Turbines (GE Frame 7 (FA) =	**3**
240 mW Steam Turbine =	**1**
Boiler Blowdown (%) =	**5.0%**
Inlet Cooler Blowdown (%) =	**20.0%**
Approximate Water TDS =	**1,100**
Cooling Tower Cycles =	**15**
Cooling Tower Blowdown Rate (Total Flow) =	**0.50%**
Cooling Tower Evaporation/Drift (Total Flow) Rate =	**2.00%**
Dry Bulb Temp (F) =	**109**
Wet Bulb Temp (F) =	**78**
Painted Rock - Evap Rate (in/yr) =	**119.9**
Painted Rock - Evap Rate (in/day) =	**0.328**
Total Pond Area (ac.) =	**82**
Total Pond Area (ac3) =	**492**
Water Gal/Cu.Ft. =	**7.48052**
Gal/Acre Foot =	**325,851**
Water lb/gal =	**8.34541**
Feet/Acre =	**43560**

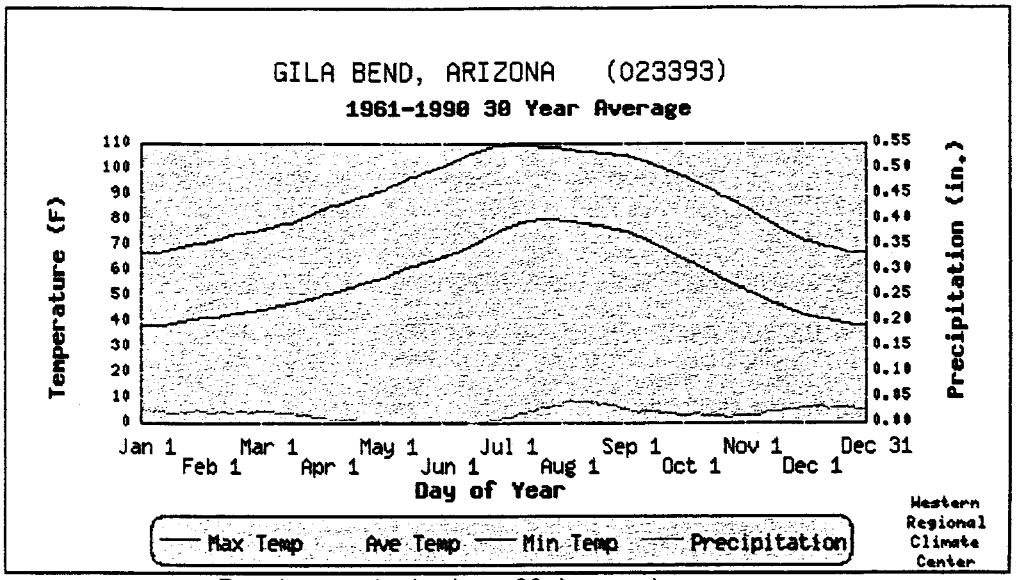
APPENDIX B-2

GILA BEND METEOROLOGICAL DATA

TEMPERATURE, PRECIPITATION & EVAPORATION

GILA BEND, ARIZONA

1961 - 1990 Temperature and Precipitation



Data is smoothed using a 29 day running average.

- Max. Temp. is the average of all daily maximum temperatures recorded for the day of the year between the years 1961 and 1990.

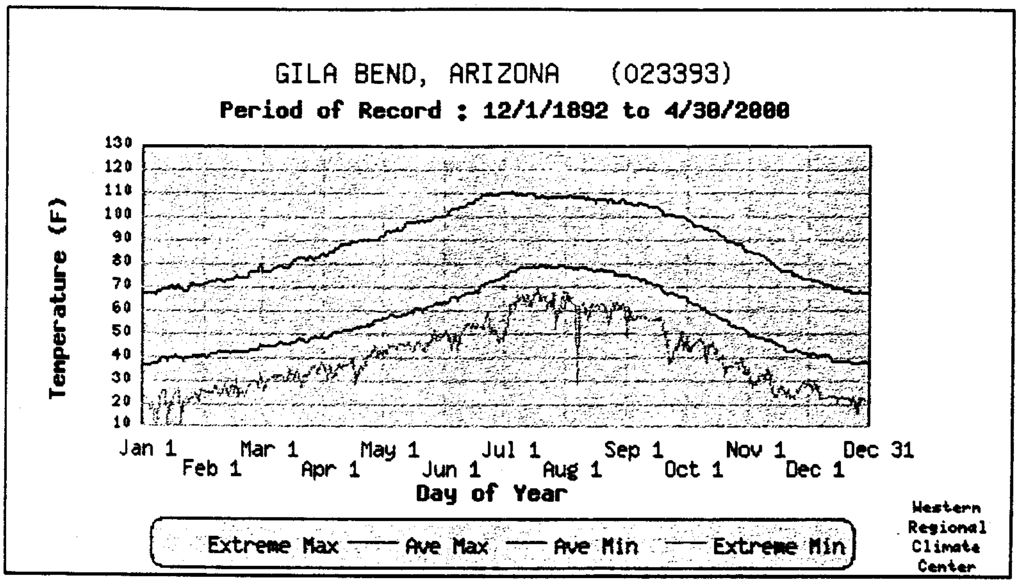
- Ave. Temp. is the average of all daily average temperatures recorded for the day of the year between the years 1961 and 1990.

- Min. Temp. is the average of all daily minimum temperatures recorded for the day of the year between the years 1961 and 1990.

- Precipitation is the average of all daily total precipitation recorded for the day of the year between the years 1961 and 1990.

GILA BEND, ARIZONA

POR - Daily Temperature Averages and Extremes



- Extreme Max. is the maximum of all daily maximum temperatures recorded for the day of the year.
- Ave. Max. is the average of all daily maximum temperatures recorded for the day of the year.
- Ave. Min. is the average of all daily minimum temperatures recorded for the day of the year.
- Extreme Min. is the minimum of all daily minimum temperatures recorded for the day of the year.

GILA BEND, ARIZONA (023393)

Period of Record Monthly Climate Summary

Period of Record : 12/1/1892 to 4/30/2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	68.8	73.7	79.7	88.0	96.5	106.0	108.9	107.1	103.0	92.1	78.6	69.2	89.3
Average Min. Temperature (F)	38.5	41.7	46.0	51.6	59.3	67.9	77.9	76.6	69.8	56.9	45.0	38.7	55.8
Average Total Precipitation (in.)	0.60	0.61	0.64	0.21	0.12	0.05	0.75	1.03	0.52	0.39	0.49	0.70	6.12
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 83.6% Min. Temp.: 83.4% Precipitation: 90.4% Snowfall: 90.6% Snow Depth: 90.6%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

e

GILA BEND, ARIZONA

Monthly Total Precipitation (inches)

(023393)

File last updated on Jul 10, 2000
*** Note *** Provisional Data *** After Year/Month 200004
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1892	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00	0.00
1893	0.00	0.00	1.70	0.00	0.40	0.00	1.45	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	3.55
1894	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1895	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	1.13	0.28	0.00	1.41
1896	0.87	0.00	0.13	0.05	0.00	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	1.05
1897	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1898	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.70	0.25	0.60	0.00	0.00	0.00	1.10	2.65
1899	0.80	0.20	0.00	0.00	0.00	0.00	1.60	0.42	0.80	0.00	1.10	0.00	4.92
1900	0.00	0.00	1.00	1.10	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	2.12
1901	0.15	0.90	0.50	0.00	0.00	0.00	0.60	0.00	0.00	0.40	0.00	0.00	2.55
1902	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00
1903	0.00 z	0.00 z	0.00 z	0.14	0.03	0.00	0.57	0.40	1.01	0.00	0.00 z	0.00 z	2.15
1904	0.00	0.00 z	0.00	0.00	0.09	0.00	0.80	1.30	0.60	0.00	0.00	0.00	2.79
1905	1.30	3.60	2.74	0.00	0.00	0.01	0.34	0.05	1.03	0.00	3.84	0.30	13.21
1906	0.00	1.10	0.03	0.10	0.00	0.00	0.00 z	0.00 z	0.00	0.00	1.10	2.43	4.76
1907	1.83	0.00	0.50	0.00	0.02	0.00	1.02	1.00	0.00	1.95	0.00	0.00	6.32
1908	0.40	1.47	0.47	1.25	0.00	0.00	0.42	0.21	0.40	0.45	0.08	2.54	7.69
1909	0.17	0.32	0.63	0.00	0.03	0.00	0.37	2.87	0.12	0.00	0.42	0.00 z	4.93
1910	0.00 z	0.00 z	0.20	0.00 z	0.00 z	0.00	0.43	0.07	0.00	0.00 z	0.00 z	0.00 z	0.70
1911	0.00 z	0.00 z	0.00 z	0.00	0.00	0.00	2.27	0.00	0.00 z	0.05	0.00	0.00	2.32
1912	0.00	0.00 z	2.00	0.00	0.56	0.00	1.06	2.68	0.00	0.53	0.00	0.97	7.80
1913	0.28	1.70	0.00	1.10	0.05	0.00	0.72	0.30	0.00	0.00	1.24	0.25	5.64
1914	0.06	0.98	0.98	0.00	0.66	0.00	0.17	0.11	0.16	1.99	0.73	2.92	8.76
1915	1.53	1.15	0.18	0.34	0.21	0.20	0.21	0.00	0.25	0.00	0.77	2.69	7.53
1916	2.45	0.16	0.50	0.00	0.00	0.00	1.18	0.22	2.32	0.95	0.00	0.69	8.47
1917	1.60	0.05	0.20	0.92	0.00	0.00	1.50	0.50	0.00	0.10	0.00	0.00	4.87
1918	0.80	0.24	1.05	0.00	0.00	1.01	0.76	0.00 z	0.60	0.50	0.88	0.85	6.69
1919	0.10	0.46	1.25	0.10	0.20	0.20	1.05	1.25	2.45	0.00	1.95	0.00	9.01
1920	1.45	0.80	1.30	0.00	0.00	0.00	0.80	1.00	0.00	0.50	0.00	0.00	5.85
1921	0.20	0.00	0.20	0.15	0.10	0.00	1.45	1.58	0.35	0.05	0.10	1.20	5.38
1922	0.57	0.40	0.84	0.15	0.00	0.20	0.70	2.20	0.30	0.00	0.20	0.15	5.71
1923	0.30	0.10	0.70	0.00	0.00 z	0.00 z	1.08	0.33	0.10	1.20	2.22	1.12	7.15
1924	0.00	0.00	0.65	0.00 q	0.00	0.00	0.08	0.45	0.00	0.25	0.05	1.10	2.58
1925	0.05	0.00	0.00	0.60	0.00	0.50	0.10	0.00 z	1.91 o	1.51	0.00	0.00	2.76
1926	0.42	0.08	0.00 z	0.01 z	0.00	0.00	0.00 z	0.00 z	2.47	0.00	0.00 z	0.00 z	2.97
1927	0.00 z	0.00 z	0.00 z	0.00	0.00	0.00 z	0.00 z	0.00 z	0.00 x	1.25	0.00	0.00 z	1.25
1928	0.00	0.86	0.05	0.00	0.01	0.00	0.05	0.76	0.32	0.00	0.00	0.83	2.88
1929	0.71	0.25	0.15	0.00	0.00	0.00	0.67	2.43	1.01	0.00	0.26	0.00	5.48
1930	1.15	0.00	1.58	0.00	1.50	0.00	0.15	1.48	0.00	0.00	0.00	0.00	5.86
1931	0.00	2.87	0.00	0.00 f	0.00	0.00	0.00 z	0.00 q	0.00	0.03	1.25	1.15	5.30
1932	0.00	1.67	0.35	0.00	0.00	0.39	1.47	0.20	0.00	1.10	0.00	2.09	7.27
1933	3.32	0.00	0.00	0.10	0.00	0.00	0.50	0.35	0.10	0.00	1.30	0.00 j	5.67
1934	0.00 z	0.30	0.00	0.00	0.00	0.00	0.32	2.96	0.00	0.00	0.00	0.11	3.69

1935	0.03	0.17	0.07	0.00	0.00	0.00	0.03	0.27	1.39	0.00	0.55	0.30	2.81
1936	0.85	0.47	0.61	0.00	0.00	0.00	1.31 o	0.25	0.00	0.00	0.70	0.00 v	2.88
1937	0.20	0.00	1.33	0.00	0.20	0.02	1.12	1.10	0.05	0.00	0.00	0.05	4.07
1938	0.15	0.15 z	0.00 b	0.00	0.00	0.00	0.14	1.21	0.11	0.00	0.00	0.90	2.51
1939	0.27	0.40	0.02	0.00	0.00	0.00	0.70	1.12	1.86	0.00	0.51	0.09	4.97
1940	0.00	0.30	0.00	0.10	0.24	0.00	0.08	0.85	1.72	1.85	0.35	2.25	7.74
1941	0.40	0.97	3.74	2.29	0.73	0.00	0.50	1.84	0.12	0.00	0.95	1.45	12.99
1942	0.37	0.28	0.40	0.71	0.00	0.00	0.43	0.81	0.15	0.12	0.00	0.10	3.37
1943	0.29	0.15	0.79	0.12	0.00	0.00	0.00	2.03	0.02	0.35	0.00 z	0.00 z	3.75
1944	0.00	0.00 z	0.77	0.26	0.20	0.00	0.70	0.68	1.13	0.15	1.01	0.60	5.50
1945	1.17	0.07	1.11	0.00	0.00	0.00	1.53	0.95	0.00	0.57	0.00	0.05	5.45
1946	0.60	0.00	0.00	0.34	0.00	0.00	1.96	1.42	3.29	0.00	0.52	0.19	8.32
1947	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00 z	0.00	0.00	1.00	0.48	1.63
1948	0.00	0.19	0.65	0.00	0.00	0.00	1.17	0.73	0.00	1.00	0.00	0.43	4.17
1949	1.78	0.00	0.25	0.21	0.00	0.10	0.31	0.55	1.69	0.10	0.50	0.42 g	5.49
1950	0.37	0.31	0.12	0.00	0.00	0.00	1.11	0.00	0.22	0.00	0.00	0.00	2.13
1951	1.25	0.06	0.08	0.40	0.45	0.00	1.64	5.60	0.00	0.00	1.14	0.00 e	10.62
1952	0.75	0.60	2.61	1.28	0.00	0.06	0.31	0.03	0.00	0.00	0.58	0.08	6.30
1953	0.10	0.38	0.30	0.09	0.00	0.00	1.28	0.53	0.00	0.00	0.00	0.00	2.68
1954	0.42	0.26	0.67	0.00	0.10	0.27	1.75	0.00	0.28	0.00	0.00	0.00	3.75
1955	1.96	0.00	0.00	0.00	0.00	0.00	3.36	1.66	0.00	0.00	0.04	0.00	7.02
1956	0.20	0.10	0.00	0.00	0.00	0.00	1.35	0.00	0.00	0.37	0.00	0.00	2.02
1957	1.58	0.30	0.47	0.29	0.53	0.16	1.47	0.08	0.00	2.36	0.06	0.00	7.30
1958	0.00	1.14	1.32	0.89	0.00	0.07	0.00	0.21	0.00	0.07	0.00	0.00	3.70
1959	0.00	0.62	0.00	0.00	0.01	0.15	0.12	1.37	0.00	0.79	0.15	2.04	5.25
1960	0.90	0.00	0.23	0.00	0.00	0.00	0.00	0.00 z	0.00	0.00 g	0.00	0.00	1.13
1961	0.28	0.00	0.27	0.00	0.00 z	0.00 z	0.00 z	3.06	1.09	0.38	0.04	0.70	5.82
1962	2.13	0.43	0.51	0.00	0.00	0.16	0.00	0.00	0.47	0.00	0.02	0.42	4.14
1963	0.08	0.21	0.35	0.00	0.00	0.00	0.00	0.58	0.04	1.31	0.00 z	0.00	2.57
1964	0.00 z	0.00 z	0.00	0.02	0.00	0.00	0.87	2.42	1.24	0.80	0.51	1.21	7.07
1965	1.32	1.25	0.68	1.89	0.12	0.00	0.10	0.29	0.34	0.00	0.60	3.42	10.01
1966	0.88	1.32	0.00	0.00	0.00	0.00	0.16	2.06	1.02	0.38	0.41	0.00 z	6.23
1967	0.14	0.00	0.09	0.33	0.02	0.00	0.94	0.12	2.15	0.62	1.25	3.00	8.66
1968	0.00	0.68	1.66	0.02	0.00	0.00	0.86	2.63	0.00	0.00	0.35	0.29	6.49
1969	1.39	0.73	0.16	0.00	0.82	0.00	0.00	0.60	0.15	0.00	0.97	0.38	5.20
1970	0.00	0.33	2.36	0.00	0.00	0.00	0.66	0.20	1.66	0.03	0.08	0.16	5.48
1971	0.01	0.33	0.00	0.00	0.00	0.00	0.20	2.59	0.63	0.18	0.00	0.26	4.20
1972	0.00	0.00	0.00	0.00	0.00	0.59	0.02	0.66	0.00	2.02	0.98	1.14	5.41
1973	0.02	1.83	1.45	0.05	0.00	0.12	0.60	0.10	0.00	0.00	1.51	0.00	5.68
1974	0.41	0.00	0.61	0.00	0.00	0.00	1.22	0.45	0.03	2.14	0.20	0.52	5.58
1975	0.06	0.24	0.81	0.50	0.00	0.00	0.48	0.05	0.69	0.05	0.74	1.93	5.55
1976	0.00	1.01	0.65	0.31	0.35	0.00	1.24	0.30	2.45	0.42	0.74	0.75	8.22
1977	0.24	0.00	0.16	0.06	0.02	0.02	0.21	0.76	1.22	0.53	0.01	0.78	4.01
1978	2.10	1.06	0.62	0.37	0.00	0.00	0.39	1.90	0.00	1.01	1.10	1.31	9.86
1979	2.61	0.18	1.27	0.04	0.41	0.00	0.84	0.91	0.30	0.09	0.01	0.02	6.68
1980	1.27	1.60	0.85	0.18	0.09	0.00	0.32	0.34	0.01	0.09	0.00	0.02	4.77
1981	0.95	0.43	0.73	0.26	0.09	0.00	0.38	0.61	0.24	0.34	0.35	0.00	4.38
1982	0.32	0.76	1.93	0.00	0.23	0.00	1.40	1.00	1.18	0.00	1.29	1.45	9.56
1983	0.94	0.92	1.46 a	0.04	0.00	0.00	0.00	8.37	1.30	0.35	0.69	2.52	16.59
1984	0.20	0.00	0.00	1.00	1.85	0.01	4.72	1.09	1.57	0.00	2.33	2.36	15.13
1985	0.39	0.90	0.09	0.37	0.00	0.00	0.60	1.14	0.99	0.75	2.19	1.05	8.47
1986	0.15	1.13	0.85	0.00	0.00	0.00	1.46	1.01	0.53	0.73	0.00	1.14	7.00
1987	0.16	1.28	0.34	0.01	0.10	0.00	0.38	1.21	0.30	0.26	0.86	1.33	6.23
1988	0.42	0.27	0.02	0.45	0.00	0.00	0.28	0.65	0.00	0.81	2.33	0.00	5.23
1989	0.98	0.00	0.15	0.00	0.00	0.00	0.20	1.69	0.00	0.26	0.00	0.00	3.28
1990	0.75	0.85	0.13	0.00	0.20	0.05	1.19	0.32	1.58	0.10	0.01	1.62	6.80
1991	0.37	0.50	2.14	0.00	0.00	0.00	0.20	0.05 a	0.03	1.31	0.11	1.51	6.22
1992	0.92 h	1.81 a	1.16	0.27	0.50	0.00	0.13	1.35	0.00	0.03	0.00	2.59	7.84
1993	2.61	3.67	0.30 a	0.00	0.00	0.00	0.08	0.55	0.00	0.38	1.06	0.00	8.65
1994	0.09	0.81	0.64	0.09	0.65	0.00	0.39	0.67	0.87	0.04	0.50	0.00 z	4.75
1995	1.53	0.58	0.21	0.18	0.00	0.00	0.15	0.24	0.05	0.00	0.22	0.00	3.16
1996	0.00	0.79	0.87	0.00	0.00	0.00	1.00	1.57	0.26	0.00	0.16	0.02	4.67

1997	0.76	0.04	0.00	0.48	0.05	0.00 a	0.01	2.01	0.47	0.22	0.15	0.97	5.16
1998	0.05	4.74	2.30	0.05	0.00	0.00 z	2.32	1.51	1.17	1.27 d	0.40	0.36	14.17
1999	0.20	0.11	0.04	1.15	0.01	0.15	2.45	2.04	0.10	0.00	0.00	0.00	6.25
2000	0.08	0.12	1.85	0.00	0.00	0.20	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	0.00 z	2.25
Period of Record Statistics													
MEAN	0.60	0.61	0.64	0.21	0.12	0.05	0.75	1.03	0.52	0.39	0.49	0.70	6.30
S.D.	0.73	0.83	0.74	0.41	0.29	0.15	0.77	1.22	0.73	0.58	0.68	0.89	2.89
SKEW	1.48	2.60	1.62	2.74	3.77	4.01	2.08	3.10	1.60	1.71	2.06	1.25	1.28
MAX	3.32	4.74	3.74	2.29	1.85	1.01	4.72	8.37	3.29	2.36	3.84	3.42	16.59
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.02
NO YRS	96	94	99	99	100	99	96	93	98	100	97	92	70

Painted Rock Dam Evaporation Data

MONTH	AVERAGE	PER MONTH		
Jan-98	0.090	2.790		
Feb-98	0.129	3.616		
Mar-98	0.224	6.955		
Apr-98	0.312	9.362		
May-98	0.369	11.438		
Jun-98	0.635	19.039		
Jul-98	0.502	15.574		
Aug-98	0.457	14.173		
Sep-98	0.455	13.637		
Oct-98	0.293	9.095		
Nov-98	0.156	4.666		
Dec-98	0.122	3.796		
		114.141	**Total Inches for the year**	
Jan-99	0.138	4.289		
Feb-99	0.191	5.335		
Mar-99	0.330	10.240		
Apr-99	0.358	10.727		
May-99	0.438	13.583		
Jun-99	0.609	18.263		
Jul-99	0.430	13.339		
Aug-99	0.550	17.052		
Sep-99	0.423	12.678		
Oct-99	0.311	9.634		
Nov-99	0.226	6.775		
Dec-99	0.151	4.674		
		126.589	**Total Inches for the year**	
Jan-00	0.154	4.773		
Feb-00	0.177	4.956		
Mar-00	0.237	7.339		
		17.068	**Total Inches for the year so far**	

Painted Rock Dam Evaporation Data - 1998 - 2000

Month	Daily Average	Month Total	
Jan-98	0.090	2.790	
Feb-98	0.129	3.616	
Mar-98	0.224	6.955	
Apr-98	0.312	9.362	
May-98	0.369	11.438	
Jun-98	0.635	19.039	
Jul-98	0.502	15.574	
Aug-98	0.457	14.173	
Sep-98	0.455	13.637	
Oct-98	0.293	9.095	
Nov-98	0.156	4.666	
Dec-98	0.122	3.796	
		114.141	**Total Inches for the year**
Month	**Daily Average**	**Month Total**	
Jan-99	0.138	4.289	
Feb-99	0.191	5.335	
Mar-99	0.330	10.240	
Apr-99	0.358	10.727	
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Jul-99	0.430	13.339	
Aug-99	0.550	17.052	
Sep-99	0.423	12.678	
Oct-99	0.311	9.634	
Nov-99	0.226	6.775	
Dec-99	0.151	4.674	
		126.589	**Total Inches for the year**
Month	**Daily Average**	**Month Total**	
Jan-00	0.154	4.773	
Feb-00	0.177	4.956	
Mar-00	0.237	7.339	
		17.068	**Total Inches for the year so far**

Painted Rock Dam Evaporation Data

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
2/17/2000		4.148		0.151	
2/18/2000		3.870		0.278	
2/22/2000	0.33	3.889			
2/23/2000		3.422		0.467	
2/24/2000		3.254		0.168	
2/25/2000		3.030		0.224	
2/28/2000		2.448		0.582	
2/29/2000		2.182		0.266	
				5.133	SUM
				0.177	AVERAGE
3/1/2000		2.008		0.174	
3/2/2000		1.762		0.246	
3/3/2000		1.592		0.170	
3/6/2000	0.91	5.718			
3/7/2000	0.44	5.701		0.017	
3/8/2000		5.250		0.451	
3/9/2000		5.000		0.250	
3/10/2000		4.764		0.236	
3/14/2000		3.830		0.934	
3/15/2000		3.540		0.290	
3/16/2000		3.202		0.338	
3/17/2000		2.956		0.246	
3/20/2000		1.956		1.000	
3/21/2000		1.578	4.500	0.378	
3/22/2000		4.314		0.186	
3/23/2000		4.062		0.252	
3/24/2000		3.862		0.200	
3/27/2000		2.979		0.883	
3/28/2000	0.01	2.780		0.199	
3/29/2000		2.475		0.305	
3/30/2000		2.224		0.251	
3/31/2000		1.891	4.500	0.333	
				7.339	SUM
				0.236742	AVERAGE

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
12/1/1999		3.418		0.186	
12/2/1999		3.238		0.180	
12/3/1999		3.088		0.150	
12/6/1999		2.560		0.528	
12/7/1999		2.428		0.132	
12/8/1999		2.370		0.058	
12/9/1999		2.110		0.260	
12/10/1999		1.994		0.116	
12/13/1999		1.686		0.308	
12/14/1999		1.478	4.500	0.208	
12/15/1999		4.422		0.078	
12/16/1999		4.236		0.186	
12/17/1999		4.002		0.234	
12/20/1999		3.456		0.546	
12/21/1999		3.456		0.000	
12/22/1999		3.338		0.118	
12/23/1999		3.060		0.278	
12/28/1999		2.181		0.879	
12/29/1999		2.052		0.129	
12/30/1999		1.952	4.500	0.100	
				4.674	**SUM**
				0.150774	**AVERAGE**
1/3/2000		3.990		0.510	
1/4/2000		3.850		0.140	
1/5/2000		3.636		0.214	
1/6/2000		3.542		0.094	
1/7/2000		3.370		0.172	
1/10/2000		3.078		0.292	
1/11/2000		2.866		0.212	
1/12/2000		2.750		0.116	
1/13/2000		2.622		0.128	
1/14/2000		2.474	4.500	0.148	
1/19/2000		3.724		0.776	
1/20/2000		3.548		0.176	
1/21/2000		3.374		0.174	
1/24/2000		2.970		0.404	
1/25/2000		2.828		0.142	
1/26/2000		2.634		0.194	
1/27/2000		2.365		0.269	
1/28/2000		2.233		0.132	
1/31/2000		1.753		0.480	
				4.773	**SUM**
				0.153968	**AVERAGE**
2/1/2000		1.623	4.500	0.130	
2/2/2000		4.432		0.068	
2/3/2000		4.148		0.284	
2/4/2000		4.004		0.144	
2/7/2000		3.414		0.590	
2/8/2000		3.230		0.184	
2/9/2000		3.011		0.219	
2/10/2000		2.773		0.238	
2/11/2000		2.548		0.225	
2/14/2000		2.471		0.077	
2/15/2000		1.834	4.500	0.637	
2/16/2000		4.299		0.201	

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
9/10/1999		4.102		0.398	
9/13/1999		2.792		1.310	
9/14/1999		2.371		0.421	
9/15/1999		1.850		0.521	
9/16/1999		1.484	4.500	0.366	
9/17/1999		3.980		0.520	
9/20/1999		2.655		1.325	
9/21/1999		2.348		0.307	
9/22/1999		2.132		0.216	
9/23/1999		1.712	4.500	0.420	
9/24/1999		4.286		0.214	
9/27/1999		3.075		1.211	
9/28/1999		2.700		0.375	
9/29/1999		2.118		0.582	
9/30/1999		1.720	4.500	0.398	
				12.678	**SUM**
				0.4226	**AVERAGE**
10/5/1999		2.690		1.810	
10/6/1999		2.315		0.375	
10/7/1999		1.854	4.500	0.461	
10/8/1999		4.228		0.272	
10/12/1999		2.765		1.463	
10/13/1999		2.410		0.355	
10/14/1999		2.044	4.500	0.366	
10/19/1999		2.676		1.824	
10/20/1999		2.378		0.298	
10/21/1999		2.098	4.500	0.280	
10/22/1999		4.230		0.270	
10/25/1999		3.409		0.821	
10/26/1999		3.083		0.326	
10/27/1999		2.858		0.225	
10/28/1999		2.676	4.500	0.182	
10/29/1999		4.194		0.306	
				9.634	**SUM**
				0.310774	**AVERAGE**
11/1/1999		3.157		1.037	
11/2/1999		2.940		0.217	
11/3/1999		2.716		0.224	
11/4/1999		2.518		0.198	
11/5/1999		2.288		0.230	
11/8/1999		1.712		0.576	
11/9/1999		1.535	4.500	0.177	
11/10/1999		4.431		0.069	
11/15/1999		3.270		1.161	
11/16/1999		3.042		0.228	
11/17/1999		2.866		0.176	
11/18/1999		2.650		0.216	
11/19/1999		2.480		0.170	
11/22/1999		1.412		1.068	
11/23/1999		1.682			
11/24/1999		1.550	4.500	0.132	
11/29/1999		3.767		0.733	
11/30/1999		3.604		0.163	
				6.775	**SUM**
				0.225833	**AVERAGE**

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
6/29/1999		1.261	4.500	0.606	
6/30/1999		3.940		0.560	
				18.263	**SUM**
				0.609	**AVERAGE**
7/1/1999		3.265	4.500	0.675	
7/2/1999		3.826		0.674	
7/6/1999		1.348	4.500	2.478	
7/7/1999	0.04	4.096		0.404	
7/8/1999		3.500		0.596	
7/9/1999		3.620			
7/12/1999	0.81	4.866			
7/13/1999	0.43	3.624		1.242	
7/14/1999		2.733		0.891	
7/15/1999	0.28	2.994	4.500		
7/16/1999		4.130		0.370	
7/19/1999		2.714		1.416	
7/20/1999		2.227	4.500	0.487	
7/21/1999		4.162		0.338	
7/22/1999		3.388	4.500	0.774	
7/23/1999		3.464		1.036	
7/26/1999		2.477		0.987	
7/27/1999		2.010		0.467	
7/28/1999		1.844		0.166	
7/29/1999		1.646	4.500	0.198	
7/30/1999		4.360		0.140	
				13.339	**SUM**
				0.43029	**AVERAGE**
8/2/1999		2.658		1.702	
8/3/1999		2.210		0.448	
8/5/1999		1.206	4.500	1.004	
8/9/1999		2.248		2.252	
8/10/1999		1.756	4.500	2.744	
8/11/1999		3.858		0.642	
8/12/1999		3.294	4.500	0.564	
8/13/1999		3.901		0.599	
8/16/1999		2.538		1.363	
8/17/1999		2.146		0.392	
8/18/1999		1.617		0.529	
8/19/1999		1.112	4.500	0.505	
8/20/1999		4.058		0.442	
8/23/1999	0.10	2.609		1.449	
8/24/1999		2.160		0.449	
8/25/1999		1.678		0.482	
8/26/1999		1.205	4.500	0.473	
8/27/1999		4.004		0.496	
8/30/1999		3.487		0.517	
8/31/1999	0.16	3.692			
				17.052	**SUM**
				0.550065	**AVERAGE**
9/1/1999		3.138		0.554	
9/2/1999		2.684	4.500	0.454	
9/3/1999		3.900		0.600	
9/7/1999		2.069		1.831	
9/8/1999		1.798		0.271	
9/9/1999		1.414	4.500	0.384	

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
4/14/1999		1.804	4.500	0.243	
4/15/1999		4.144		0.356	
4/16/1999		3.704		0.440	
4/19/1999		2.465		1.239	
4/20/1999		2.019		0.446	
4/21/1999		1.393	4.500	0.626	
4/22/1999		4.082		0.418	
4/26/1999		2.502		1.580	
4/27/1999		2.150		0.352	
4/28/1999		1.567		0.583	
4/29/1999		1.100	4.500	0.467	
4/30/1999		4.256		0.244	
				10.727	**SUM**
				0.358	**AVERAGE**
5/3/1999		3.442		0.814	
5/4/1999		3.072		0.370	
5/5/1999		2.740		0.332	
5/6/1999		2.272	4.500	0.468	
5/7/1999		4.014		0.486	
5/10/1999		2.345		1.669	
5/11/1999		1.905		0.440	
5/12/1999		1.584		0.321	
5/13/1999		1.147	4.500	0.437	
5/14/1999		3.874		0.626	
5/17/1999		2.330		1.544	
5/18/1999		1.866		0.464	
5/19/1999		1.359		0.507	
5/20/1999		0.000	4.500	1.359	
5/21/1999		3.874		0.626	
5/24/1999		2.275		1.599	
5/25/1999		1.800	4.500	0.475	
5/26/1999		3.926		0.574	
5/27/1999		3.454	4.500	0.472	
				13.583	**SUM**
				0.438	**AVERAGE**
6/1/1999		1.602	4.500	1.852	
6/2/1999		4.066		0.434	
6/3/1999	0.14	3.880	4.500	0.186	
6/4/1999		3.900		0.600	
6/7/1999		2.781		1.119	
6/8/1999		2.194	4.500	0.587	
6/9/1999		3.970		0.530	
6/10/1999		3.364	4.500	0.606	
6/11/1999		3.952		0.548	
6/14/1999		2.314		1.638	
6/15/1999		1.644	4.500	0.670	
6/16/1999		3.854		0.646	
6/17/1999		3.244	4.500	0.610	
6/18/1999		3.806		0.694	
6/21/1999		1.958		1.848	
6/22/1999		1.228	4.500	0.730	
6/23/1999		3.936		0.564	
6/24/1999		3.334	4.500	0.602	
6/25/1999		3.840		0.660	
6/28/1999		1.867		1.973	

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
2/1/1999		1.860	4.500	0.414	
2/2/1999		4.344		0.156	
2/3/1999		4.138		0.206	
2/4/1999		4.028		0.110	
2/5/1999	0.18	4.360			
2/8/1999		3.868		0.492	
2/9/1999		3.802		0.066	
2/10/1999		3.582		0.220	
2/11/1999		3.170		0.412	
2/12/1999		3.000		0.170	
2/16/1999		2.131		0.869	
2/17/1999		1.946		0.185	
2/18/1999		1.753	4.500	0.193	
2/19/1999		4.384		0.116	
2/22/1999		3.609		0.775	
2/23/1999		3.346		0.263	
2/24/1999		3.119		0.227	
2/25/1999		2.930		0.189	
2/26/1999		2.658		0.272	
				5.335	**SUM**
				0.191	**AVERAGE**
3/1/1999		1.441		1.217	
3/2/1999		1.256	4.500	0.185	
3/3/1999		4.290		0.210	
3/4/1999		3.954		0.336	
3/5/1999		3.678		0.276	
3/8/1999		2.976		0.702	
3/9/1999		2.838		0.138	
3/10/1999		2.582		0.256	
3/11/1999		2.400		0.182	
3/12/1999		2.146	4.500	0.254	
3/15/1999		3.694		0.806	
3/16/1999		3.280		0.414	
3/17/1999		3.082		0.198	
3/18/1999		2.934		0.148	
3/19/1999		1.740		1.194	
3/22/1999		1.264	4.500	0.476	
3/23/1999		4.238		0.262	
3/24/1999		3.881		0.357	
3/25/1999		3.594		0.287	
3/26/1999		3.220		0.374	
3/29/1999		2.574		0.646	
3/30/1999		2.178		0.396	
3/31/1999		1.252		0.926	
				10.240	**SUM**
				0.330	**AVERAGE**
4/1/1999		1.462	4.500		
4/2/1999	0.78	5.780			
4/5/1999		4.431		1.349	
4/6/1999		4.144		0.287	
4/7/1999		3.783		0.361	
4/8/1999		3.588		0.195	
4/9/1999		3.274		0.314	
4/12/1999		2.346		0.928	
4/13/1999		2.047		0.299	

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
11/17/1998		2.536		0.130	
11/18/1998		2.300		0.236	
11/19/1998		2.163		0.137	
11/20/1998		2.028		0.135	
11/23/1998		1.564		0.464	
11/24/1998		1.412	4.500	0.152	
11/25/1998		4.398		0.102	
11/30/1998		3.959		0.439	
				4.666	SUM
				0.156	AVERAGE
12/1/1998		3.842		0.117	
12/2/1998		3.721		0.121	
12/3/1998		3.854			
12/4/1998		3.576		0.278	
12/7/1998	0.12	3.658			
12/8/1998		3.416		0.242	
12/9/1998		3.317		0.099	
12/10/1998		3.160		0.157	
12/11/1998		3.040		0.120	
12/14/1998		2.634		0.406	
12/15/1998		2.489		0.145	
12/16/1998	0.10	2.700			
12/17/1998		2.358		0.342	
12/18/1998		2.174		0.184	
12/21/1998		1.757		0.417	
12/22/1998		1.648		0.109	
12/23/1998		1.571	4.500	0.077	
12/24/1998		4.346		0.154	
12/28/1998		3.877		0.469	
12/29/1998		3.798		0.079	
12/30/1998		3.638		0.160	
12/31/1998		3.518		0.120	
				3.796	SUM
				0.122	AVERAGE
1/4/1999		2.918		0.709	
1/5/1999		2.809		0.109	
1/6/1999		2.680		0.129	
1/7/1999		2.588		0.092	
1/8/1999		2.472		0.116	
1/11/1999		2.000		0.472	
1/12/1999		1.859		0.141	
1/13/1999		1.704		0.155	
1/14/1999		1.652	4.500	0.052	
1/15/1999		4.406		0.094	
1/19/1999		3.785		0.621	
1/20/1999		3.639		0.146	
1/21/1999		3.450		0.189	
1/22/1999		3.184		0.266	
1/25/1999		2.688		0.496	
1/26/1999	0.12	2.776			
1/27/1999		2.566		0.210	
1/28/1999		2.476		0.090	
1/29/1999		2.274		0.202	
				4.289	SUM
				0.138	AVERAGE

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
8/19/1998		1.882		0.532	
8/20/1998		1.445	4.500	0.437	
8/21/1998		4.024		0.476	
8/24/1998	0.22	2.828		1.196	
8/25/1998		2.411		0.417	
8/26/1998		2.036		0.375	
8/27/1998		1.604	4.500	0.432	
8/28/1998		4.000		0.500	
				14.173	**SUM**
				0.457	**AVERAGE**
9/1/1998		1.680	4.500	2.320	
9/2/1998		3.958		0.542	
9/3/1998		3.446	4.500	0.512	
9/4/1998	0.56	5.366			
9/8/1998		3.350		2.016	
9/9/1998		2.942		0.408	
9/10/1998	0.48	3.568	4.500		
9/15/1998		2.736		1.764	
9/16/1998		2.278		0.458	
9/17/1998		1.880	4.500	0.398	
9/22/1998		2.122		2.378	
9/23/1998		1.809		0.313	
9/24/1998		1.508	4.500	0.301	
9/29/1998		2.694		1.806	
9/30/1998		2.273		0.421	
				13.637	**SUM**
				0.455	**AVERAGE**
10/1/1998		1.964	4.500	0.309	
10/6/1998		2.561		1.939	
10/7/1998		2.293		0.268	
10/8/1998		1.990	4.500	0.303	
10/9/1998		4.016		0.484	
10/13/1998		2.955		1.061	
10/14/1998		2.519		0.436	
10/15/1998		2.177	4.500	0.342	
10/20/1998		2.979		1.521	
10/21/1998		2.765		0.214	
10/22/1998		2.547	4.500	0.218	
10/27/1998		3.137		1.363	
10/28/1998		2.928		0.209	
10/29/1998		2.744		0.184	
10/30/1998		2.500		0.244	
				9.095	**SUM**
				0.293	**AVERAGE**
11/2/1998		2.000		0.500	
11/3/1998		1.849		0.151	
11/4/1998		1.666		0.183	
11/5/1998		1.463	4.500	0.203	
11/6/1998		4.254		0.246	
11/9/1998		3.723		0.531	
11/10/1998		3.455		0.268	
11/11/1998		3.295		0.160	
11/12/1998		3.276		0.019	
11/13/1998		3.146		0.130	
11/16/1998		2.666		0.480	

Painted Rock Dam Evaporation Data

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
				0.369	**AVERAGE**
6/1/1998		2.276		2.224	
6/2/1998		1.880		0.396	
6/3/1998		1.354	4.500	0.526	
6/4/1998		3.840		0.660	
6/5/1998		3.448		0.392	
6/8/1998		1.910		1.538	
6/9/1998		1.462	4.500	0.448	
6/10/1998		3.830		0.670	
6/11/1998		3.256	4.500	0.574	
6/16/1998		1.817	4.500	2.683	
6/17/1998		3.741		0.759	
6/18/1998		3.238	4.500	0.503	
6/19/1998		3.932		0.568	
6/22/1998		2.056		1.876	
6/23/1998		1.466	4.500	0.590	
6/24/1998		3.734		0.766	
6/25/1998		3.318	4.500	0.416	
6/26/1998		3.842		0.658	
6/29/1998		1.050		2.792	
6/30/1998		1.434	4.500		
				19.039	**SUM**
				0.635	**AVERAGE**
7/1/1998		3.812		0.688	
7/2/1998		3.155	4.500	0.657	
7/6/1998	0.64	3.564		0.936	
7/7/1998		2.574		0.990	
7/8/1998		1.961		0.613	
7/9/1998		1.458	4.500	0.503	
7/10/1998		3.932		0.568	
7/13/1998		2.086		1.846	
7/14/1998		1.542	4.500	0.544	
7/15/1998		3.888		0.612	
7/16/1998		3.266	4.500	0.622	
7/17/1998		3.852		0.648	
7/20/1998	0.59	3.124		0.728	
7/21/1998		2.100	4.500	1.024	
7/22/1998		4.059		0.441	
7/23/1998	0.62	4.952			
7/24/1998		3.952		1.000	
7/27/1998		2.435		1.517	
7/28/1998		1.862	4.500	0.573	
7/29/1998	0.02	3.954		0.546	
7/30/1998		3.436	4.500	0.518	
				15.574	**SUM**
				0.502	**AVERAGE**
8/4/1998		1.786	4.500	2.714	
8/5/1998		3.958		0.542	
8/6/1998		3.348	4.500	0.610	
8/10/1998		2.470		2.030	
8/11/1998		2.060		0.410	
8/12/1998	1.06	3.547			
8/13/1998		2.131	4.500	1.416	
8/17/1998		2.539		1.961	
8/18/1998	0.17	2.414		0.125	

Painted Rock Dam Evaporation Data

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
3/19/1998		3.270		0.284	
3/20/1998		3.080		0.190	
3/23/1998		2.442		0.638	
3/24/1998		2.174		0.268	
3/25/1998		1.764	4.500	0.410	
3/26/1998	0.49	5.002		0.012	
3/27/1998		4.294		0.708	
3/30/1998	0.33	4.880		0.256	
3/31/1998		4.368		0.512	
				6.955	SUM
				0.224	AVERAGE
4/1/1998		4.155		0.213	
4/2/1998	0.10	4.237			
4/3/1998		3.960		0.277	
4/6/1998		3.194		0.766	
4/7/1998		2.848		0.346	
4/8/1998		2.571		0.277	
4/9/1998		2.337		0.234	
4/10/1998		2.158	4.500	0.179	
4/13/1998		3.404		1.096	
4/14/1998		3.044		0.360	
4/15/1998		2.740		0.304	
4/16/1998		2.476		0.264	
4/17/1998		2.166	4.500	0.310	
4/18/1998		3.962		0.538	
4/20/1998		3.586		0.376	
4/21/1998		3.234		0.352	
4/22/1998		2.836		0.398	
4/23/1998		2.416		0.420	
4/24/1998		1.902	4.500	0.514	
4/27/1998		3.413		1.087	
4/28/1998		3.094		0.319	
4/29/1998		2.672		0.422	
4/30/1998		2.362		0.310	
				9.362	SUM
				0.312	AVERAGE
5/1/1998		4.084			
5/4/1998		2.754		1.330	
5/5/1998		2.277		0.477	
5/6/1998		1.852		0.425	
5/7/1998		1.484	4.500	0.368	
5/8/1998		3.920		0.580	
5/11/1998		2.686		1.234	
5/12/1998		2.249		0.437	
5/13/1998		1.952		0.297	
5/14/1998		1.666	4.500	0.286	
5/15/1998		4.032		0.468	
5/18/1998		2.720		1.312	
5/19/1998		2.280		0.440	
5/20/1998		1.705		0.575	
5/21/1998		1.552	4.500	0.153	
5/26/1998		2.147		2.353	
5/27/1998		1.709		0.438	
5/28/1998		1.444	4.500	0.265	
				11.438	SUM

Painted Rock Dam Evaporation Data

DATE	Rainfall	HOOK GAGE	DAILY	CHANGE	
1/2/1998		2.129	4.000		
1/5/1998		3.654		0.346	
1/6/1998		3.524		0.130	
1/7/1998		3.395		0.129	
1/8/1998		3.324		0.071	
1/9/1998		3.253		0.071	
1/12/1998		3.253		0.000	
1/13/1998		3.163		0.090	
1/14/1998		3.134		0.029	
1/15/1998		3.022		0.112	
1/16/1998		2.916		0.106	
1/20/1998		2.470		0.446	
1/21/1998		2.346		0.124	
1/22/1998		2.234		0.112	
1/26/1998		1.752		0.482	
1/27/1998		1.628	4.500	0.124	
1/28/1998		4.339		0.161	
1/29/1998		4.203		0.136	
1/30/1998		4.082		0.121	
				2.790	**SUM**
				0.090	**AVERAGE**
2/2/1998		3.619		0.463	
2/3/1998		3.477		0.142	
2/4/1998	0.45	4.205			
2/5/1998		3.620		0.585	
2/6/1998		3.550		0.070	
2/9/1998	0.66	4.624			
2/10/1998		3.875		0.749	
2/11/1998		3.790		0.085	
2/12/1998		3.702		0.088	
2/13/1998		3.582		0.120	
2/17/1998		3.681			
2/18/1998	0.52	4.680			
2/19/1998		4.071		0.609	
2/20/1998		3.998		0.073	
2/23/1998		4.050			
2/24/1998		3.792		0.258	
2/25/1998	0.05	3.767		0.025	
2/26/1998		3.544		0.223	
2/27/1998		3.418		0.126	
				3.616	**SUM**
				0.129	**AVERAGE**
3/2/1998		2.890		0.528	
3/3/1998		2.767		0.123	
3/4/1998		2.580		0.187	
3/5/1998		2.398		0.182	
3/6/1998		2.182	4.000	0.216	
3/9/1998		3.230		0.770	
3/10/1998		3.017		0.213	
3/11/1998		2.766		0.251	
3/12/1998		2.507		0.259	
3/13/1998		2.290	4.000	0.217	
3/16/1998	0.32	4.285			
3/17/1998		3.790		0.495	
3/18/1998		3.554		0.236	

1995 SUMMARY			
MONTH	**AVERAGE**	**PER MONTH**	
Jan-95	0.0857	2.66	
Feb-95	0.1623	4.54	
Mar-95	0.2670	8.28	
Apr-95	0.3534	10.60	
May-95	0.4954	15.36	
Jun-95	0.5526	16.58	
Jul-95	0.5987	18.56	
Aug-95	0.5789	17.94	
		94.52	**Total inches**

20-Jun-95	730		2.652		0.546		
21-Jun-95	700		2.058		0.594		
22-Jun-95	630		1.470	4.500	0.588		
23-Jun-95	630		3.870				
24-Jun-95							
25-Jun-95							
26-Jun-95	700		2.162		1.708		
27-Jun-95	700		1.520	4.500	0.642		
28-Jun-95	630		3.788		0.712		
29-Jun-95	700		3.064		0.724	**SUM**	16.577
30-Jun-95	700		2.402	4.500	0.662	**AVERAGE**	0.552567
1-Jul-95							
2-Jul-95							
3-Jul-95	630		2.278		2.222		
4-Jul-95							
5-Jul-95	700		1.258	4.500	1.020		
6-Jul-95	630		3.952		0.548		
7-Jul-95	630		3.262		0.690		
8-Jul-95							
9-Jul-95							
10-Jul-95	630		1.510	4.500	1.752		
11-Jul-95	630		3.830		0.670		
12-Jul-95	630		3.144		0.686		
13-Jul-95	630		2.614		0.530		
14-Jul-95	630		2.080	4.500	0.534		
15-Jul-95							
16-Jul-95							
17-Jul-95	630	0.03	**3.358**		1.142		
18-Jul-95	630		2.860		0.498		
19-Jul-95	630		2.222		0.638		
20-Jul-95	630		1.642		0.580		
21-Jul-95	630		1.082	4.500	0.560		
22-Jul-95							
23-Jul-95							
24-Jul-95	630		2.514		1.986		
25-Jul-95	630		1.977	4.500	0.537		
26-Jul-95	630		3.800		0.700		
27-Jul-95	630		3.226		0.574		
28-Jul-95	630		2.588	4.500	0.638		
29-Jul-95							
30-Jul-95						**SUM**	18.561
31-Jul-95	630		2.444		2.056	**AVERAGE**	0.598742
1-Aug-95	630		1.831	4.500	0.613		
2-Aug-95	630		3.864		0.636		
3-Aug-95	630		3.188		0.676		
4-Aug-95	630		2.572	4.500	0.616		
5-Aug-95							
6-Aug-95							
7-Aug-95	630		2.756		1.744		
8-Aug-95	630		2.000	4.500	0.756		
9-Aug-95	630		3.876		0.624		
10-Aug-95	630		3.274		0.602		
11-Aug-95	630		2.650	4.500	0.624		
12-Aug-95							
13-Aug-95							
14-Aug-95	630		2.708		1.792	**SUM**	8.683
15-Aug-95	630	0.40	**2.952**			**AVERAGE**	0.578867

23-Apr-95							
24-Apr-95	730		3.446		1.054		
25-Apr-95	730		3.118		0.328		
26-Apr-95	730		2.704		0.414		
27-Apr-95	730		2.252		0.452		
28-Apr-95	730		1.768	4.500	0.484		
29-Apr-95						**SUM**	10.602
30-Apr-95						**AVERAGE**	0.3534
1-May-95	730		3.114		1.386		
2-May-95	730		2.624		0.490		
3-May-95	730		2.032	5.000	0.592		
4-May-95	730		4.518		0.482		
5-May-95	730		3.888		0.630		
6-May-95							
7-May-95							
8-May-95	730		2.910		0.978		
9-May-95	730		2.537		0.373		
10-May-95	730		2.160		0.377		
11-May-95	730		1.758	5.000	0.402		
12-May-95	730		4.480		0.520		
13-May-95							
14-May-95							
15-May-95	730		2.862		1.618		
16-May-95	730		2.480		0.382		
17-May-95	730		2.070	4.500	0.410		
18-May-95	730		4.056		0.444		
19-May-95	730		3.608		0.448		
20-May-95							
21-May-95							
22-May-95	730		2.174		1.434		
23-May-95	730		1.608	4.500	0.566		
24-May-95	730		4.063		0.437		
25-May-95	730		3.576		0.487		
26-May-95	730		3.166	4.500	0.410		
27-May-95							
28-May-95							
29-May-95							
30-May-95	730		2.518		1.982	**SUM**	15.358
31-May-95	730		2.008		0.510	**AVERAGE**	0.495419
1-Jun-95	730		1.590	4.500	0.418		
2-Jun-95	730		3.653		0.847		
3-Jun-95							
4-Jun-95							
5-Jun-95	730		2.236		1.417		
6-Jun-95	730		1.650		0.586		
7-Jun-95	730		1.047	4.500	0.603		
8-Jun-95	730		3.846		0.654		
9-Jun-95	730		3.446		0.400		
10-Jun-95							
11-Jun-95							
12-Jun-95	730		2.029		1.417		
13-Jun-95	730		1.462	4.500	0.567		
14-Jun-95	700		3.824		0.676		
15-Jun-95	700		3.036		0.788		
16-Jun-95	700		2.310	4.500	0.726		
17-Jun-95							
18-Jun-95							
19-Jun-95	700		3.198		1.302		

24-Feb-95	730		1.849	4.500	0.146		
25-Feb-95							
26-Feb-95							
27-Feb-95	730		3.886		0.614	**SUM**	4.544
28-Feb-95	730		3.728		0.158	**AVERAGE**	0.162286
1-Mar-95	730		3.531		0.197		
2-Mar-95	730		3.338		0.193		
3-Mar-95	730		3.160		0.178		
4-Mar-95							
5-Mar-95							
6-Mar-95	730	0.08	**2.730**		0.430		
7-Mar-95	730		2.450		0.280		
8-Mar-95	730		2.184		0.266		
9-Mar-95	730		2.037		0.147		
10-Mar-95	730		1.840	4.000	0.197		
11-Mar-95	900		3.580		0.420		
12-Mar-95	830	0.32	**4.183**				
13-Mar-95	730		3.710		0.473		
14-Mar-95	730		3.516		0.194		
15-Mar-95	730		3.320		0.196		
16-Mar-95	730		3.080		0.240		
17-Mar-95	730		2.764	4.500	0.316		
18-Mar-95							
19-Mar-95							
20-Mar-95	730		3.492		1.008		
21-Mar-95	730		3.197		0.295		
22-Mar-95	730		2.818		0.379		
23-Mar-95	730		2.514		0.304		
24-Mar-95	730		2.263	4.500	0.251		
25-Mar-95							
26-Mar-95							
27-Mar-95	730		3.708		0.792		
28-Mar-95	730		3.415		0.293		
29-Mar-95	730		3.165		0.250		
30-Mar-95	730		2.841		0.324	**SUM**	8.276
31-Mar-95	730		2.188	4.500	0.653	**AVERAGE**	0.266968
1-Apr-95							
2-Apr-95							
3-Apr-95	730		2.236		2.264		
4-Apr-95	730		1.930		0.306		
5-Apr-95	730		1.540	4.500	0.390		
6-Apr-95	730		4.105		0.395		
7-Apr-95	730		3.685		0.420		
8-Apr-95							
9-Apr-95							
10-Apr-95	730		2.500		1.185		
11-Apr-95	730		2.200		0.300		
12-Apr-95	730		1.960	4.500	0.240		
13-Apr-95	730		4.270		0.230		
14-Apr-95	730		3.738		0.532		
15-Apr-95							
16-Apr-95							
17-Apr-95	730		2.931		0.807		
18-Apr-95	730		2.722		0.209		
19-Apr-95	730	0.26	**3.062**				
20-Apr-95	730		2.663		0.399		
21-Apr-95	730		2.470	4.500	0.193		
22-Apr-95							

Painted Rock Dam Evaporation Data

Date	Time	Rainfall	Hook Gage	Pan Fill	Change		
31-Dec-94						**Painted Rock Dam**	
1-Jan-95						**Evaporation Data**	
2-Jan-95						**01 Jan 95 to 15 Aug 95**	
3-Jan-95	730		4.016				
4-Jan-95	730	Trace	3.990		0.026	Entered by TK	
5-Jan-95	730		4.790				
6-Jan-95						**Bold #s are calculations**	
7-Jan-95						**not measurements.**	
8-Jan-95							
9-Jan-95	730		4.436		0.354		
10-Jan-95	730		4.357		0.079		
11-Jan-95	730		4.243		0.114		
12-Jan-95	730		4.182		0.061		
13-Jan-95	730		4.150		0.032		
14-Jan-95							
15-Jan-95							
16-Jan-95							
17-Jan-95	730		3.845		0.305		
18-Jan-95	730		3.714		0.131		
19-Jan-95	730		3.632		0.082		
20-Jan-95	730		3.564		0.068		
21-Jan-95							
22-Jan-95							
23-Jan-95	730		3.274		0.290		
24-Jan-95	730		3.213		0.061		
25-Jan-95	730		3.095		0.118		
26-Jan-95	730	0.26	**3.646**				
27-Jan-95	730		3.230		0.416		
28-Jan-95							
29-Jan-95							
30-Jan-95	730		2.934		0.296	SUM	2.657
31-Jan-95	730		2.710		0.224	AVERAGE	0.08571
1-Feb-95	730		2.547		0.163		
2-Feb-95	730		2.346		0.201		
3-Feb-95	730		2.250	5.000	0.096		
4-Feb-95							
5-Feb-95							
6-Feb-95	730		4.412		0.588		
7-Feb-95	730		4.254		0.158		
8-Feb-95	730		4.062		0.192		
9-Feb-95	730		3.848		0.214		
10-Feb-95	730		3.658		0.190		
11-Feb-95							
12-Feb-95							
13-Feb-95	730		3.144		0.514		
14-Feb-95	730	0.09	**3.305**				
15-Feb-95	730		3.092		0.213		
16-Feb-95	730		3.022		0.070		
17-Feb-95	730		2.930		0.092		
18-Feb-95							
19-Feb-95							
20-Feb-95							
21-Feb-95	730		2.192		0.738		
22-Feb-95	730		2.062		0.130		
23-Feb-95	730		1.995		0.067		

23-Apr-94							
24-Apr-94							
25-Apr-94	630		1.630	4.500	1.416		
26-Apr-94	630		4.062		0.438		
27-Apr-94							
28-Apr-94	630		3.474		0.588		
29-Apr-94	630		3.058		0.416	**SUM**	12.253
30-Apr-94						**AVERAGE**	0.408433
1-May-94							
2-May-94	630		1.556	4.500	1.502		
3-May-94	630		4.110		0.390		
4-May-94	630		3.677		0.433		
5-May-94	630		3.160		0.517		
6-May-94	630		2.642	4.500	0.518		
7-May-94							
8-May-94							
9-May-94	630		3.102		1.398		
10-May-94	630		2.774		0.328		
11-May-94	630		2.408		0.366		
12-May-94	630		2.156		0.252		
13-May-94	630		1.664	4.500	0.492		
14-May-94							
15-May-94						**SUM**	7.860
16-May-94	630		2.836		1.664	**AVERAGE**	0.49125

1994 SUMMARY

MONTH	**AVERAGE**	**PER MONTH**	
Jan-94	0.1194	3.70	
Feb-94	0.1936	5.42	
Mar-94	0.2412	7.48	
Apr-94	0.4084	12.25	
May-94	0.4913	15.23	
		44.08	**Total inches**

24-Feb-94	730		3.792		0.208		
25-Feb-94	730		3.640		0.152		
26-Feb-94							
27-Feb-94						**SUM**	5.422
28-Feb-94	730		3.024		0.616	**AVERAGE**	0.193643
1-Mar-94	730		2.802		0.222		
2-Mar-94	730		2.571		0.231		
3-Mar-94	730		2.378		0.193		
4-Mar-94	730		2.175	4.000	0.203		
5-Mar-94							
6-Mar-94							
7-Mar-94	730		3.065		0.935		
8-Mar-94	730	0.06	**3.130**				
9-Mar-94	730		2.886		0.244		
10-Mar-94	730		2.720		0.166		
11-Mar-94	730		2.446		0.274		
12-Mar-94							
13-Mar-94							
14-Mar-94	730		1.688	4.500	0.758		
15-Mar-94	730		4.335		0.165		
16-Mar-94	730		3.905		0.430		
17-Mar-94	730		3.656		0.249		
18-Mar-94	730		3.368		0.288		
19-Mar-94							
20-Mar-94							
21-Mar-94	730		2.992		0.376		
22-Mar-94	730		2.756		0.236		
23-Mar-94	730		2.366		0.390		
24-Mar-94	730		2.074		0.292		
25-Mar-94	730		1.630	4.000	0.444		
26-Mar-94							
27-Mar-94							
28-Mar-94	730	0.54	**4.540**				
29-Mar-94	730		3.711		0.829		
30-Mar-94	730		3.450		0.261	**SUM**	7.477
31-Mar-94	730		3.159		0.291	**AVERAGE**	0.241194
1-Apr-94	730		2.340	4.000	0.819		
2-Apr-94							
3-Apr-94							
4-Apr-94	730		2.824		1.176		
5-Apr-94	630		2.492		0.332		
6-Apr-94	630		2.042	4.500	0.450		
7-Apr-94	630		4.046		0.454		
8-Apr-94	630		3.754		0.292		
9-Apr-94							
10-Apr-94							
11-Apr-94	630		2.624		1.130		
12-Apr-94	630		2.332		0.292		
13-Apr-94	630		1.900	4.500	0.432		
14-Apr-94	630		4.030		0.470		
15-Apr-94	630		3.680		0.350		
16-Apr-94							
17-Apr-94							
18-Apr-94	630		2.341		1.339		
19-Apr-94	630		1.936	4.500	0.405		
20-Apr-94	630		3.988		0.512		
21-Apr-94	630		3.539		0.449		
22-Apr-94	630		3.046		0.493		

Painted Rock Dam Evaporation Data

Date	Time	Rainfall	Hook Gage	Pan Fill	Change		
31-Dec-93							
1-Jan-94						**Painted Rock Dam**	
2-Jan-94						**Evaporation Data**	
3-Jan-94	730		2.518			**01 Jan 94 to 16 May 94**	
4-Jan-94	730		2.394		0.124	Entered by TK	
5-Jan-94	730		2.300		0.094		
6-Jan-94	730		2.250		0.050	**Bold #s are calculations**	
7-Jan-94	730		2.010	4.000	0.240	**not measurements.**	
8-Jan-94							
9-Jan-94							
10-Jan-94	730		3.650		0.350		
11-Jan-94	730		3.526		0.124		
12-Jan-94	730		3.378		0.148		
13-Jan-94	730		3.256		0.122		
14-Jan-94	730		3.118		0.138		
15-Jan-94							
16-Jan-94							
17-Jan-94							
18-Jan-94	730		2.656		0.462		
19-Jan-94	730		2.418		0.238		
20-Jan-94	730		2.270		0.148		
21-Jan-94	730		2.150	4.000	0.120		
22-Jan-94							
23-Jan-94							
24-Jan-94	730		3.609		0.391		
25-Jan-94	730		3.444		0.165		
26-Jan-94	730		3.356		0.088		
27-Jan-94	730		3.258		0.098		
28-Jan-94	730		3.032		0.226		
29-Jan-94							
30-Jan-94						**SUM**	3.700
31-Jan-94	730		2.658		0.374	**AVERAGE**	0.119355
1-Feb-94	730		2.520		0.138		
2-Feb-94	730		2.368		0.152		
3-Feb-94	730		2.254		0.114		
4-Feb-94	730		2.112	4.000	0.142		
5-Feb-94							
6-Feb-94							
7-Feb-94	730		3.575		0.425		
8-Feb-94	730	0.41	**4.383**				
9-Feb-94	730	0.86	**5.602**				
10-Feb-94	730		4.572		1.030		
11-Feb-94	730		4.472		0.100		
12-Feb-94							
13-Feb-94							
14-Feb-94	730		3.820		0.652		
15-Feb-94	730		3.642		0.178		
16-Feb-94	730		3.500		0.142		
17-Feb-94	730		3.364		0.136		
18-Feb-94	730		3.076		0.288		
19-Feb-94							
20-Feb-94							
21-Feb-94							
22-Feb-94	730		2.307		0.769		
23-Feb-94	730		2.127	4.000	0.180		

11-Dec-93								
12-Dec-93								
13-Dec-93	730		3.729		0.441			
14-Dec-93	730		3.600		0.129			
15-Dec-93	730		3.504		0.096			
16-Dec-93	730		3.408		0.096			
17-Dec-93	730		3.309		0.099			
18-Dec-93								
19-Dec-93								
20-Dec-93	730		3.039		0.270			
21-Dec-93	730		2.894		0.145			
22-Dec-93	730		2.819		0.075			
23-Dec-93	730		2.711	4.000	0.108			
24-Dec-93								
25-Dec-93								
26-Dec-93								
27-Dec-93	730		3.318		0.682			
28-Dec-93	730		3.214		0.104			
29-Dec-93	730		3.150		0.064			
30-Dec-93	730		3.007		0.143		**SUM**	3.438
31-Dec-93							**AVERAGE**	0.110903

1993 SUMMARY

MONTH	AVERAGE	PER MONTH	
Jan-93	0.1642	5.09	
Feb-93	0.1441	4.04	
Mar-93	0.2052	6.36	
Apr-93	0.3458	10.37	
May-93	0.4537	14.07	
Jun-93	0.6455	19.37	
Jul-93	0.5725	17.75	
Aug-93	0.4606	14.28	
Sep-93	0.4211	12.63	
Oct-93	0.2832	8.78	
Nov-93	0.1998	5.99	
Dec-93	0.1109	3.44	
		122.16	**Total Inches for the year**

14-Oct-93	630		2.910		0.129		
15-Oct-93	630		2.474	4.000	0.436		
16-Oct-93							
17-Oct-93							
8-Oct-93	630		3.262		0.738		
9-Oct-93	630		3.060		0.202		
0-Oct-93	630		2.836		0.224		
21-Oct-93	630		2.688		0.148		
22-Oct-93	630		2.239	4.500	0.449		
23-Oct-93							
24-Oct-93							
25-Oct-93	630		3.755		0.745		
26-Oct-93	630		3.474		0.281		
27-Oct-93	630		3.038		0.436		
28-Oct-93	630		2.741		0.297		
29-Oct-93	630		2.483	4.000	0.258		
30-Oct-93						**SUM**	8.780
31-Oct-93						**AVERAGE**	0.283226
1-Nov-93	1030		3.126		0.874		
2-Nov-93	630		3.025		0.101		
3-Nov-93	630		2.894		0.131		
4-Nov-93	630		2.604		0.290		
5-Nov-93	630		2.394	4.000	0.210		
6-Nov-93							
7-Nov-93							
8-Nov-93	730		3.482		0.518		
9-Nov-93	645		3.253		0.229		
10-Nov-93	645		3.062		0.191		
11-Nov-93							
Nov-93	645		2.727		0.335		
Nov-93							
14-Nov-93							
15-Nov-93	700	1.30	**4.986**				
16-Nov-93	645		3.596		1.390		
17-Nov-93	645		3.500		0.096		
18-Nov-93	700		3.438		0.062		
19-Nov-93	700		3.328		0.110		
20-Nov-93							
21-Nov-93							
22-Nov-93	700		3.017		0.311		
23-Nov-93	700		2.861		0.156		
24-Nov-93	730		2.671		0.190		
25-Nov-93							
26-Nov-93	730		2.342	4.000	0.329		
27-Nov-93							
28-Nov-93							
29-Nov-93	730		3.633		0.367	**SUM**	5.993
30-Nov-93	730		3.530		0.103	**AVERAGE**	0.199767
1-Dec-93	730		3.426		0.104		
2-Dec-93	730		3.302		0.124		
3-Dec-93	730		3.268		0.034		
4-Dec-93							
5-Dec-93							
ec-93	730		2.874	4.500	0.394		
-Dec-93	730		4.402		0.098		
ec-93	730		4.350		0.052		
9-Dec-93	730		4.228		0.122		
10-Dec-93	730		4.170		0.058		

17-Aug-93	630		4.000		0.500		
18-Aug-93	630		3.666		0.334		
19-Aug-93	630		2.856		0.810		
20-Aug-93	630	0.07	**2.744**	4.500	0.112		
21-Aug-93							
22-Aug-93							
23-Aug-93	630		3.166		1.334		
24-Aug-93	630		2.520		0.646		
25-Aug-93	630	0.76	**3.501**				
26-Aug-93	600	0.07	**2.910**		0.591		
27-Aug-93	630		2.775	4.000	0.135		
28-Aug-93							
29-Aug-93							
30-Aug-93	630	0.09	**3.688**		0.312	**SUM**	14.280
31-Aug-93	630		3.249		0.439	**AVERAGE**	0.460645
1-Sep-93	600		2.718		0.531		
2-Sep-93	700		2.386	4.500	0.332		
3-Sep-93	630		4.005		0.495		
4-Sep-93							
5-Sep-93							
6-Sep-93							
7-Sep-93	630		2.144	5.000	1.861		
8-Sep-93	630		4.581		0.419		
9-Sep-93	630		4.014		0.567		
10-Sep-93	630		3.520		0.494		
11-Sep-93							
12-Sep-93							
13-Sep-93	630		2.180		1.340		
14-Sep-93	630		1.774	4.500	0.406		
15-Sep-93	630		4.120		0.380		
16-Sep-93	630		3.754		0.366		
17-Sep-93	630		3.220		0.534		
18-Sep-93							
19-Sep-93							
20-Sep-93	630		2.200	4.500	1.020		
21-Sep-93	630		4.023		0.477		
22-Sep-93	630		3.649		0.374		
23-Sep-93	630		3.388		0.261		
24-Sep-93	630		2.845	4.500	0.543		
25-Sep-93							
26-Sep-93							
27-Sep-93	615		3.510		0.990		
28-Sep-93	630		3.000		0.510		
29-Sep-93	630		2.626		0.374	**SUM**	12.633
30-Sep-93	630		2.267		0.359	**AVERAGE**	0.4211
1-Oct-93	630		2.063	4.500	0.204		
2-Oct-93							
3-Oct-93							
4-Oct-93	630		3.542		0.958		
5-Oct-93	630		3.029		0.513		
6-Oct-93	630		2.590		0.439		
7-Oct-93	630	0.03	**2.512**		0.078		
8-Oct-93	630		2.228	5.000	0.284		
9-Oct-93							
10-Oct-93							
11-Oct-93							
12-Oct-93	630		3.410		1.590		
13-Oct-93	645		3.039		0.371		

20-Jun-93							
21-Jun-93	630		3.285		1.715		
22-Jun-93	630		2.568		0.717		
23-Jun-93	630		1.944		0.624		
-Jun-93	615		1.372	5.000	0.572		
-Jun-93	600		4.324		0.676		
6-Jun-93							
27-Jun-93							
28-Jun-93	615		2.490		1.834		
29-Jun-93	630		1.900	6.000	0.590	**SUM**	19.365
30-Jun-93	630		4.450		1.550	**AVERAGE**	0.6455
1-Jul-93	615		3.719		0.731		
2-Jul-93	615		3.132	5.000	0.587		
3-Jul-93	800		4.218		0.782		
4-Jul-93	800		3.575		0.643		
5-Jul-93	740		2.914		0.661		
6-Jul-93	640		2.392		0.522		
7-Jul-93	630		1.916	5.000	0.476		
8-Jul-93	600		4.474		0.526		
9-Jul-93	630		3.780		0.694		
10-Jul-93							
11-Jul-93							
12-Jul-93	630		2.102	5.000	1.678		
13-Jul-93	630		4.397		0.603		
14-Jul-93	630		3.842		0.555		
15-Jul-93	630		3.272		0.570		
16-Jul-93	630		2.610	5.000	0.662		
17-Jul-93							
8-Jul-93							
Jul-93							
-Jul-93	615		2.626		2.374		
1-Jul-93	630		2.064		0.562		
22-Jul-93	630		1.547	5.000	0.517		
23-Jul-93	630		4.397		0.603		
24-Jul-93							
25-Jul-93							
26-Jul-93	630		2.552		1.845		
27-Jul-93	630		2.052	5.000	0.500		
28-Jul-93	630		4.506		0.494		
29-Jul-93	630		3.904		0.602		
30-Jul-93	630		3.342		0.562	**SUM**	17.749
31-Jul-93						**AVERAGE**	0.572548
1-Aug-93							
2-Aug-93	630		1.590	4.500	1.752		
3-Aug-93	600		4.040		0.460		
4-Aug-93	630		3.498		0.542		
5-Aug-93							
6-Aug-93	630		2.573	4.500	0.925		
7-Aug-93							
8-Aug-93							
9-Aug-93	745		3.024		1.476		
0-Aug-93	630		2.545		0.479		
1-Aug-93	630		1.930	4.500	0.615		
g-93	630		3.989		0.511		
ug-93	630		3.382		0.607		
ug-93							
5-Aug-93							
6-Aug-93	630		1.682	4.500	1.700		

23-Apr-93	615		3.155		0.448		
24-Apr-93	715		2.690		0.465		
25-Apr-93	710		2.444		0.246		
26-Apr-93	615		2.183	4.000	0.261		
27-Apr-93	700		3.526		0.474		
28-Apr-93	615		3.066		0.460		
29-Apr-93	615		2.680		0.386	**SUM**	10.373
30-Apr-93	630		2.348	5.000	0.332	**AVERAGE**	0.345767
1-May-93							
2-May-93							
3-May-93	615		3.569		1.431		
4-May-93	615		3.131		0.438		
5-May-93	615		2.531		0.600		
6-May-93	630		2.266		0.265		
7-May-93	630		1.857	5.000	0.409		
8-May-93							
9-May-93							
10-May-93	630		3.460		1.540		
11-May-93	630		2.963		0.497		
12-May-93	630		2.376		0.587		
13-May-93	630		1.922	5.000	0.454		
14-May-93	630		4.510		0.490		
15-May-93							
16-May-93							
17-May-93	615		3.084		1.426		
18-May-93	620		2.758		0.326		
19-May-93	630		2.190		0.568		
20-May-93	620		1.729	5.000	0.461		
21-May-93	630		4.401		0.599		
22-May-93							
23-May-93							
24-May-93	630		2.815		1.586		
25-May-93	615		2.358		0.457		
26-May-93	630		1.900	5.000	0.458		
27-May-93	630		4.276		0.724		
28-May-93	630		3.526		0.750		
29-May-93							
30-May-93						**SUM**	14.066
31-May-93						**AVERAGE**	0.453742
1-Jun-93	630		1.470	5.000	2.056		
2-Jun-93	630		4.488		0.512		
3-Jun-93	630		3.856		0.632		
4-Jun-93	615		3.270		0.586		
5-Jun-93							
6-Jun-93							
7-Jun-93	600		1.782	5.000	1.488		
8-Jun-93	615		4.532		0.468		
9-Jun-93	630		4.106		0.426		
10-Jun-93	615		3.602		0.504		
11-Jun-93	630		3.082		0.520		
12-Jun-93							
13-Jun-93							
14-Jun-93	615		1.444	5.000	1.638		
15-Jun-93	615		4.420		0.580		
16-Jun-93	615		3.866		0.554		
17-Jun-93	620		3.206		0.660		
18-Jun-93	630		2.743	5.000	0.463		
19-Jun-93							

24-Feb-93	800		2.920		0.223		
25-Feb-93	800		2.778		0.142		
26-Feb-93	800		2.343		0.435		
27-Feb-93	730		2.515			**SUM**	4.035
Feb-93	730	0.56	**3.543**			**AVERAGE**	0.144107
-Mar-93	800	0.08	**3.065**				
-Mar-93	800		2.838		0.227		
3-Mar-93	800		2.722		0.116		
4-Mar-93	730		2.570		0.152		
5-Mar-93	730		2.408		0.162		
6-Mar-93	800		2.258		0.150		
7-Mar-93	730		2.060		0.198		
8-Mar-93	730		1.907		0.153		
9-Mar-93	730		1.732		0.175		
10-Mar-93	730		1.574	4.000	0.158		
11-Mar-93	730		3.754		0.246		
12-Mar-93	730		3.501		0.253		
13-Mar-93	730		3.243		0.258		
14-Mar-93	730		3.033		0.210		
15-Mar-93	730		2.939		0.094		
16-Mar-93	730		2.730		0.209		
17-Mar-93	730		2.477		0.253		
18-Mar-93	730		2.273		0.204		
19-Mar-93	730		1.971	4.000	0.302		
20-Mar-93	800		3.730		0.270		
21-Mar-93	800		3.571		0.159		
22-Mar-93	800		3.326		0.245		
23-Mar-93	730		3.042		0.284		
24 Mar-93	730	0.03	**2.902**		0.140		
ar-93	730		2.620		0.282		
Mar-93	730		2.347		0.273		
-Mar-93	730		2.847				
28-Mar-93	730		2.664		0.183		
29-Mar-93	730	0.61	**3.772**				
30-Mar-93	730		2.959		0.813	**SUM**	6.362
31-Mar-93	730		2.766		0.193	**AVERAGE**	0.205226
1-Apr-93	730		2.573		0.193		
2-Apr-93	730		2.300	4.000	0.273		
3-Apr-93							
4-Apr-93							
5-Apr-93	730		3.214		0.786		
6-Apr-93	700		2.910		0.304		
7-Apr-93	700		2.604		0.306		
8-Apr-93	715		2.308		0.296		
9-Apr-93	715		1.970	4.000	0.338		
0-Apr-93	715		3.605		0.395		
1-Apr-93	705		3.362		0.243		
2-Apr-93	700		2.935		0.427		
3-Apr-93	700		2.610		0.325		
4-Apr-93	705		2.256		0.354		
5-Apr-93	745		1.860	4.000	0.396		
6-Apr-93	730		3.634		0.366		
7-Apr-93							
r-93							
pr-93	705		2.457		1.177		
pr-93	615		2.000		0.457		
1-Apr-93	615		1.732	4.000	0.268		
2-Apr-93	630		3.603		0.397		

Painted Rock Dam Evaporation Data

Date	Time	Rainfall	Hook Gage	Pan Fill	Change		
31-Dec-92	730		3.940			**Painted Rock Dam**	
1-Jan-93						**Evaporation Data**	
2-Jan-93						**Jan 93 - Dec 93**	
3-Jan-93							
4-Jan-93	730		3.612		0.328	Entered by TK	
5-Jan-93	730		3.588		0.024		
6-Jan-93	730	Trace	3.590			**Bold #s are calculations**	
7-Jan-93	730	0.45	**4.347**			**not measurements.**	
8-Jan-93	730	1.01	**6.010**				
9-Jan-93							
10-Jan-93	820	0.10	**4.437**		1.573		
11-Jan-93	730	0.53	**5.376**				
12-Jan-93	730		4.706		0.670		
13-Jan-93	730	0.15	**4.951**				
14-Jan-93	730		4.704		0.247		
15-Jan-93	730	Trace	4.708				
16-Jan-93	730	0.02	**3.918**		0.790		
17-Jan-93	730	0.27	**4.378**				
18-Jan-93	730		4.040		0.338		
19-Jan-93	730	0.02	**4.056**				
20-Jan-93	730		3.943		0.113		
21-Jan-93	730		3.876		0.067		
22-Jan-93	730		3.805		0.071		
23-Jan-93							
24-Jan-93							
25-Jan-93	730		3.446		0.359		
26-Jan-93	730		3.372		0.074		
27-Jan-93	730		3.200		0.172		
28-Jan-93	730		3.159		0.041		
29-Jan-93	730		2.937		0.222		
30-Jan-93						**SUM**	5.089
31-Jan-93						**AVERAGE**	0.164161
1-Feb-93	730		2.785		0.152		
2-Feb-93	730		2.678		0.107		
3-Feb-93	730		2.462		0.216		
4-Feb-93	730		2.355		0.107		
5-Feb-93	730		2.244	4.000	0.111		
6-Feb-93	730		3.952		0.048		
7-Feb-93	730		3.625		0.327		
8-Feb-93	730		3.703				
9-Feb-93	730	0.60	**4.900**				
10-Feb-93	730	0.10	**4.333**		0.567		
11-Feb-93	730		4.112		0.221		
12-Feb-93	730		4.021		0.091		
13-Feb-93	730		3.911		0.110		
4-Feb-93	730	0.08	**4.026**				
5-Feb-93	730	0.17	**4.321**				
6-Feb-93	730		3.968		0.353		
7-Feb-93	730		3.906		0.062		
8-Feb-93	730		3.780		0.126		
9-Feb-93	730		3.702		0.078		
0-Feb-93	730	0.01	**3.672**		0.030		
1-Feb-93	730		3.458		0.214		
2-Feb-93	730		3.262		0.196		
3-Feb-93	800		3.143		0.119		

13-May-92	730		2.382		0.402		
14-May-92	730		2.056		0.326		
15-May-92	730		1.662	5.000	0.394		
16-May-92							
17-May-92							
18-May-92	730		3.474		1.526		
19-May-92	730		2.977		0.497		
20-May-92	730		2.690		0.287		
21-May-92	730		2.065		0.625		
22-May-92	730		1.702	5.000	0.363		
23-May-92							
24-May-92		0.10	**5.100**				
25-May-92							
26-May-92	730		3.673		1.427		
27-May-92	730		3.358		0.315		
28-May-92	730		2.728		0.630		
29-May-92	730		2.450	5.000	0.278		
30-May-92						**SUM**	11.901
31-May-92						**AVERAGE**	0.383903
1-Jun-92	730		4.088		0.912		
2-Jun-92	730		3.610		0.478		
3-Jun-92	730		3.110		0.500		
4-Jun-92	730		2.476		0.634		
5-Jun-92	730		1.674	5.000	0.802		
6-Jun-92							
7-Jun-92							
8-Jun-92	730		3.196		1.804		
9-Jun-92	730		2.750		0.446		
10-Jun-92	730		2.276		0.474		
11-Jun-92	730		1.875	5.000	0.401		
12-Jun-92	730		4.495		0.505		
13-Jun-92							
14-Jun-92							
15-Jun-92	730		2.675		1.820		
16-Jun-92	730		2.164	5.000	0.511	**SUM**	9.832
17-Jun-92	730		4.455		0.545	**AVERAGE**	0.578353
1992 SUMMARY							
MONTH	**AVERAGE**	**PER MONTH**					
Jan-92	0.0983	3.05					
Feb-92	0.1746	5.06					
Mar-92	0.1840	5.70					
Apr-92	0.3621	10.86					
May-92	0.3839	11.90					
Jun-92	0.5784	17.35					
		53.93	**Total inches for half of the year**				

16-Mar-92	730		3.754		0.746		
17-Mar-92	730		3.503		0.251		
18-Mar-92	730		3.240		0.263		
19-Mar-92	730		3.029		0.211		
20-Mar-92	730		2.784		0.245		
21-Mar-92							
22-Mar-92							
23-Mar-92	730	0.02	**2.170**		0.614		
24-Mar-92	730		1.936		0.234		
25-Mar-92	730		1.750		0.186		
26-Mar-92	730		1.478		0.272		
27-Mar-92	730	0.13	**1.788**	3.500			
28-Mar-92							
29-Mar-92							
30-Mar-92	730	0.07	**3.288**		0.212	**SUM**	5.704
31-Mar-92	730	0.03	**3.186**		0.102	**AVERAGE**	0.184
1-Apr-92	730		2.996		0.190		
2-Apr-92	730	0.48	**3.854**				
3-Apr-92	730		3.128		0.726		
4-Apr-92							
5-Apr-92							
6-Apr-92	730		2.366	4.500	0.762		
7-Apr-92	730		4.372		0.128		
8-Apr-92	730		4.012		0.360		
9-Apr-92	730		3.668		0.344		
10-Apr-92	730		3.318		0.350		
11-Apr-92							
12-Apr-92							
13-Apr-92	730		2.318		1.000		
14-Apr-92	730		2.072		0.246		
15-Apr-92	730		1.626	5.000	0.446		
16-Apr-92	730		4.720		0.280		
17-Apr-92	730		4.296		0.424		
18-Apr-92							
19-Apr-92							
20-Apr-92	730		3.098		1.198		
21-Apr-92	730		2.688		0.410		
22-Apr-92	730		2.468		0.220		
23-Apr-92	730		1.924	5.000	0.544		
24-Apr-92	730		4.690		0.310		
25-Apr-92							
26-Apr-92							
27-Apr-92	730		3.128		1.562		
28-Apr-92	730		2.796		0.332		
29-Apr-92	730		2.218		0.578	**SUM**	10.862
30-Apr-92	730		1.766	5.000	0.452	**AVERAGE**	0.362067
1-May-92	730		**4.433**		0.567		
2-May-92							
3-May-92							
4-May-92	730		2.929		1.504		
5-May-92	730	0.25	**3.046**				
6-May-92	730	0.13	**2.692**		0.354		
7-May-92	730		2.348		0.344		
8-May-92	730		2.002	4.500	0.346		
9-May-92							
10-May-92							
11-May-92	730		3.220		1.280		
12-May-92	730		2.784		0.436		

Painted Rock Dam Evaporation Data

Date	Time	Rainfall	Hook Gage	Pan Fill	Change		
21-Jan-92	730		2.544			**Painted Rock Dam**	
22-Jan-92	730		2.486		0.058	**Evaporation Data**	
23-Jan-92	730		2.400		0.086	**22 Jan 92 - 17 Jun 92**	
24-Jan-92	730		2.350		0.050		
25-Jan-92						Entered by TK	
26-Jan-92							
27-Jan-92	730		1.923	4.000	0.427	**Bold #s are calculations**	
28-Jan-92	730		3.884		0.116	**not measurements.**	
29-Jan-92	730		3.718		0.166		
30-Jan-92	730		3.664		0.054	**SUM**	1.081
31-Jan-92	730		3.540		0.124	**AVERAGE**	0.098273
1-Feb-92							
2-Feb-92							
3-Feb-92	730		2.922		0.618		
4-Feb-92	730		2.853		0.069		
5-Feb-92	730		2.658		0.195		
6-Feb-92	730		2.420		0.238		
7-Feb-92	730	0.90	**4.294**				
8-Feb-92							
9-Feb-92							
10-Feb-92	730		3.054		1.240		
11-Feb-92	730		2.933		0.121		
12-Feb-92	730	0.08	**3.169**				
13-Feb-92	730	0.22	**3.344**				
14-Feb-92	730		3.013		0.331		
15-Feb-92							
16-Feb-92	730	0.15	**3.163**				
17-Feb-92							
18-Feb-92	730		2.882		0.281		
19-Feb-92	730		2.633		0.249		
20-Feb-92	730		2.501		0.132		
21-Feb-92	730		2.430	4.000	0.071		
22-Feb-92							
23-Feb-92							
24-Feb-92	730		3.354		0.646		
25-Feb-92	730		3.276		0.078		
26-Feb-92	730		3.010		0.266		
27-Feb-92	730		2.701		0.309		
28-Feb-92	730		2.483		0.218	**SUM**	5.062
29-Feb-92						**AVERAGE**	0.174552
1-Mar-92							
2-Mar-92	730		1.911		0.572		
3-Mar-92	730	0.54	**3.024**				
4-Mar-92	730		2.394		0.630		
5-Mar-92	730		2.120		0.274		
6-Mar-92	730		2.084		0.036		
7-Mar-92							
8-Mar-92							
9-Mar-92	730	0.40	**2.514**				
10-Mar-92	730		2.048		0.466		
11-Mar-92	730		1.908		0.140		
12-Mar-92	730		1.740		0.168		
13-Mar-92	730		1.658	4.500	0.082		
14-Mar-92							
15-Mar-92							

Painted Rock Dam Evaporation Data

23-Apr-91	730		2.868		0.332		
24-Apr-91	730		2.654		0.214		
25-Apr-91	730		2.378		0.276		
26-Apr-91	730		1.870	4.500	0.508		
27-Apr-91							
28-Apr-91							
29-Apr-91	730		3.205		1.295	**SUM**	11.245
30-Apr-91	730		3.000		0.205	**AVERAGE**	0.374833
1-May-91	730		2.650		0.350		
2-May-91	730		1.813	4.500	0.837		
3-May-91	730		4.182		0.318		
4-May-91							
5-May-91						**SUM**	2.834
6-May-91	730		2.853		1.329	**AVERAGE**	0.472333
1991 SUMMARY							
MONTH	**AVERAGE**	**PER MONTH**					
Mar-91	0.1961	6.08					
Apr-91	0.3748	11.25					
May-91	0.4723	14.64					
		31.97	**Total inches**				

Painted Rock Dam Evaporation Data

Date	Time	Rainfall	Hook Gage	Pan Fill	Change		
28-Feb-91	730	0.17	**2.902**			**Painted Rock Dam**	
1-Mar-91	730	0.03	**2.722**		0.180	**Evaporation Data**	
2-Mar-91		0.25				**01 Mar 91 - 06 May 91**	
3-Mar-91							
4-Mar-91	730		**2.834**	4.500	-0.112	Entered by TK	
5-Mar-91	730		4.314		0.186		
6-Mar-91	730		3.972		0.342	**Bold #s are calculations**	
7-Mar-91	730		3.752		0.220	**not measurements.**	
8-Mar-91	730		3.423		0.329		
9-Mar-91							
10-Mar-91							
11-Mar-91	730		2.306	4.500	1.117		
12-Mar-91	730		4.250		0.250		
13-Mar-91	730		3.984		0.266		
14-Mar-91	730		3.726		0.258		
15-Mar-91	730		3.474		0.252		
16-Mar-91		0.33	**3.804**				
17-Mar-91							
18-Mar-91	730		3.420		0.384		
19-Mar-91	730		3.200		0.220		
20-Mar-91	730	0.08	**3.150**		0.050		
21-Mar-91	730	0.27	**3.436**				
22-Mar-91	730		3.060		0.376		
23-Mar-91							
24-Mar-91							
25-Mar-91	730		2.321		0.739		
26-Mar-91	730		2.200		0.121		
27-Mar-91	730	0.75	**3.544**				
28-Mar-91	730	0.63	**4.026**				
29-Mar-91	730		3.124		0.902		
30-Mar-91						**SUM**	6.080
31-Mar-91						**AVERAGE**	0.196129
1-Apr-91	730		2.504	4.500	0.620		
2-Apr-91	730		4.024		0.476		
3-Apr-91	730		3.800		0.224		
4-Apr-91	730		3.500		0.300		
5-Apr-91	730		3.292		0.208		
6-Apr-91							
7-Apr-91							
8-Apr-91	730		2.030	4.500	1.262		
9-Apr-91	730		4.268		0.232		
10-Apr-91	730		3.876		0.392		
11-Apr-91	730		3.298		0.578		
12-Apr-91	730		2.834	4.500	0.464		
13-Apr-91							
14-Apr-91							
15-Apr-91	730		3.650		0.850		
16-Apr-91	730		3.184		0.466		
17-Apr-91	730		2.813		0.371		
18-Apr-91	730		2.400		0.413		
19-Apr-91	730		2.141	4.500	0.259		
20-Apr-91							
21-Apr-91							
22-Apr-91	730		3.200		1.300		

Painted Rock Dam Pan Evaporation Data

29-Mar-86								
30-Mar-86							SUM	7.746
31-Mar-86	730		3.122		0.878		AVERAGE	0.249871
1-Apr-86	730	0.03	**2.934**		0.188			
2-Apr-86	730		2.624		0.310			
3-Apr-86	730		2.242		0.382			
4-Apr-86	730		1.922	4.500	0.320			
5-Apr-86								
6-Apr-86								
7-Apr-86	730		3.394		1.106			
8-Apr-86	730		3.182		0.212			
9-Apr-86	730		2.852		0.330			
10-Apr-86	730		2.500		0.352			
11-Apr-86	730		2.206	4.500	0.294			
12-Apr-86								
13-Apr-86								
14-Apr-86	730		3.154		1.346			
15-Apr-86	730		2.872		0.282			
16-Apr-86	730		2.422		0.450			
17-Apr-86	730		2.096		0.326			
18-Apr-86	730		1.788	4.500	0.308			
19-Apr-86								
20-Apr-86								
21-Apr-86	730		3.159		1.341			
22-Apr-86	730		2.736		0.423			
23-Apr-86	730		2.232		0.504			
24-Apr-86	730		1.713	4.000	0.519			
25-Apr-86	730		3.586		0.414			
26-Apr-86								
27-Apr-86								
28-Apr-86	730		2.150		1.436			
29-Apr-86	730		1.732	5.000	0.418		SUM	11.681
30-Apr-86	730		4.580		0.420		AVERAGE	0.389367
1986 SUMMARY								
MONTH	**AVERAGE**	**PER MONTH**						
Dec-86	0.0818	2.45						
Jan-86	0.1190	3.69						
Feb-86	0.1291	3.61						
Mar-86	0.2499	7.75						
Apr-86	0.3894	11.68						
		29.18	**Total inches**					

31-Jan-86	730		2.078		0.102	**AVERAGE**	0.118968
1-Feb-86	800	0.40	**2.478**				
2-Feb-86							
3-Feb-86	800		2.248	4.600	0.230		
4-Feb-86	800		4.495		0.105		
5-Feb-86	800		4.331		0.164		
6-Feb-86	800		4.150		0.181		
7-Feb-86	730		4.018		0.132		
8-Feb-86							
9-Feb-86							
10-Feb-86	730	0.18	**4.184**				
11-Feb-86	730		3.894		0.290		
12-Feb-86	730		3.790		0.104		
13-Feb-86	730		3.660		0.130		
14-Feb-86	730		3.554		0.106		
15-Feb-86							
16-Feb-86							
17-Feb-86							
18-Feb-86	730	0.05	**3.332**		0.222		
19-Feb-86	730		3.149		0.183		
20-Feb-86	730		3.064		0.085		
21-Feb-86	730		2.749		0.315		
22-Feb-86							
23-Feb-86							
24-Feb-86	730		2.207		0.542		
25-Feb-86	730		2.035		0.172		
26-Feb-86	730		1.815		0.220		
27-Feb-86	730		1.692		0.123	**SUM**	3.614
28-Feb-86	730		1.382	4.000	0.310	**AVERAGE**	0.129071
1-Mar-86	730						
2-Mar-86							
3-Mar-86	730		3.182		0.818		
4-Mar-86	730		2.840		0.342		
5-Mar-86	730		2.511		0.329		
6-Mar-86	730		2.388		0.123		
7-Mar-86	730		1.982	4.500	0.406		
8-Mar-86							
9-Mar-86							
10-Mar-86	730		3.602		0.898		
11-Mar-86	730	0.11	**3.838**				
12-Mar-86	730		3.580		0.258		
13-Mar-86	730	0.15	**3.488**		0.092		
14-Mar-86	730	0.10	**3.350**		0.138		
15-Mar-86							
16-Mar-86							
17-Mar-86	730	0.20	**3.124**		0.226		
18-Mar-86	730		2.802		0.322		
19-Mar-86	730		2.621		0.181		
20-Mar-86	730		2.393		0.228		
21-Mar-86	730		2.144	4.500	0.249		
22-Mar-86							
23-Mar-86							
24-Mar-86	730		3.546		0.954		
25-Mar-86	730		3.220		0.326		
26-Mar-86	730		2.922		0.298		
27-Mar-86	730		2.634		0.288		
28-Mar-86	730		2.242	4.000	0.392		

Painted Rock Dam Pan Evaporation Data

Date	Time	Rainfall	Hook Gage	Pan Fill	Change		
8-Dec-85						**Painted Rock Dam**	
9-Dec-85	730		3.520			**Evaporation Data**	
10-Dec-85	730		3.408		0.112	**09 Dec 85 - 01 Apr 86**	
11-Dec-85	730	0.10	**3.500**			Entered by TK	
12-Dec-85	730	0.84	**5.086**				
13-Dec-85	730		4.192		0.894	**Bold #s are calculations**	
14-Dec-85						**not measurements.**	
15-Dec-85							
16-Dec-85	730		3.978		0.214		
17-Dec-85	730		3.863		0.115		
18-Dec-85	730		3.790		0.073		
19-Dec-85	730		3.694		0.096		
20-Dec-85	730		3.592		0.102		
21-Dec-85							
22-Dec-85							
23-Dec-85	730		3.333		0.259		
24-Dec-85	730		3.292		0.041		
25-Dec-85							
26-Dec-85	730		3.030		0.262		
27-Dec-85	730		3.003		0.027		
28-Dec-85							
29-Dec-85							
30-Dec-85	730		2.812		0.191	SUM	2.453
31-Dec-85	730		2.745		0.067	AVERAGE	0.081767
1-Jan-86							
2-Jan-86	730		2.634		0.111		
3-Jan-86	730		2.534		0.100		
4-Jan-86							
5-Jan-86							
6-Jan-86	730		2.340		0.194		
7-Jan-86	730		2.180		0.160		
8-Jan-86	730		2.022		0.158		
9-Jan-86	730		1.974		0.048		
10-Jan-86	730		1.784	4.000	0.190		
11-Jan-86							
12-Jan-86							
13-Jan-86	730		3.472		0.528		
14-Jan-86	730		3.355		0.117		
15-Jan-86	730	0.38	**4.160**				
16-Jan-86	730		3.710		0.450		
17-Jan-86	730		3.640		0.070		
18-Jan-86							
19-Jan-86							
20-Jan-86							
21-Jan-86	730		3.260		0.380		
22-Jan-86	730		3.140		0.120		
23-Jan-86	730		3.048		0.092		
24-Jan-86	730		2.941		0.107		
25-Jan-86							
26-Jan-86							
27-Jan-86	730		2.518		0.423		
28-Jan-86	730		2.400		0.118		
29-Jan-86	730		2.282		0.118		
30-Jan-86	730		2.180		0.102	SUM	3.688

23-Feb-85							
24-Feb-85							
25-Feb-85	730		1.480	4.000	0.346		
?6-Feb-85	730		3.890		0.110		
/-Feb-85	730		3.724		0.166	**SUM**	3.380
:8-Feb-85	730		3.676		0.048	**AVERAGE**	0.1207
1-Mar-85	730		3.332		0.344		
2-Mar-85							
3-Mar-85							
4-Mar-85	730		2.634		0.698		
5-Mar-85	730		2.483		0.151		
6-Mar-85	730		2.318		0.165		
7-Mar-85	730		2.102		0.216		
8-Mar-85	730		2.090		0.012		
9-Mar-85							
10-Mar-85							
11-Mar-85	730	0.02	**1.500**	4.000	0.590		
12-Mar-85	730		3.886		0.114		
13-Mar-85	730		3.652		0.234		
14-Mar-85	730		3.426		0.226		
15-Mar-85	730	0.03	**3.256**		0.170		
16-Mar-85							
17-Mar-85							
18-Mar-85	730		2.683		0.573		
19-Mar-85	730		2.320		0.363		
20-Mar-85	730		2.130		0.190		
21-Mar-85	730		1.950		0.180		
??-Mar-85	730		1.782	4.000	0.168		
Mar-85							
1-Mar-85							
25-Mar-85	730		3.374		0.626		
26-Mar-85	730		2.954		0.420		
27-Mar-85	730		2.640		0.314		
28-Mar-85	730		2.310		0.330		
29-Mar-85	730		1.981	4.000	0.329	**SUM**	6.413
30-Mar-85						**AVERAGE**	0.2069

85 SUMMARY

MONTH	**AVERAGE**	**PER MONTH**	
n	0.0798	2.475	
b	0.1207	3.38	
r	0.2069	6.413	
		12.268	**Total inches for the first quarter**

Painted Rock Dam Pan Evaporation Data

Date	Time	Rainfall	Hook Gage	Pan Fill	Change		
31-Dec-84	730		3.430			**Painted Rock Dam**	
1-Jan-85	730		3.370		0.060	**Evaporation Input**	
2-Jan-85	730		3.260		0.110	**Jan to Mar 1985**	
3-Jan-85	730		3.151		0.109	Entered by TK	
4-Jan-85	730		3.042		0.109		
5-Jan-85							
6-Jan-85							
7-Jan-85	730		2.782		0.260	**Bold #s are calculations**	
8-Jan-85	730	0.10	**3.012**			**not measurements.**	
9-Jan-85	730		2.840		0.172		
10-Jan-85	730		2.800		0.040		
11-Jan-85	730		2.728		0.072		
12-Jan-85							
13-Jan-85							
14-Jan-85	730		2.503		0.225		
15-Jan-85	730		2.354		0.149		
16-Jan-85	730		2.314		0.040		
17-Jan-85	730		2.206		0.108		
18-Jan-85	730		2.128		0.078		
19-Jan-85							
20-Jan-85							
21-Jan-85	730		1.912		0.216		
22-Jan-85	730		1.810		0.102		
23-Jan-85	730		1.744		0.066		
24-Jan-85	730		1.704		0.040		
25-Jan-85	730		1.694		0.010		
26-Jan-85		0.40	**2.094**				
27-Jan-85							
28-Jan-85	730		1.863	3.000	0.231		
29-Jan-85	730		2.980		0.020		
30-Jan-85	730		2.800		0.180	**SUM**	2.475
31-Jan-85	730		2.722		0.078	**AVERAGE**	0.0798
1-Feb-85	730		2.626		0.096		
2-Feb-85	730						
3-Feb-85	730	0.44	**3.066**				
4-Feb-85	730		2.912		0.154		
5-Feb-85	730		2.851		0.061		
6-Feb-85	730		2.781		0.070		
7-Feb-85	730		2.712		0.069		
8-Feb-85	730		2.626	4.000	0.086		
9-Feb-85							
10-Feb-85							
11-Feb-85	730		3.431		0.569		
12-Feb-85	730		3.326		0.105		
13-Feb-85	730		3.150		0.176		
14-Feb-85	730		3.000		0.150		
15-Feb-85	730		2.774		0.226		
16-Feb-85							
17-Feb-85							
18-Feb-85							
19-Feb-85	730		2.212		0.562		
20-Feb-85	730		2.056		0.156		
21-Feb-85	730		1.900		0.156		
22-Feb-85	730		1.826		0.074		

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EVAPORATION FROM OPEN WATER SURFACES IN ARIZONA

Acknowledgement

Data used in preparing this paper were obtained from three sources: (1) records of evaporation from sunken insulated evaporation pans at the U. S. Water Conservation Laboratory near Phoenix, Arizona, for the years 1966-1968, (2) records of evaporation from a Class A evaporation pan at the University of Arizona Mesa Experiment Farm for the years 1917-1967, and (3) evaporation maps of the United States based on 1946-1955 data.

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FOLDER 159

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EVAPORATION FROM OPEN WATER SURFACES IN ARIZONA

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Most people know that a considerable amount of water is lost by evaporation from open water surfaces in Arizona. However, they are amazed that, from a stock tank containing water 7 feet deep, the loss to evaporation in a year's time could be as much as 6 feet, leaving only one foot for livestock. On the other hand, declines in water level of 3 or 4 inches per day from fish ponds and swimming pools cannot be due entirely to evaporation.

Using the method outlined in this folder, the home owner, farmer, rancher, contractor, or consultant can estimate the amount of evaporation expected from an open, unfrozen water surface during any part of the year and for any location in Arizona. Results will generally be within 10 percent of actual evaporation on an annual basis.

How to Estimate Evaporation

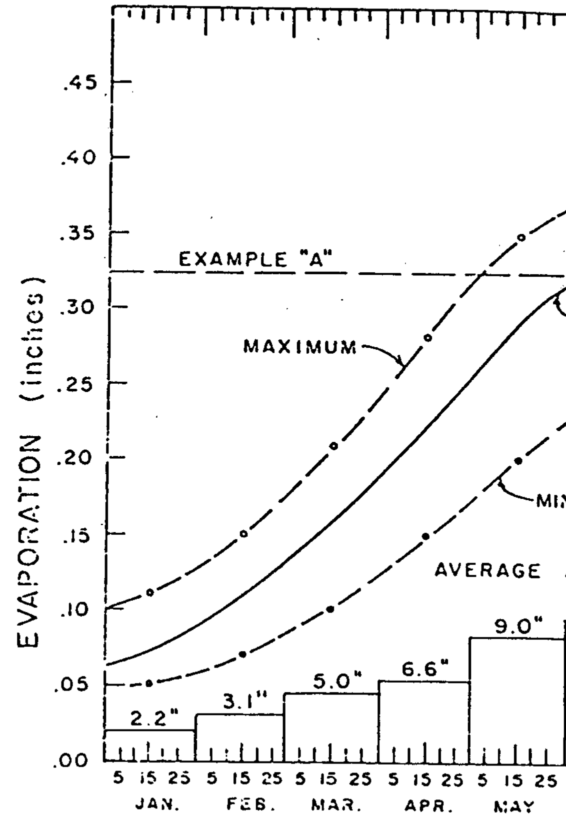
Estimation of evaporation consists of three steps.

1. Select the average daily or average monthly evaporation for the period in question from Figure 1. For daily evaporation, choose one of the three curves, depending on whether you want maximum, normal, or minimum expected evaporation.

Values of average normal evaporation are shown in the bar graph as inches per month.

Use the curve representing normal evaporation for an estimate of expected evaporation under average conditions. However, for extremely hot windy periods, or cool cloudy periods, the curves representing maximum and minimum evaporation, respectively, will give a better estimate. The curves of maximum and minimum evaporation may also be of value when considering the possible range of seepage losses from water storage facilities.

2. Determine an adjustment factor from Figure 2 for the location in question. Read from the map the factor nearest the location in which you are interested.



3. Multiply the values obtained [...] above to obtain the estimated evapora[...] and location in question.

For facilities with exposed walls, such [...] stock tanks and exposed-wall swimmin[...] the value obtained in step 3 above by [...] average coefficient for the entire state [...] exposed-wall structures.

Examples:

A. Wanted: Average daily normal [...] from a swimming pool in Tucson [...]
Step 1. From Figure 1, average [...] July = 0.32 inches/da[...]
Step 2. From Figure 2, adjustme[...]
Step 3. Multiply values obtaine[...] 2 above: 0.32 x 0.95 = [...] = average daily evapor[...] in Tucson.

B. Wanted: Average normal evapor[...] pond in Phoenix during May and [...]
Step 1. From Figure 1, average [...] May and June = 9.0 [...] respectively.
Step 2. Adjustment factor fro[...] Phoenix = 1.0.

(See over)

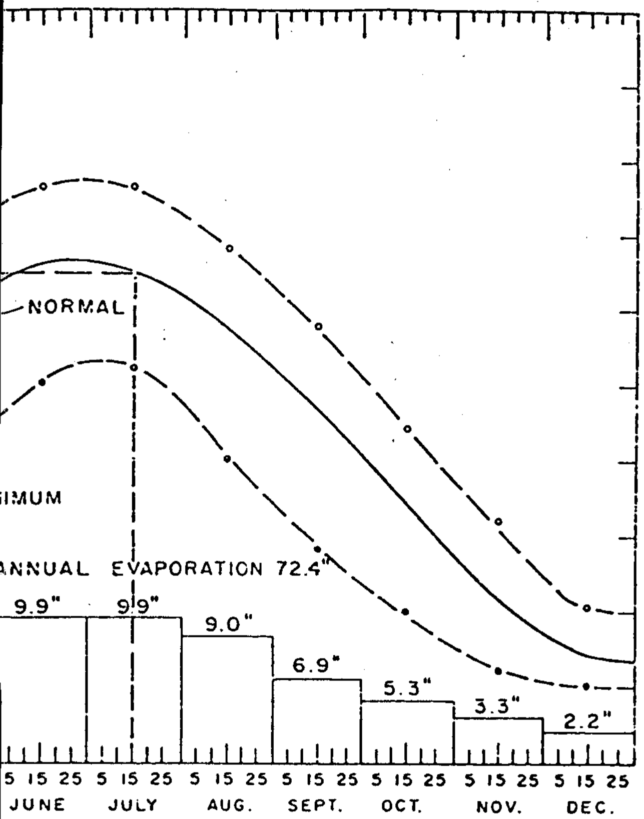


FIGURE 1. Maximum, Normal, and Minimum Daily Evaporation and Average Monthly Evaporation From Open Water Surfaces (Adjustment Factor = 1.00).

n steps 1 and 2
tion for the time

as above-ground
g pools, multiply
1.25, which is an
for all types of

evaporation from
during July.
evaporation for
y.
nt factor = 0.95.
d in steps 1 and
= 0.3 inches/day
ation during July

ation from a fish
June.
evaporation for
and 9.9 inches,

n Figure 2 for

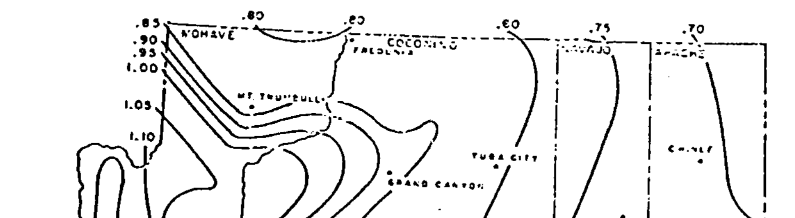


FIGURE 2. Evaporation Adjustment Factors for Arizona.

Step 3. Multiply values obtained in steps 1 and 2 above: (9.0 x 1.0) + (9.9 x 1.0) = 18.9 or approximately 19 inches = total average evaporation for May and June.

Wanted: Maximum evaporation to be expected from a stock pond near Snowflake during May, June, and July.

Step 1. From the curve of maximum values in Figure 1, values for May, June, and July are: 0.35, 0.38, and 0.38 inches/day, respectively.

Step 2. From Figure 2, adjustment factor for Snowflake = 0.80.

Step 3. Multiply values obtained in steps 1 and 2 above times the number of days in each month:

May:	0.35	x 31	x 0.8	=	8.7		
June:	0.38	x 30	x 0.8	=	9.1		
July:	0.38	x 31	x 0.8	=	9.4		
Total:					27.2	inches	

Maximum evaporation expected from a stock pond near Snowflake during May, June, and July is approximately 27 inches.

Wanted: Average normal evaporation from an exposed-wall swimming pool near Yuma during June.

Step 1. From Figure 1, average evaporation for June is 9.9 inches.

Step 2. From Figure 2, adjustment factor for Yuma = 1.10.

Step 3. Multiply values obtained in steps 1 and 2 above:
9.9 x 1.10 = 10.9 inches.

Step 4. Multiply by the coefficient for exposed-wall storage facilities, 1.25:
10.9 x 1.25 = 13.6 inches = average evaporation from an exposed-wall swimming pool at Yuma during June.

APPENDIX B-3

SALT ACCUMULATION CALCULATIONS

Gila Bend Power Project
Estimated Salts Accumulation in Evaporation Ponds

Assumptions		**Units**
Pond fill time:	90	days
Pond drying time:	240	days
Pond area:	20	acres
Nominal pond water depth:	6.5	feet
Pond water volume:	130	acre feet
Evaporation rate:	0.328	inches/day
Density of salt deposits:	75	lbs/cubic foot
Water density:	8.34	lbs/cubic foot
Square feet/acre:	43560	square feet
Cubic feet/acre foot:	325851	cubic feet
Estimated TDS in pond:	19500	mg/liter
Calculations		
Evaporation during fill:	29.52	inches
Evaporation during drying:	78	inches
Total volume evaporated:	179.2	acre feet
Water mass evaporated:	486993443	lbs
Salt deposit mass:	9496372	lbs
Salt deposit volume:	126618	cubic feet
Salt deposit depth:	**1.74**	**inches**

APPENDIX C
WASTEWATER IMPOUNDMENT CONSTRUCTION SPECIFICATIONS

TABLE OF CONTENTS

DIVISION 1 GENERAL REQUIREMENTS

SECTION	01010	SUMMARY OF WORK
SECTION	01015	DEFINITIONS AND ABBREVIATIONS
SECTION	01050	SURVEYING
SECTION	01300	SUBMITTALS
SECTION	01400	QUALITY CONTROL

DIVISION 2 SITE WORK

SECTION	02050	GENERAL DEMOLITION
SECTION	02110	SITE CLEARING AND GRUBBING
SECTION	02140	TEMPORARY DIVERSION AND CONTROL OF WATER
SECTION	02200	EARTHWORK
SECTION	02250	LOW PERMEABILITY SOIL LINER
SECTION	02714	DRAINAGE AND COLLECTION PIPING
SECTION	02776	HDPE LINER
SECTION	02777	DRAINAGE NET
SECTION	02779	GEO-SYNTHETIC CLAY LINER (ALTERNATIVE)

DIVISION 3 CONCRETE

SECTION	03200	CONCRETE REINFORCEMENT
SECTION	03300	CAST-IN-PLACE CONCRETE

DIVISION 5 METALS

SECTION	05400	MISCELLANEOUS METAL

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 BRIEF PROJECT DESCRIPTION

A. The Gila Bend Power Project is a proposed power plant located approximately 6 miles northwest of Gila Bend, Arizona. The proposed Evaporation Impoundments consists of installing evaporation impoundments that are divided into five (5) separate impoundments west and northwest of the proposed power plant and a waste water impoundment (and a 5-acre storm water impoundment) east of the plant site. Industrial Power Technology (IPT) has prepared drawings and technical documents for the construction of the project. The average elevation of the site is 680 feet above sea level.

1.2 LOCATION

A. The project site is located in Maricopa County approximately 6 miles northwest of the Town of Gila Bend and 55 miles southwest of Phoenix. Yuma is approximately 115 miles to the west and Tucson lies approximately 125 miles southeast.

1.3 EXISTING SITE CONDITIONS

A. The layout of the proposed evaporation impoundments is shown on Drawing No. 2 along with the primary access road to the site from Citrus Valley Road at the intersection of Watermelon Road. A secondary site access will be from the north entering from Sisson Road. These are currently unimproved, dirt access roads, developed for agricultural purposes and will be graded and surfaced to meet anticipated traffic loads. Additional gravel surface roads will be constructed for access to the ponds.

B. Geotechnical investigations have been conducted at the site to determine soil conditions for construction evaluation. Soil boring, classification, and lab analytical results are summarized in the report dated November 3, 2000 and prepared by Ninyo & Moore, a geotechnical contractor. This information will be provided to the Contractor for use, but does not represent a complete characterization of existing soil and bedrock conditions.

C. There are no overhead utilities or underground utilities in the path of the project access roads.

1.4 CONTRACTORS USE OF PROPERTY

A. The Contractor shall have unrestricted access and egress from the site, as necessary, to perform the work under this Contract. The Contractor shall obtain the necessary permits and approvals to accomplish all on-property and off-property work.

B. The Contractor's use of the site will be limited only to work and storage related to this Contract.

C. The Contractor shall assume full responsibility for the protection and safekeeping of equipment and materials on or off the site that are related to this Contract.

1.5 WORK SEQUENCE

A. It is anticipated the Owner's Engineer will be onsite on a full time basis to manage the construction of the evaporation impoundments. Coordination of the work sequence, for separate contracts, will be conducted by the Owner's Engineer, Industrial Power Technology.

B. Notice to Proceed will be given after the bid award to begin work under these Contracts Documents.

C. The Contractor shall be responsible for planning, scheduling, and otherwise executing the work in a manner that meets the requirements of the specifications for this project.

1.6 BROAD SCOPE

A. This article describes the project in generality and provides an overview of the intent of the work to be performed under this Contract. The Contractor shall review I .08. Narrow Scope, for a more detailed description, and the entire set of Contract Documents shall be reviewed to gain a thorough understanding of the detailed project requirements.

B. Contractor shall be responsible for obtaining all permits associated with construction of the proposed evaporation impoundments.

C. Contractor shall provide all equipment, materials, and resources for dewatering the surface and subsurface flows in each of the construction areas for the proposed evaporation impoundments.

D. Contractor shall provide all labor, equipment, and materials for the construction of the evaporation impoundments.

E. Contractor shall provide all labor, equipment and materials for temporary utilities, roads, storage, and other facilities necessary for the construction of the structure listed above.

F. Contractor shall perform the work in accordance with the Contract Documents:

1. Project Design Drawings, Construction Specifications, reference design reports, subsequent addenda, and approved shop drawings and submittals.

G. Contractor shall demolish existing structures and facilities shown on the Contract Drawings and demolish and dispose in accordance with the specifications.

H. Throughout construction, the Contractor shall maintain one set of red-line field drawings to show the structures as-constructed. These drawings shall remain onsite during the project for periodic review by the Owner or Engineer. Upon completion of the construction activities, one set of red-line drawings with revised survey data shall be submitted to the Owner or Engineer for incorporation into As-built Drawings to be prepared by the Engineer.

1.7 NARROW SCOPE

A. This article describes the project in more detail and provides the Contractor with the intent of the work to be performed under this Contract. The Contractor shall review the entire set Contract Documents to identify all work, detail, and specifications.

B. Contractor shall demolish and dispose of all concrete foundations and structures within the footprint of the proposed evaporation impoundments, at an appropriate disposal facility or landfill.

C. Contractor shall construct temporary stormwater diversion as necessary in order to divert existing washes around or through the construction site.

D. Contractor shall be responsible for all surveying associated with the construction of the proposed evaporation impoundments.

E. Contractor shall perform all necessary earthwork in accordance with the contract documents, construction drawings, and construction specifications Sections 02110, 02140 and 02200.

F. Contractor shall be responsible for the installation of the Leak Collection and Removal System (LCRS) in accordance with the contract documents, construction drawings, and construction specifications Sections 01400, 02250, 02714, 02776 and 02777.

G. Contractor shall be responsible for the construction and installation of all concrete structures relating to the construction of the proposed evaporation impoundments in accordance with the contract documents, construction drawings, and construction specifications Sections 03200, and 03300.

H. Contractor shall be responsible for the installation and construction of the conveyance piping, access roads, and proposed evaporation impoundments in accordance with the contract documents, construction drawings, and construction specifications.

1.8 OWNER PROVIDED MATERIALS AND FACILITIES

A. Power Plant construction under other contract(s).

B. Conveyance pipe from plant site to evaporation impoundments.

C. Unsuitable earth and rock spoils shall be disposed of off-site.

D. Clear & grub spoils shall be disposed of at an offsite landfill.

END OF SECTION

SECTION 01015

DEFINITIONS AND ABBREVIATIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. The following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1. Addenda - Written or graphic instruments issued prior to the opening of bids which clarify, correct or change the Bidding Requirements or the Contract Documents.

2. Agreement - The written contract between Owner and Contractor covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

3. Application for Payment - The form accepted by Owner's Engineer which is to be used by Contractor in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. Bid - The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. Bidding Documents - The advertisement or invitation to Bid, instructions to bidders, the Bid form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

6. Bidding Requirements - The advertisement or invitation to Bid, instructions to bidders, and the Bid form.

7. Bonds - Performance and Payment bonds and other instruments of security.

8. Change Order - A document recommended by the Owner's Engineer, which is singed by Contractor and Owner and authorizes and addition, deletion or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

9. Contract Documents - The agreement, Addenda (which pertain to the Contract Documents), Contractor's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Field Orders and Engineer's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Shop Drawings and technical data are not Contract Documents.

10. Contract Price - The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement.

11. Contract Times - The numbers of days or the dates stated in the Agreement:

(i) to achieve Substantial Completion, and (ii) to complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendations of final payment.

12. Contractor - The person, firm or corporation with whom Owner has entered into the Agreement.

13. Defective - An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to Engineer's recommendation of final payment.

14. Drawings - The drawings, which show the scope, extent and character of the Work to be furnished and performed by Contractor and which have been prepared or approved by Engineer and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.

15. Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

16. Engineer – (Owner's Engineer) The person, firm or corporation named as such in the Agreement.

17. Engineer's Consultant - A person, firm or corporation having a contract with Engineer to furnish services as Engineer's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

18. Field Order - A written order issued by Engineer which orders minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

19. General Requirements - Sections of Division I of the Specifications.

20. Hazardous Substances - The term Hazardous Substances shall have the meaning provided in Section 101 (14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601, 0603, 9604) and the Resource Conservation and Recovery Act (RCRA) (40 CFR Part 302) as amended from time to time.

21. Hazardous Waste - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

22. Laws and Regulations; Laws or Regulations - Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

23. Liens - Liens, charges, security interests or encumbrances upon real property or personal property.

24. Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all Work.

25. Modifications - Changes made to the specifications or the drawings that are approved by the Owner and Engineer in waiting after the specifications and drawings have been finalized.

26. Notice of Award - The written notice by Owner to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, Owner will sign and deliver the Agreement.

27. Notice to Proceed - A written notice given by Owner to Contractor (with a copy to Engineer) fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform Contractor's obligations under the Contract Documents.

28. Owner - The public body or authority, corporation, association, firm or person with whom Contractor has entered into the Agreement and for whom the Work is to be provided.

29. Owner's Engineer – (Engineer) The person, firm or corporation named as such in the Agreement.

30. Partial Utilization - Use by Owner of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

31. Permeability - A property of the soil that denotes capacity to conduct or discharge water under a given hydraulic gradient. Permeability is usually expressed as K, a coefficient with the unit cm/sec.

32. Project - The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

33. Resident Project Representative - The authorized representative of Owner's Engineer or Owner who may be assigned to the site or any part thereof.

34. Samples - Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

35. Shop Drawings - All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the work or demolition plan.

36. Specifications - Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

37. Subcontractor - An individual, firm or corporation having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

38. Substantial Completion - The Work (or a specified part thereof) has progressed to the point where, in the opinion of the Owner's Engineer as evidenced by Engineer's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is

intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by Engineer's written recommendation of final payment. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

39. Supplementary Conditions - The part of the Contract Documents, which amends or supplements these General Conditions.

40. Supplier - A manufacturer, fabricator, supplier, distributor, material man or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

41. Unit Price Work - Work to be paid for on the basis of unit prices.

42. Work - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing: or furnishing services and furnishing documents, all as required by the Contract Documents.

43. Work Change Directive - A written directive to Contractor, issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer, ordering and addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.2 ABBREVIATIONS

A. The following abbreviations are used in this document:

1. ANSI - American National Standard Institute
2. ASTM - American Society for Testing and Materials
3. CPR - Cardio-Pulmonary Resuscitation
4. CQAP - Contractor Quality Assurance Plan
5. CQCP - Contractor Quality Control Plan
6. CSI - Construction Specification Institute n
7. DOT - U.S. Department of Transportation
8. EPA - U.S. Environmental Protection Agency
9. HDPE - High-Density Polyethylene
10. IPT – Industrial Power Technology
11. LCRS - Leachate Collection and Recovery System

12. MSDS - Material Safety Data Sheet
13. NTP - Notice to Proceed
14. OSHA - Occupational Safety and Health Administration
15. PDEI – Power Development Enterprises, Inc.
16. PPE - Personal Protective Equipment
17. SDR - Standard Dimension Ratio
18. QA/QC - Quality Assurance/Quality Control
19. SHC - Safety and Health Coordinator
20. SSHP - Site Safety and Health Plan

END OF SECTION

SECTION 01050

SURVEYING

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. All work covered by Contract Documents.

1.2 QUALITY ASSURANCE

A. Use an adequate number of skilled workmen, thoroughly trained and experienced in the necessary skills and completely familiar with the specified requirements and methods needed for proper performance of the work described in this Section.

1.3 SUBMITTALS

A. Submit qualifications of persons proposed to be engaged for field surveying services.

B. Submit certification, signed by the Contractor's survey party chief or foreman, that elevations and locations of buried structures and utilities are in conformance or non-conformance with requirements of the Contract.

1.4 PROCEDURES

A. From the survey control obtained from the benchmarks shown on the drawings, the Contractor shall complete the layout of the work and will be responsible for all measurements that may be required for the preparation of the project red-line field drawings to the location and limit marks prescribed in the specifications or on the Contract Drawings. These locations and limits are subject to such modifications as the Engineer may require to meet changed conditions or as a result of necessary modifications to the Contract Work.

B. The Contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the work from the survey control. It will be the responsibility of the Contractor to maintain and preserve all stakes and other marks established work is complete and record information is satisfactory to the Owner's Engineer.

C. The Owner's Engineer may require the work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the work.

D. Locate, protect, and preserve permanent reference and control points before and during progress of work on the site.

E. Do not change or relocate reference points or times of the Work without specific approval from the Owner's Engineer.

F. Promptly advise the Owner's Engineer when a reference point is lost or destroyed or requires relocation because of other changes in the Work.

1. Upon direction of the Engineer, require the survey crew chief **to** replace reference stakes or markers.

2. Locate replacement stakes or markers according to the original survey control.

G. The Contractor shall make such surveys and computations as are necessary to determine the quantities of work performed or placed during each period for which a progress payment is to be made. All original field notes, computations and other records for the purpose of layout and progress surveys shall be furnished promptly to the Engineer at the site of the Work. A copy of the original notes, computations and records furnished to the Owner's Engineer, shall be retained by the Contractor.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Equipment and materials necessary for proper construction surveying shall be at the Contractor's option.

PART 3 - EXECUTION

3.1 SURVEYING

A. The horizontal and vertical survey control and bench marks shall be outlined from the drawings and used by the Contractor in the performance of Contract Work.

B. Contractor is responsible for the quality control relating the location, lines, and grades of work that rely on survey layout and field data. QC cross-checks of survey work shall be implemented as necessary.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Division I - General Requirements

B. Division 2 - Site Work

C. Division 3 - Concrete

1.2 SUBMITTAL CONTROL

A. Within 7 days after receipt of notice to proceed, submit to the Engineer a control document listing and scheduling all required submittal items. The control document shall show the phase and date a submittal is to be provided, and the frequency of repetitive submittals. The list shall include but is not limited to the following:

1. Concrete Reinforcement Shop Drawings
2. Drainage and Collection Piping Shop Drawings
3. HDPE Liner Shop Drawings
4. Drainage Geonet Shop Drawings
5. Red-Line Field Drawings
6. Progress QC Reports for Earthwork
7. Progress QC Reports for Concrete
8. Progress QC Reports for HDPE Piping
9. Progress QC Reports for HDPE liners
10. Progress QC Reports for GCL
11. Progress Schedules
12. Progress Pay Requests
13. Concrete Mix Design
14. Dewatering, Diversion, and Control Plan
15. Quality Control Plan
16. Construction and Temporary Facility Plan
17. Inspection and Test Certificates
    - shop fabricated HDPE liner boots
18. Manufacturer's Literature
    - HDPE liner

- geonet
- geosynthetic clay liner (GCL)
- HDPE piping
- perforated piping
- vaults
- pumps
- fence
- manholes

19. Material Samples
    - HDPE liner
    - geosynthetic clay liner (GCL)
    - geonet
    - riprap
    - landscape gravel
    - Abmaterial

20. Guarantees
    - HDPE liner
    - geosynthetic clay liner (GCL)
    - geonet
    - pumps

B. No work shall begin prior to the approval of the submittal control schedule.

PART 2 - PRODUCTS

A. Submittals shall be organized, stapled, bound, and/or tabbed as appropriate for easy reference.

B. A title page, cover letter, or standard transmittal form shall accompany each submittal.

C. Submit five *(5)* copies of each for review and approval. Two copies will be returned with one of the following standard stamped remarks:

1. Approved;
2. Approved with exceptions noted;
3. Not approved.

D. All submittals shall bear the following information:

1. Date
2. Contract Number
3. Project Title and Location
4. Contractor/Subcontractor's Name
5. Supplier's Name
6. Manufacturer's Name
7. Specification Section and Paragraph Numbers
8. Drawing and Detail Numbers
9. Submittal Control Number

E. Submittals shall reference the appropriate section and its detailed content. Questions regarding any submittals shall be directed to the Engineer for content and schedule of delivery.

F. Limit submittal items to one specification section per submittal. Submit for each item as required in the technical sections.

G. If a submittal is returned for correction or is not, satisfactory and is disapproved by the Engineer, the Contractor shall resubmit the corrected material in the same quantity, as specified for the original submittal, for approval within a maximum of five (5) calendar days after receipt by him of the disapproved material.

PART 3 - EXECUTION

3.1 GENERAL

A. All submittals are required under these Contract Documents and regarded as essential to the successful completion of the Evaporation Impoundment Project. Exceptions to submittals are at the Engineer's discretion.

B. The Contractor shall submit for approval all Shop Drawings called for under the various sections of these specifications. These shop drawings shall be completed and detailed. If approved by the Engineer each copy of the drawings will be identified as having received such approval by being so marked and dated. Make any corrections required by the Engineer.

C. Each Shop Drawing submitted for approval shall have, in the lower right hand corner just above the title, a white space 3 inches x 4 inches in which the Engineer can indicate the action taken.

3.2 CONCRETE REBAR SHOP DRAWINGS

A. The shop drawing for concrete rebar work shall indicate rebar size, grade of steel, lap lengths, bend radius, type of clearance or spacing accessories, clearance dimensions, bar spacing, and general layout.

3.3 EQUIPMENT PRODUCT DATA

A. Submit information for proposed permanent equipment such as pumps for approval prior to purchase. Provide vendor name, specifications, cut sheets, performance data and laboratory test data, and manufactured warranties and guarantees.

B. Once equipment is approved, procured, and installed, the Contractor shall provide all final equipment instruction and operation and equipment manuals as applicable.

3.4 INSPECTION AND TEST CERTIFICATES

A. Inspection and test certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in two copies. Each certificate shall be signed by an official, authorized to certify on behalf of the manufacturing company, the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification will not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

3.5 RED-LINE FIELD DRAWINGS

A. The Contractor shall furnish marked-up or Red-line Field Drawings to the Engineer for approval before submitting for final payment. These Drawings shall be maintained current by the Contractor and readily accessible by the Engineer.

B. The Contractor shall describe and dimension, on the Drawings, vertical and horizontal locations of all buried work that has been done as part of this Contract.

C. Show on the Drawings, the locations of concealed items such as but not limited to the key trenches, piping, the limits of excavation, sump structures, and leachate collection and recovery system appurtenances.

D. The Contractor shall show on the Drawings, all deviations from the Contract Drawings.

3.6 PROGRESS SCHEDULE

A. The Contractor shall prepare and submit a preliminary progress schedule for the Work with the bid documents. Within five (5) calendar days of the notice to proceed, the Contractor shall submit a detailed Project Progress Schedule in the Critical Path Method (CPM) format. A Gantt or bar chart showing detailed activities, similar to the Bid Item Cost Sheet, shall be preferred, however a time-logic diagram will also satisfy the requirements. Relate the progress schedule to the Project to the extent required by the Contract Documents and provide for expeditious and practicable execution of the Work.

B. The Contractor shall incorporate time into the schedule to allow the appropriate Engineering personnel to evaluate or inspect completed work. Sufficient time should be allotted for a special site visit by personnel, office or lab evaluation. The Contractor shall schedule other events or activities during this period so time and equipment is used as efficiently as possible. Sufficient notice should be given for planning the Engineer's inspection and evaluation.

C. The Contractor shall maintain the Progress Schedule and update on a weekly basis to show performance in relation to the target (original) schedule.

3.7 CONSTRUCTION AND TEMPORARY FACILITIES PLAN

A. The Contractor shall prepare and submit a preliminary construction plan with the bid documents generally indicating the construction procedures, equipment, and materials proposed to accomplish the Work under this Contract.

B. The Contractor shall update and resubmit the construction plan within five (5) calendar days of his receipt of this Notice to Proceed.

C. The updated plan shall provide more detail for construction procedures, equipment, and materials to be used for this work.

D. The updated plan shall include a detailed sequencing and layouts showing the proposed location of temporary construction facilities, material storage areas, dewatering structures, access roads, fuel and oil and gas facilities, material processing sites, stockpiles, power requirements, and various equipment and facilities to be used for the Work under this Contract.

E. The plan shall also include sequencing and methods for demolition of existing earthen and concrete facilities and structures.

F. The plan shall include temporary safety facilities such as signs, lighted barricades, traffic controls, flagmen concrete barriers, berms, and high-intensity lighting.

G. The plan shall include equipment and controls for preventing and minimizing the generation of dust due to operations in construction and materials processing areas, along haul routes, equipment parking areas, and in waste areas. The plan may consist of water sprinkling or an equivalent service.

H. Make corrections to the preliminary plan as required upon receipt of the Notice to Proceed, incorporating any modifications to the construction procedures developed during the time interval.

3.8 DELAY IN WORK

A. If an event causes or may cause delay in the Work as required by the Contract documents to achieve the requirements of the Project, the Contractor shall notify the Engineer orally as soon as possible and in writing within five *(5)* calendar days from the date of the event which will cause the delay.

3.9 PAY REQUESTS

A. The Contractor shall submit Progress Pay Requests in draft to the Engineer and the final request to the Owner with recommended modifications incorporated.

B. The Pay Requests shall include, at a minimum, a breakdown of the work or activity line item closely matching the breakdown of the Bid Item Cost Sheet, work period for request, estimates of percent complete, dollar amount of previous requests, and a total dollar amount requested to date.

3.10 DEWATERING, DIVERSION AND CONTROL PLAN

A. The Contractor shall submit a preliminary dewatering, diversion, and control plan for the site with_the bid documents. These plans shall identify and show the proposed schedule, layout, equipment and method for the diversion and control of the streamflow and dewatering of the site throughout the construction period.

B. The plans shall show the method of operation and a complete layout of all facilities including but not limited to temporary drainage pipes, wells, wellpoints, sumps, pumps, impoundments, earthen diversion works, and channels to be utilized.

C. Construct diversion and control for protection of work prior to its start.

D. The dewatering, diversion, and control plan shall be updated by the Contractor to reflect the actual equipment and methods to be used within five (5) days after Notice to Proceed. Further updates may be necessary as the project progresses. The Contractor is solely responsible for the adequacy of the diversion and control and for the protection of Work.

3.11 QUALITY CONTROL PLAN

A. Submit to the Engineer for approval within five (5) calendar days after the receipt of the Notice to Proceed a Quality Control Plan which shall include the procedures, instructions, and reports to be used. This document shall include as a minimum:

1. The QC organization (organizational chart specifically identifying responsible individuals).

2. Number and qualifications of personnel to be used for this purpose.

3. Authority and responsibilities of QC personnel.

4. Methods of QC including that for his subcontractor's work.

5. Specifically identified test methods and frequency of testing for each material and/or component of construction. Identify the testing standard and provide a blank copy of the report format.

6. Detail the proposed method of documenting QC operation, inspection, and testing.

7. A copy of a letter of direction to the Contractor's representative responsible for QC, outlining his duties, authority and responsibilities, and signed by a responsible officer of the firm.

B. All quality control inspections and tests shall be recorded and documented on forms approved by the Engineer including but not limited to the specific items required in the Specifications. A quality control report to include a description of project activities, QC tests and records of corrective action taken, shall be furnished to the Engineer as a daily report.

C. Submittals of QC data include but are not, limited to survey, soil compaction, soil gradation, concrete, geosynthetic clay liner installation and testing, HDPE lining installation and testing, and HDPE pipe installation and testing.

D. Specific submittals and QC provisions are identified in the appropriate section.

E. If recurring deficiencies in an item or items indicate that the quality control system is not adequate, such corrective actions shall be taken as directed by the Engineer.

F. In the event the Contractor fails to satisfactorily perform any required inspections and tests; to submit timely, complete. and factual reports and test data; or otherwise comply with the QC provisions, the Engineer may provide these services from another source and all costs for providing these services will be deducted from payments due the Contractor.

3.12 DRAINAGE AND COLLECTION PIPING SHOP DRAWINGS

A. The shop drawing shall indicate pipe or tubing size, dimensions, grade or rating of piping, lap lengths, clearances, spacing, type of welds or adhesives, types and locations of fittings, accessories, types of cross-material adapters, fastening materials, and general layout of tubing.

B. Provide cut sheets and/or product performance data on perforated drain piping or continuous tubing.

3.13 DRAINAGE GEONET SHOP DRAWINGS

A. The Contractor shall provide shop drawings of the geonet layout plan and details for Engineer's review and approval prior to geonet procurement and installation. Provide sequence of layout. Detail all panel joining and anchorage. Follow manufacturer's instructions and recommendations as best as possible.

B. Provide cut sheets and/or product performance data on geonet material.

3.14 CONCRETE MIX DESIGN

A. Provide concrete design mixes in accordance with ACI 318-83 for each mix utilized. Include supplier name, admixtures and quantity, maximum aggregate size and percentages used, cementitious content, air content, and compressive strength in accordance with ASTM C39. The mix design shall be approved by the Owner's Engineer prior to placement of concrete.

B. Notify the Engineer, in writing, of the manufacturers and specific brand names of all admixtures to be used. Admixtures will conform to their respective ASTM criteria for acceptance.

C. The Contractor shall provide for information to the Engineer, a copy of the batch ticket providing the information identified in ASTM C685 for all concrete used for permanent work.

3.15 HDPE LINER SHOP DRAWINGS, CERTIFICATIONS, AND REPORTS

A. Submit a summary of the manufacturer's experience with the manufacture of 60 and 80-mil HDPE lining material and lining systems. As a minimum, the manufacturer shall have 2 years of continuous experience with in excess of 5 million square feet of similar HDPE liner manufactured.

B. The Contractor shall provide manufacturer's Shop Drawings of the synthetic liner layout plan and details for the Engineer's review and approval prior to liner procurement. Detail all jointing, liner system and liner anchorage. Shop Drawings shall include details for the HDPE liner boot/pipe penetration assembly. Show bands, welds, laps, concrete pad dimensions, and other accessories related to the assembly.

C. Submit a summary of the Lining Subcontractor's experience with the placement of 60 or 80-mil HDPE. As a minimum, the Lining Subcontractor shall have 2 years of continuous installation experience with in excess of 1 million square feet of HDPE liner installed.

D. The Lining Subcontractor's approved construction layout drawings shall specify all components and details required to meet these specifications. The responsibility of the Owner, Contractor, and the Lining Subcontractor shall be clearly defined.

E. Provide manufacturer testing results with the following frequency:

1. Density - two per resin bath number

2. Tensile Properties - one per 1000 feet of manufactured sheet

3. Carbon Black - two per resin batch number thickness - one per 1000 feet of manufactured sheet

4. Volatile Loss - Certification by resin supplier with each resin batch

F. Submit test results to the Engineer for approval prior to delivery of the HDPE membrane to the job site. Alternate testing methods may be used with prior approval by the Owner's Engineer.

G. Submit to the Engineer a peel strength value and the test procedure used to determine the peel strength 30 days before delivering liner to the site. This value will be used to evaluate field seam quality.

H. The liner Subcontractor shall submit written certification to the General Contractor that the foundation on which the liner membrane is to be installed is acceptable and in accordance with verification and inspection provisions in Section 02776. Install no liner until a copy of this certification is furnished to and accepted by the Engineer.

I. Submit to the Engineer copies of daily field notes, quality control test results, panel installations and layout, and repair logs.

J. Submit testing and QC report on shop fabricated systems such as pipe boots. Describe in detail the method of testing conducted in the shop and all results and repairs if needed.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Division 1 - General Requirements

B. Division 2 - Site work

C. Division 3 - Concrete

1.2 QUALITY CONTROL

A. Quality control (QC) refers to the sampling, testing and measuring of all materials used at the job site and the verification checking of the Drawings and Specifications by the Contractor to ensure that the Work conforms to the requirements of the Specification and Drawings. QC testing will comply with all pertinent codes, regulations and standards referenced within the Contract Documents.

B. Unless specifically authorized in writing, no construction will be started until the Contractor's QC plan is approved.

C. The Contractor will establish and continuously provide a quality control system to perform sufficient inspection and tests of all items of work, including that of subcontractors, to ensure conformance to applicable specifications and drawings with respect to the materials, workmanship, construction, finish, functional performance, and identification. This control will be established for all construction, except where the Technical Provisions of the contract provide for specific control inspections, tests or other means to be performed by the Engineer. The Contractor's control system will specifically include the surveillance and tests required in the Technical Provisions of the Contract specifications.

D. The Contractor's quality, control system is the means by which he assures himself that his construction complies with the requirements of the .Contract plans and specifications. The controls will be adequate to cover all construction operations and should be keyed to, the proposed construction sequence.

E. The Contractor's job supervisory staff may be used for quality control, supplemented as necessary by additional personnel for surveillance, special technicians, or testing facilities to provide capability for the controls required by the Technical Provisions of the specifications. Prior approval is required for facilities, equipment, and personnel used by the Contractor in performing the specified tests.

1.3 SUBMITTALS

A. Submit to the Engineer for approval within five *(5)* calendar days after the receipt of the Notice to proceed a Quality Control Plan which will include the procedures, instructions, and reports to be used. This document will include as a minimum:

1. The QC organization (organizational chart specifically identifying responsible individuals and their organization).

2. Number and qualifications of personnel to be used for this purpose.

3. Authority and responsibilities of QC personnel.

4. Methods of QC including that for his subcontractor's work.

5. Specifically identified test methods and frequency of testing for each material and/or component of construction. Identify the testing standard and provide a blank copy of the report format.

6. Detail the proposed method of documenting QC operation, inspection, and testing.

7. A copy of a letter of direction to the Contractor's representative responsible for QC, outlining his duties, authority and responsibilities, and signed by a responsible officer of the firm.

B. All quality control inspections and tests will be recorded and documented on forms approved by the Engineer including but not limited to the specific items required in the Specifications. A quality control report to include a description of project activities, QC tests and records of corrective action taken, will be furnished to the Engineer as a daily report.

C. If recurring deficiencies in an item or items indicate that the quality control system is not adequate, such corrective actions will be taken as directed by the Engineer.

D. In the event the Contractor fails to satisfactorily perform any required inspections and tests; to submit timely, complete, and factual reports and test data; or otherwise comply with the QC provisions, the Engineer may provide these services from another source and all costs for providing these services will be deducted from payments due the Contractor.

1.4 NOTICES

A. Additional inspection and tests required due to defective work or ill-timed notices may be initiated by Engineer and will be at Contractor's expense.

1.5 PROJECT COOPERATION

A. Provide representatives of the Owner and Engineer access to the Work at all times and at all locations where work is in progress.

B. Allow the Engineer, Owner, or their representatives access and time to conduct Quality Assurance (QA) sampling or testing. Frequencies, time, and locations of **QA** inspections or testing will follow the Quality Control requirements in general, but will ultimately be at the Field Engineer's discretion. Quality Assurance Sampling or testing may include concrete placement, compaction of soils, GCL installation, Drainage Net installation, and HDPE liner installation. Allowing the Engineer to perform QA inspections and testing does not preclude the Contractor from ensuring quality control. The Contractor possesses complete responsibility to the quality of work.

1.6 TESTING FREQUENCY

A. Sampling and testing frequencies will be as assigned in the pertinent section of these Specifications.

END OF SECTION

SECTION 02050

GENERAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 01010 Summary of Work

B. Section 02110 Site Clearing and Grubbing

C. Section 02200 Earthwork

1.2 SUBMITTALS

NOT USED.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 PREPARATION

A. The Contractor shall perform a complete survey of all areas designated for underground work. If any underground lines or conduit are detected, the area will be clearly marked to identify the underground line or conduit.

B. All required excavation and/or drilling shall be then performed to prevent damage to any of the identified lines or conduit.

C. The Contractor shall incur all repair costs to make good all damage resulting from an incomplete underground line survey or for any misinterpretations of supplied information.

D. Coordinate with Owner to identify known subsurface structures and/or utilities at the site prior to demolition work.

E. Coordinate all demolition with Owner and Engineer prior to beginning work. Obtain full agreement between project representatives prior to demolition of facilities, utilities, or structures.

F. Coordinate with Owner regarding corridors and thoroughfares to be kept clear and open.

3.2 EXECUTION

A. Demolish/remove existing concrete irrigation channels within the limits of the work.

3.3 DISPOSAL

A. Dispose of materials in accordance with Section 01010 at an authorized offsite landfill.

B. Clarification of disposal sites and debris spoil stockpiles may be made during prebid and pre-construction conferences.

END OF SECTION

SECTION 02110

SITE CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Section 01010 Summary of Work

B. Section 02050 General Demolition

C. Section 02200 Earthwork

1.2 SUBMITTALS

NOT USED

1.3 SEQUENCING AND SCHEDULING

A. Grub construction clearing areas and other areas as required by Engineer.

B. Fill surface depressions left by grubbing with fill material as directed by Engineer.

PART 2 - PRODUCT

NOT USED.

PART 3 - EXECUTION

3.1 GENERAL

A. Preserve in place natural vegetation that are so designated and marked in the field by the Engineer and Owner.

B. Protect the environmental resources outside the limits of permanent structures during the construction period. Do not remove, cut, deface, injure, or destroy such resources or property including trees, shrubs, vines, grasses, vegetated soil cover and land forms.

C. Protect private property outside Work area from construction activities. Prior to construction; mark the areas within Work area that do not require Work to be performed under this Contract. Restrict access to these areas. Stake and flag isolated areas within the Work area which are to be saved and protected.

D. Protect monuments and markers before Work commences. If construction operations are to be conducted during darkness, the markers shall be illuminated so as to be visible in the dark. Communicate to personnel the purpose of marking and protection of necessary objects.

3.2 CLEARING

A. Clear areas to be occupied by Work. Keep clearing to the minimum amount possible. Clearing shall be limited to 5 feet outside the work area unless directed by the Engineer.

B. Do not clear beyond property limits, or areas marked on the drawings. Clearing of land for temporary work pads or roads shall require approval from the Engineer or Owner.

3.3 GRUBBING

A. Grub construction clearing areas and other areas as required by Engineer.

B. Fill surface depressions left by grubbing with fill material as directed by Engineer.

3.4 TOPSOIL

A. Strip the topsoil to a depth of at least 6 inches within the limits of the required excavation and store in designated stockpile areas.

B. If organic topsoil is present deeper than 6 inches, extend stripping as directed by Engineer.

C. Place topsoil in stockpiles that are separate and protected from other excess soil stockpiles. Coordinate the location of topsoil stockpiles with Engineer prior to stripping of the topsoil. Stockpiled topsoils shall be utilized to reclaim designated areas and areas that are disturbed during construction. Protect stockpiles to avoid erosion and loss of material.

3.5 DEMOLITION AND DISPOSAL

A. Dispose of debris resulting from clearing, grubbing and demolition operations in accordance with applicable laws and regulations, in locations identified on the drawings, and as approved by the Engineer. Contractor shall be responsible for, obtain, and pay for necessary permits. Submit permits to the Engineer.

B. Burning of cleared debris shall not be permitted. Vegetation disposal shall be the responsibility of Contractor. Concrete and other construction materials shall be removed and disposed of as required by Contractor.

C. Clarification of disposal sites for clear and grubbing spoils will be made during prebid and pre-construction conferences.

3.6 SCHEDULE

A. Schedule construction clearing, grubbing and the stockpiling of vegetated soil cover before excavation or construction.

B. Coordinate any and all clear and grubbing activities on county or Bureau of Land Management (BLM) land with the Owner and applicable agencies.

END OF SECTION

SECTION 02140

TEMPORARY DIVERSION AND CONTROL OF WATER

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 - Earthwork

B. Section 02776 - Liner

C. Section 03300 - Concrete

1.2 SCOPE OF WORK

A. Provide for the temporary diversion and control of surface and ground water at the project areas. The flows will include water originating upstream of the proposed evaporation pond as well as from adjacent stream.

B. Provide for the dewatering of all work sites immediately prior to and during construction. Maintain the ground-water level below the surface of the bottom of excavations throughout the period of construction as required to perform the Work. Maintain all work areas free from water and sediment.

C. All collected water shall be routed downstream away from the construction activities, to the existing wash located at the north end of the proposed evaporation impoundment.

D. Contractor's diversion and control plan shall comply with the Owner's requirements for containment and control of site water.

1.3 QUALITY CONTROL

A. Streamflow records are relevant for flows occurring at the project site. Annual rainfall data from local or state Climatology offices or applicable United States Geological Surveys may be useful in evaluating the potential time of year and magnitude of rainfall and runoff.

B. The Contractor is responsible for the dewatering of the project area. Control the rate and effect of dewatering in such a manner as to avoid all objectionable settlement and subsidence of the site and adjacent permanent structures as determined by the Engineer and to assure the integrity of the finished work.

C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, establish reference points and observe at frequent intervals to detect any settlement that may develop. Conduct the dewatering operation in a manner that will protect adjacent structures and facilities. Cost of repairing all damage that will protect adjacent structures and facilities will be the sole responsibility of the Contractor.

D. Protect all ongoing and completed work including GCL, liner, drainage net, HDPE piping, foundation earthwork, concrete, and anchor trenches from erosion, infiltration, damage, and compromised subgrades from operating and storm water flows.

1.4 SUBMITTALS

A. Submit a dewatering, diversion and control of water plan in accordance with Section 01300 Submittals.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Before operations begin, sufficient equipment shall be available on-site to assure that the operation and adequacy of the diversion, control and/or dewatering system can be continuously maintained. The contractor will be responsible for providing temporary power supply.

PART 3 - EXECUTION

3.1 METHODS

A. Perform all permanent construction in areas free from water. During and after periods of rain, intermittent showers may be expected. The Contractor is solely responsible for the protection of Work against damage or delay from waterflow. At all locations where construction work is at a lower elevation than the elevation of the natural stream or ground water at the time of doing the Work, suitable water control measures will be constructed to allow diligent performance of the Work.

B. Construct temporary ponds, trenches, ditches, channels, diversion dikes, cofferdams, and any other dewatering and water control structure prior to work.

C. Furnish, install, maintain, and operate all necessary pumping and other equipment for removal of water from the various parts of the Work and for maintaining the dam foundation and other parts of the Work free from water as required for constructing each part of the Work.

D. Select methods of dewatering that do not destroy or weaken the strength of the in-situ material under or alongside the excavation.

E. Perform diversion control and dewatering before execution of all Work.

F. Dispose of water in a manner that does not cause injury to public or private property and is consistent with Regulatory and Owner's requirements.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02140 - Diversion and Control of Water

B. Section 02714 — Drainage and Collection Piping System

C. Section 02779 — Geosynthetic Clay Liner (GCL)

D. Section 02250 — Low Permeability Soil Lines

1.2 GENERAL REQUIREMENTS

A. This section describes general requirements for all types of earthwork and is applicable to all required earthwork. Earthwork includes but is not limited to excavation, subgrade and foundation preparation, drain systems, LCRS collection sumps, fill placement to include: low permeability soil liner, bedding, drain sand, structural fill, and select fill; and the appropriate disposal of all unsuitable materials. Fill includes fill and backfill operations.

B. The Contractor is solely responsible for the safety of all temporary cuts and fills. Slope lines indicated on the Drawings for temporary cuts do not represent the actual slope to which the excavation must be made to safely perform the Work.

C. Excavate permanent cuts to the slope lines indicated.

D. Excavation will be performed in a manner, which will not impair the finished surface or subgrade. Excavation or overcut made outside the lines indicated on the Drawings or staked in the field will be refilled with materials approved by the Engineer, at the expense of the Contractor, except where such overcut is directed or specified by the Engineer.

E. Use equipment, tools, and machines to perform the work covered by this section as approved by the Engineer. Maintain in satisfactory working condition at all times all equipment, tool and machines. Excavating and/or equipment used in the areas from which fill and borrow materials are obtained will be capable of producing the necessary blending required to consistently meet the specified gradation requirements. Compaction equipment will be suitable for consistently producing uniform soil densities.

F. The limits of excavations are as indicated on the Drawings, except that limits may be increased or decreased by the Engineer if, in the opinion of the Engineer, the location and frequency of Quality Assurance Density Tests will be at the Engineer's discretion in the field.

G. Determine material gradation in accordance with ASTM C136-76. Gradation tests will be well distributed and average one test for each 1000 cubic yards or portion thereof of fill material placed by material type.

1.3 QUALITY CONTROL TESTS

A. Laboratory Moisture Content and Maximum Dry Density: Moisture-Density

Relationship Standard ASTM 698.

B. In-place Density Determination: Sandcone Method ASTM D1556 or Nuclear Method ATM D2922.

C. Sieve and screen analysis for fine and coarse aggregate: ASTM C136-76.

D. Classification of Soils: ASTM D2487.

E. Regularly inspect and verify all fill placement and operations to ensure conformance to the procedures and standards specified. Establish moisture-density relations in the Laboratory for applicable materials as part of the Contractor's Quality Control Program. Perform field density tests in sufficient number and in such locations to document that the specified density is provided. Report moisture-density relations and field densities on approved forms to the Engineer. Provide one copy of density data, less dry weight determinations, on the day each test is taken and provide the completed test reports with the Contractor Quality Control Report on the work day following the test.

1. Laboratory Control.

a. Perform moisture-density (when applicable to the material), mechanical analysis and classification for each class of fill material. Do not compact any fill in the work until approval of test results by the Engineer.

b. Use fresh fill materials for each test. Do not reuse materials for testing.

2. Field Control.

a. Determine field in-place density in accordance with ASTM D1556 or D2922. The density tests will be conducted on compacted material processed as a unit, and in each work area. Locate density tests to provide results as to the uniformity of fill compaction. The location and frequency of Quality Assurance Density Tests will be at the Engineer's discretion in the field.

b. Determine material gradation in accordance with ASTM C136-76 Gradation tests will be well-distributed and average one test for each 1000 cubic yards or portion thereof of fill material placed by material type.

1.4 QUALITY ASSURANCE TESTS

A. Laboratory and field testing will be performed by the Engineer in accordance with the methods listed in Article 1.03 of this Section.

B. Field Quality Assurance testing will be performed by the Engineer following the frequency and distribution specifications described in Article 1.03 of this Section, or at the Engineer's discretion. Frequencies, distribution, and locations of assurance testing will be determined in the field.

1.5 SUBMITTALS

A. Submit work area plan designating the various activities on-site, such as stockpile layout, materials storage, fuel, oil and gas facilities, waste disposal, etc., and the areas to be utilized. Submit for approval by the Engineer, project traffic control plan showing location of all haul roads and site service roads.

B. Submit an acceptable plan for preventing the generation of dust due to operations in construction and materials processing areas, along haul routes, in equipment parking areas, and in waste areas located on the site. This plan may consist of water sprinkling or an equivalent service.

C. Submit Contractor Quality Control Report and other testing report forms supporting the testing requirements specified for review and approval by the Engineer.

D. Furnish samples from material available on-site or from the Contractor's source or supplier, as requested by the Engineer for Quality Assurance testing.

1.6 EXCAVATION SAFETY

A. Comply with the occupational, safety, and health requirements of the State of Arizona.

B. Provide necessary materials and shore and brace temporary excavations to prevent slope failure and adjacent surface settlement, to provide safety, and to protect public and private property from damage during construction.

C. Perform waste operations within the areas designated and in such a manner as to maintain a safe working condition for personnel and equipment.

1.7 DRAWING CALLOUTS

A. All permanent work cut and fill slopes are called out on the Drawings using a ratio of horizontal distance to vertical distance (e.g. 2:1).

PART 2 - PRODUCTS

2.1 GENERAL FILL

A. General fill material shall be free of vegetable matter and other deleterious substances. General Fill materials shall be homogeneously blended.

2.2 STRUCTURAL FILL

A. The Contractor shall provide structural fill that is durable, well graded, and obtained from designated borrow areas or required excavation or a location or supplier approved by the Engineer. Fines within structural fill material will have a Plasticity Index equal to or less than 15 as determined by ASTM D481 8. Structural fill shall conform to the following gradation.

Sieve Designation	Percent Passing
2"	100
1/2"	50-100
#200	0-40

2.3 LOW PERMEABILITY BEDDING MATERIAL

A. The Contractor shall provide bedding materials that are durable sands and gravels, free of organic or deleterious materials and obtained from a designated borrow area. Bedding material shall be well graded within the following limits:

Sieve Designation	Percent Passing
3/8"	100
#200	0-40

2.4 OVERLINER MATERIAL

A. The Contractor shall provide overliner materia1 that free or organic or deleterious overliner materials shall have a grain size distribution within the following limits:

B. In-place material that is unsuitable as sub-grade shall be designated as such by the Engineer and removed, to a depth of 12 inches, or as directed and suitable backfill placed where required.

C. After trimming and shaping and removal of any materials determined to be unsuitable, the surface area shall be scarified to a depth of 12 inches, moisture - conditioned, and compacted to the specified density.

D. Scarified and placed materials and the exposed surfaces of excavation (where applicable) shall be compacted to a dry density of not less than 90 percent of the maximum dry density as determined by ASTM D698. Moisture content shall be uniform throughout a compacted lift and shall be within the limits of +/- 2 percent of the optimum moisture content.

PART 3 - EXECUTION

3.1

A.

B. In-place material that is unsuitable as subgrade shall be designated as such by the Engineer and removed, to a depth of 12 inches, or as directed and suitable backfill placed where required.

C. After trimming and shaping and removal of any materials determined to be unsuitable, the surface area shall be scarified to a depth of 12 inches, moisture-conditioned, and compacted to the specified density.

D. Scarified and placed materials and the exposed surfaces of excavation (where applicable) shall be compacted to a dry density of not less than 90 percent of the maximum dry density as determined by ASTM D698. Moisture content shall be uniform throughout a compacted lift and shall be within the limits of +/- 2 percent of the optimum moisture content.

3.2 GENERAL REQUIREMENTS FOR EXCAVATION

A. Notify the Engineers of any discrepancies between contractual requirements and site conditions in writing upon discovery.

B. The Contractor assumes all responsibility for deductions and conclusions as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavations. The Engineer does not represent that excavation can be performed to or maintained at the lines described in these specifications.

C. The slopes, grades, or the dimensions of the excavations from those specified herein by the Engineer may be varied during the progress of the work.

D. Coordinate in a timely manner with the Engineer, maintain and leave open fill, and sub-grade areas until the materials placed or the sub-grade is approved by the Engineer. Excavate and reconstruct at Contractor's expense any work covered up prior to approval by the Engineer.

E. Work in inclement weather at the Contractor's risk. Replace and rework any materials that become unsuitable or unstable as the result of work during inclement weather. No additional payment will be made for replacement and/or reworking of materials due to construction activities during inclement weather.

F. Perform excavation and fill operations such that drainage is maintained at all times. No additional payment will be made beyond Contract price bid for site drainage or dewatering requirements.

G. Deposit materials suitable for reuse in protected, maintained piles that are separate from other materials and readily available. Upon project completion, restore all material storage areas to their original condition.

H. Any and all excess excavation for the convenience of the Contractor or over-excavation performed by the Contractor for any purpose or reason, except as may be ordered in writing by the Engineer, whether or not due to the fault of the Contractor, is at the expense of the Contractor. Where required to complete the, Work, refill all such excess excavation and over-excavation with materials furnished and placed at the expense of and by the Contractor.

I. Excavation will consist of the removal and appropriate disposal of every type of material encountered to the lines, grades, and elevations indicated. The material to be removed may include but is not limited to earth, hardpan, caliche, silt, clay, sand, gravel, cobbles, boulders, cemented alluvium, rock, slopewash talus and construction debris. Slope lines indicated on the drawings for temporary cuts to not necessarily represent the actual slope to which the excavation must be made to safely perform the work. Any excavation .or overcut made outside the neat lines indicated on the drawings or staked in the field shall be refilled with material acceptable to the Engineer or concrete in any approved manner by and at the~ expense of the Contractor, except where such overcut is directed or specified by the Engineer, in which case payment for such overcut and fill will be made at the applicable contract unit prices for the type of excavation and fill made.

J. Materials excavated from outside of the projection limits may be utilized for fill activities for the proposed structure upon approval by the engineer or owner; all fill materials regardless of their source will be placed in accordance with these specifications, specifically the gradation and compaction criteria established by material type.

3.3 IMPOUNDMENT FOUNDATION AND BERM EXCAVATION

A. Excavate the impoundment foundation to the contours and dimensions indicated on the Drawings or as directed by the Engineer. Found the base of the impoundment on competent material, removing materials considered deleterious as directed by the Engineer.

B. Excavate the impoundment below the contours on the Drawings where directed by the Engineer to expose competent foundation.

C. Limits of excavations for the various structures and parts of the Work are as indicated on the Drawings but the right is reserved to increase or decrease the depth or area extent of excavation if, in the opinion of the Engineer, the conditions encountered warrant such modification. Except as otherwise directed, the Contractor will make all excavations to the profiles and sections shown.

D. Deviations from the lines and grades shown on the Drawings or established by the Engineer for excavation in rock shall be within tolerance limits of 6 inches.

E. Any projections inside the limits established will be removed. The neat line shown on the Drawings is the line to which measurement for payment of excavation will be made, and is considered to be the final excavation line indicated on the Drawings. Any excavation beyond the neat line shown on the Drawings will be replaced with concrete complying with applicable portions, of these specifications without additional cost to the Owner.

F. General and structural excavation methods shall be controlled to prevent damage to rock and natural terrain outside the limits of excavation. Provide a final excavated surface that is relatively uniform and free from abrupt steps and irregularities.

G. Excavate the slopes in the foundation area and berm excavation areas as shown on the Drawings, except excavate overburden or soil slopes at 1:1 (horizontal: vertical) or flatter as required for safety. Slopes may be modified as required by the Engineer. The exploratory investigations of the foundation are not sufficiently complete to disclose all seams, alluvium channels, defects, and other irregularities that may exist in the foundation. The limits of excavation shown on the Drawings will therefore not be interpreted as indicating that no defects or irregularities exist. The excavations at all elevations will be so shaped as to produce a uniform and regular profile as is practicable to obtain. All necessary precautions will be taken to preserve the foundational materials below and beyond the lines of excavation in the soundest possible conditions.

3.4 FOUNDATION AND BERM PREPARATION

A. Scale, remove and dispose of vertical and over-hanging ledges on the berms, within the foundation area, below original grade and elsewhere, as directed by the Engineer. Remove large overhangs and protrusions to a relatively uniform slope by means approved by the Engineer. The required scaling will be indicated on the ground surface with stakes, paint, or like means by the Engineer. Dispose of material excavated in the designated areas. Perform all scaling required prior to the placement of fill material.

B. Perform a final general cleanup of the foundation surfaces underlying the impoundment to remove any unsuitable materials prior to placement of embankment material. Remove all standing water.

C. Upon completion of general clean up, the top one foot layer of foundation material shall be compacted as specified in paragraph 3.04-D to not less than 95 percent maximum dry density as determined by standard proctor (ASTM D698).

D. No material will be placed upon any part of the foundation until the foundation treatment has been completed and such areas have been inspected and approved.

3.5 ANCHOR TRENCH EXCAVATION

A. Excavate the anchor trench in the top of the separation berms to approximately the lines and grades indicated on the drawings.

B. Final elevation, lines, and grades of anchor trench will be at the Engineer's discretion upon one or more site visit evaluations.

C. Coordinate all planning, equipment, and methods for anchor trench excavation with the Engineer. Consult the geotechnical investigation report and actual field observation prior to anchor trench excavation and plan activities with the Engineer.

D. The Contractor shall provide the Engineer and appropriate representatives the opportunity to witness anchor trench excavation, and observe the trench at various stages. Several days may be needed to complete a full evaluation. Comply with provisions in Section 01300 Submittals for progress schedules.

3.6 GENERAL REQUIREMENTS FOR FILLS AND BACKFILLS

A. Obtain fill and backfill materials from the required excavation and/or borrow areas, approved locations or suppliers free from sod, roots, brush, construction debris, trash or other objectionable material.

B. Do not place fill materials against structural concrete until it has been in place a minimum of 3 days or until the concrete has attained 1500 psi when tested in accordance with the requirements of Division 3 - Concrete. All damage caused by premature fill placement will be replaced or repaired to the satisfaction of the Engineer and at the Contractor's expense.

C. Place compacted fill with suitable equipment in horizontal layers which, after compaction, meet or exceed established requirements, or as directed by the Engineer. Place material, containing rock in a manner to prevent the stones from striking concrete and to prevent the formation of segregated rock nests and voids in the fill.

D. Vibratory rollers for compacting fill material shall be equipped with a smooth or sheep's foot steel compaction drum and shall be operated at a frequency of vibration during compaction operations between 1100 and 1500 vpm. Vibratory rollers may be either towed or self-propelled and shall have an unsprung drum weight that is a minimum of 60 percent of the rollers' static weight. Towed rollers shall have at least 90 percent of their weight transmitted to the ground through the compaction drum when the roller is standing in a level position hitched to the towing vehicle. Rollers for compacting structural fill and drain rock material shall have a minimum static weight of 20,000 pounds, a minimum dynamic force of 40,000 pounds when operating at 1400 vpm, and an applied force not less than 9,000 pounds per foot of compaction drum length. The level of amplitude and vibration frequency during compaction will be maintained uniform throughout the embankment zone within which it is operating. Rollers shall be operated at speeds not to exceed 2.5 miles per hour. The equipment manufacturer shall furnish sufficient data, drawings, and. computation for verification of the above specifications, and the character and efficiency of this equipment shall be subject to the approval of the Engineer.

E. Rollers will not be permitted to operate within 2 feet of structure walls, well pipes, or over buried structures until the compacted fill over the top of the structure walls or over buried structures has reached a depth of 2 feet. Do not operate heavy equipment over pipes and buried structures until at least 2 feet of fill material has been placed and compacted over the top of the buried structure or as directed by the Engineer. Operate compaction equipment so that structures are not damaged nor overstressed during compaction operations. Use mechanical tampers for compaction of fill material adjacent to structures where rolling equipment is impractical for use in compaction.

3.7 STRUCTURAL FILL

A. Provide structural fill to the lines, grades and elevations as shown on the Drawing and as directed by the Engineer.

B. Spread structural fill in approximate horizontal lifts with a 12-inch maximum loose lift thickness and compact to not less than the maximum dry density given in the table below; Moisture content shall be uniform throughout a compacted lift and shall be within the limits of ± 3 percent of the optimum moisture content structural fill shall be compacted to not less than 95 percent maximum dry density as determined by standard proctor per ASTM D698.

C. Structural backfill operations shall include excavation cuts or keys into the adjoining slope for every compacted lift. Keyed excavation cuts may range from 1 to 3 feet horizontally. Exceptions shall be at the Engineer's discretion.

3.8 FREE DRAINING GRAVEL

A. Free draining gravel shall be spread uniformly in approximate horizontal lifts with a 1-foot loose list thickness to the lines and grades indicated. Only low weight-bearing equipment, (i.e.. small track dozers) shall be used to spread the gravel material to preserve the integrity of the liner beneath, protecting it from undue stresses and abrasions. Abrupt changes in direction by the equipment greater that 45' horizontally shall be avoided while operating above the liner.

3.9 COMPACTED FILL ABOUT BURIED STRUCTURES

A. Compacted fill and backfill will be placed with suitable equipment in horizontal layers in a maximum loose lift thickness of 12 inches in depth for vibratory rollers, 6 inches in depth for tamping rollers, and 4 inches in depth when mechanical tampers are used.

B. Material containing stones will be placed in a manner to prevent the stones from striking buried structures and to prevent the formation of voids.

C. Material will have a uniform moisture content while being placed and compacted. Material containing an excess of moisture will be manipulated with suitable implements to facilitate maximum aeration and will be permitted to dry to the proper consistency before being compacted.

D. Rollers will not be permitted to operate within 2 feet of structures or over buried structures until the compacted fill over the top of the structures has reached a depth of 2 feet. Compaction equipment will be so operated that structures are not damaged nor overstressed during compaction operations. Mechanical tampers will be used for compaction of fill material adjacent to structures where rolling equipment is impractical for use in compaction.

E. Take all necessary precautions to protect the pipe from any damage, movement, or shifting. Quality Control testing for density will be made as necessary to verify conformance to the specified compaction criteria.

F. Labor shall conduct observation or spotting when necessary to protect buried structures.

G. Hand operated equipment of manageable size shall be used to protect buried or adjacent structures or material, such as HDPE lining or drain piping.

3.10 EXCAVATED MATERIAL AS BACKFILL

A. Provide back fill to the lines, grades and elevations as shown on the Drawings and as directed by the Engineer.

B. Spread backfill material in approximate horizontal lifts with a 2-foot maximum loose lift thickness and compact to not less than 95 percent maximum dry density (ASTM D698). Moisture content shall be uniform throughout a compacted lift and shall be close to optimum throughout.

3.11 PIPE AND CONDUIT BACKFILL

A. Pipe trenches shall be excavated with side allowance (within trench supports and wales, if any) of 1 foot, and the sides of each trench from the bottom up shall be as near vertical as possible for a height equal to at least the full diameter of the pipe plus the specified depth of selected fill over the pipe.

B. The trimming and grading of the bottom of the trench shall be such that the barrel of each length of pipe can be uniformly supported by the bedding for its full length, free at the joints, and at the correct grades and levels. Except where the trench excavation is in rock, hard objects and boulders that may adversely affect the uniformity of the foundation shall be removed to a depth of 4" below the specified trench bottom. Where the bottom of the trench has been loosened during excavation, it shall be compacted at optimum moisture content to 95 percent of Standard Proctor maximum dry density prior to pipe laying and bedding.

C. Backfilling of pipe trenches shall commence after the pipe has been laid and firmly bedded in the specified bedding material and the selected fill placed and adequately compacted at optimum moisture content below, around, and over the top of the pipe to a height of one foot or as directed by the Engineer. The bedding and selected fill shall besuitable fine-grained material as approved by the Engineer.

D. Unless the Contractor is authorized by the Engineer to use other material, material for backfilling above the bedding and selected fill shall be obtained from trench excavations.

3.12 WORK PADS AND HAUL ROADS

A. Construct work pads and haul roads as approved by Engineer.

B. Alignments for haul roads and temporary access roads to and on the site will be approved by the Engineer prior to construction. Temporary roads will be constructed such that they do not impair the foundation or berms of the impoundments, other work areas and/or the stability of existing slopes.

C. No separate payment will be made for site restoration, and all costs in connection to the operations required will be included by the Contractor in the applicable Contract price.

D. Provide a plan acceptable to the Engineer for preventing the generation of dust due to operations in construction zones, along haul routes, in equipment parking areas, and in waste areas. This plan may consist of water sprinkling or an equivalent service.

E. Maintain haul roads and work pads in a manner to ensure dust control and truck operator safety.

F. Coordinate haul routes and work pads with the Engineer and Owner during progress meetings.

3.13 GENERAL GRADING

A. General grading shall be performed to achieve drainage diversion and collection in the area indicated on the drawings and to the Engineer's approval.

B. General grading shall be performed to provide positive slope towards drainage ditches, channels, road crossings, pipe inlets, and catchments and as indicated on the drawings.

C. General grading shall be performed downstream of the aforementioned structures to provide controlled drainage away from the outlet.

D. General grading shall be performed to provide positive slope away from new and existing buildings, offices, plant structures, and roadways.

E. The Contractor shall coordinate establishing earthwork lines, grades, and slopes with the Engineer.

F. General grading shall consist of minor excavation cuts, backfilling, sloping, contouring, and compaction.

G. Compaction of general graded areas shall consist of wheel-rolling method using rubber tire earthmoving equipment with a gross vehicle operating weight of at least 50,000 pounds.

H. Incidental over excavation shall be backfilled with material that meets the structural fill requirements and compacted accordingly.

I. General grading shall be adjusted, revised, expanded, or reduced as job conditions become apparent and at the Engineer's discretion.

3.14 DRAINAGE CHANNELS, DITCHES, AND ROAD CROSSINGS

A. Excavate, cut, grade, contour, and compact as necessary for the construction of drainage ditches, riprap-lined channels, unlined channels, pipes and culverts, concrete road crossings, concrete interval erosion pads, and concrete catchments to the approximate lines and grades shown on the drawings.

B. Excavation elevations and drainage and diversion inverts shall be determined in the field to adapt to the existing stream or drainage flow line and job conditions. The Contractor shall coordinate establishing earthwork lines, grades, and slopes with the Engineer.

C. Compaction of the sub-grade shall be by wheel-rolled method for the aforementioned unlined or riprap structures.

D. Compaction of the sub-grade shall conform to the structural fill requirements in this section for the aforementioned concrete structures. Scarification and compaction may be necessary. Appropriate hand, walk-behind, or ride-on compaction equipment shall be used under concrete work.

E. Incidental over excavation shall be backfilled with material that meets the structural fill requirements and compacted accordingly.

F. Earthwork associated with these structures shall be adjusted, adapted, revised, expanded, or reduced as job conditions become apparent and at the Engineer's discretion.

3.15 WASTE MATERIALS

A. Dispose of foreign materials, buried rubble, and native material encountered during foundation and borrow excavation unacceptable to the Engineer at an approved waste area. No additional payment will be made for the disposal of waste materials as specified regardless of material characteristics or quantity.

B. All foreign materials, construction debris, rubble and abandoned construction waste will be disposed of at the waste disposal area.

C. At completion of the project, grade all borrow areas to maintain a natural-appearing variable slope and grade to drain as approved by Engineer.

END OF SECTION

SECTION 02250

LOW PERMEABILITY SOIL LINER

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work shall consist of placing and compacting low permeability soil liner material for the evaporation impoundments in accordance with these specifications and in reasonably close conformity with the grades, thickness and typical section shown on the plans or as directed by the Engineer.

1.2 RELATED SECTIONS

A. Section 02222 - Excavation.

B. Section 02276 — HDPE Liner

1.3 REFERENCES

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1. ASTM D 422 - Method for Particle Size Analysis of Soils

2. ASTM D 1556 - Test Method for Density of Soil in Place by the Sand-Cone Method

3. ASTM D 1557 - Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixture using 10-lb (4.54-kg) Rammer and 18-inch (457-mm) Drop

4. ASTM D 2487 - Test Method for Classification of Soils for Engineering Purposes.

5. ASTM D 2922 - Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (shallow depth)

6. ASTM D 4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

7. ASTM D 4643 - Test Method for In-Place Moisture by Microwave Oven

B. ENVIRONMENTAL PROTECTION AGENCY

1. EPA 9100 - EPA Laboratory Triaxial Permeability

1.4 DESIGN REQUIREMENTS

A. Process, place and compact soil materials suitable as a component for a composite liner for an evaporation impoundment system.

1.5 PERFORMANCE REQUIREMENTS

A. Low permeability soil liner shall have a field permeability of less than I x 10 3 cm/s determined by large scale in-situ testing using sealed double ring infiltrometer testing apparatus.

B. Materials to be used as liner shall be placed as a test pad to determine suitability of field compaction equipment, and the range of the moisture content/density relationship which satisfies the hydraulic conductivity requirement as noted above. This range shall be used to determine the liner construction methods and test criteria.

C. Testing frequency of subgrade shall be as shown Table 02250-1.

D. Testing frequency for borrow material shall be as shown in Table 02250-2.

E. Testing frequency of low permeability soil liner after construction shall be as shown in Table 02250-3.

1.6 SUBMITTALS

A. Submit certification for all performance requirement under provisions of Section 01300, to Engineer for review and acceptance.

TABLE 02250-1

TESTS AND OBSERVATIONS

ON SUB-GRADE PREPARATION

Parameter	Test Method	Minimum Testing Frequency
Percent Compaction (Note 1)	ASTM D 2922	1 per acre (Note 2)
Compaction Curve	ASTM D 1557	1 per 5 acres
Preparation of Previously Compacted Lift	Observation	Full Coverage

1. Percent compaction is defined as the dry density of the compacted soil divided by the maximum dry density measured in the laboratory with a specified method of compaction. The test methods listed are for measurement of the dry density of the compacted soil.

2. In addition, at least one test should be performed each day the construction personnel prepare sub-grade by compaction.

TABLE 02250-2

MATERIALS ACCEPTANCE TESTING FOR

LOW PERMEABILITY SOIL LINER MATERIAL

Parameter	Test Method	Minimum Testing Frequency
Percent Fines	ASTM D 1140	1 per 5.000 yd^3
Liquid & Plastic Limits	ASTM D 4318	1 per 5.000 yd^3
Water Content	ASTM D 4643	1 per 5.000 yd^3
Construction Oversight	Observation	Full-Time

TABLE 02250-3

CONSTRUCTION TESTING FOR LOW PERMEABILITY SOIL LINER

Parameter	Test Method	Minimum Testing Frequency
Water Content (Note 1)	ASTM D 3017	1/acre/lift and at least 1 per 1000 yd^3
Density	ASTM D 2922	1/acre/lift and at least 1 per 1000 yd^3
Construction Oversight	Observation	Full-Time

1. Every tenth sample tested with ASTM D3017 should be tested by ASTM D4643 as well.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Low Permeability Soil Liner

1. Fine-grained soils obtained by selective excavation, maximum particle size of 1 inch; minimum fines content (percent passing U.S. No. 200 sieve) of 25 percent, classified as SC, ML, CL, CH or MH; minimum liquid limit of 35: minimum plasticity index of 10.

2. Test Pad: Soil liner materials shall be the same as those materials used in the test pad.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify clay liner material is coming from an approved borrow source and meets the minimum criteria as above.

B. Check the depth and slope of the excavation for conformance with design documents.

C. Check the location and grades to the collection sumps, ensuring that water will drain.

D. Ensure that the clay material is placed evenly and uniformly, and that it is relatively homogeneous.

E. Observe the loose lift thickness over the liner area to be compacted. Ensure that the thickness is in conformance with the specifications and the test pad results.

F. Closely observe the clod size; ensure that clods are broken down to the correct size.

G. Monitor the moisture content to ensure that it is kept within the limits specified. Recondition clay materials if moisture content is not within the limits specified.

H. Maintain the clay moisture content to avoid desiccation.

I. Scarify and recompact any areas of shrinkage cracks in the clay liner.

J. Maintain a uniform compactive effort across the entire site.

K. Verify that the moisture content-density/permeability relationship is consistent. Placement of the clay liner shall be in conformance with the results of the test pad.

L. Verify that the specified testing procedure and frequency of tests are carried out. The Engineer may require additional resting if irregularities develop. The contractor will correct these irregularities in a manner approved by the Engineer.

M. Ensure that the surface of each successive lift is properly scarified so that proper bonding and specified permeability is achieved at each lift interface.

3.2 PREPARATION

A. Clear and grub borrow areas and test pad area as described in Section 02110.

B. Handle and process the clay from the borrow area or process plant.

C. Remove rocks, debris, vegetation and other detrimental material from the materials to be used for the liner as directed by the Engineer during construction.

D. Moisture condition and scarify, or rotomix clay materials to provide a uniform moisture content. If the moisture content in the stockpile area is higher than permissible limits, disc and allow to air dry before placing.

3.3 PLACEMENT AND COMPACTION

A. Place clay liner on prepared and approved rough surface subgrade.

B. Spread to provide a loose lift thickness as determined by the test pad.

C. Remove oversize material greater than 1 inch as directed by the Engineer during construction.

D. Breakdown clods greater than 3 inch size.

E. Each lift shall be moisture conditioned by carefully utilizing spray nozzles or equivalent and scarifying to provide uniform moisture conditioning.

F. Following moisture conditioning, each lift shall be compacted as determined from the results of the test pad.

G. Rework and recompact lifts which the test results indicate non-compliance with the test pad data.

H. Use hand-held mechanical compactors or tampers on difficult or tight areas which are inaccessible or impractical to large compacting equipment.

I. Scarify each lift before placing a subsequent lift if necessary or as directed by the Engineer.

J. Compact the side wall clay liners continuous with the bottom. Do not compact the side wall liners in horizontal lifts unless the lift is a minimum of 10 feet wide.

3.4 TEST PAD

A. Construct a test pad with a minimum size of 30 feet x 75 feet x 2 feet thick in an area designated by the Engineer. A new test pad shall be constructed for each new material or if the type of construction equipment significantly changes as determined by the Engineer.

B. Construction of the test pad is to be completed and approved by the Engineer in advance of placement of the liner.

C. Materials and compaction equipment is to be similar to those materials and compaction equipment proposed for the construction of the liner.

D. Place and compact processed clay from the borrow source. Establish the field criteria for the moisture content-density/permeability relationship required to achieve the specified permeability.

E. Determine the number of compaction equipment passes required to achieve the specified permeability.

F. Access the ability of the equipment and method of operation required to break up large clods of un-compacted soil.

G. Conduct at least two field and two laboratory permeability tests. Compare the results and establish a relationship between field and laboratory permeability.

H. If alternate types of equipment are proposed, evaluate the compaction equipment type, size, number of passes and compatibility with soil type. Document and compare the field and laboratory permeability.

I. If the soil types from the borrow source vary substantially, construct a new test pad for each soil type or mixture. Additional testing will be at the contractor's expense.

J. Submit all documentation for Engineer's approval in accordance with Section 01300.

3.5 PROTECTION

A. Protect the low permeability soil liner from desiccation. Use of either a water truck or an irrigation system.

3.6 SMOOTH ROLL

A. After the test pad is approved by the Engineer and survey verification has been performed, smooth roll at the required final liner elevation. Check for tightness, smoothness and that the liner is graded as specified. Ponding of water on the liner will be cause for rejection by the Engineer.

END OF SECTION

SECTION 02714

DRAINAGE COLLECTION AND CONVEYANCE PIPING

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02776 - Liner

C. Section 02777 - Drainage Net

D. Section 02779 — Geosynthetic Clay Liner (GCL)

1.2 SCOPE

A. HDPE piping of varying diameter and wall thickness is included for conveyance of solution and/or stormwater collected and conveyed by the LCRS and impoundment drain pipe systems. HDPE shall be installed, buried, or routed on the ground surface in accordance with these specifications and to the locations, lines, and grades indicated on the drawings. Field verification and measurement to fit shall be conducted prior to installation.

B. HDPE pipe of the size and dimensions indicated on the drawings to be fabricated for the inspection sump structure of the under drain system located downstream collection sump Fabrication and installation shall conform to details on the drawing and approved shop drawings. Field verification and measurement to fit shall be conducted prior to installation.

C. Perforated drain pipe is included for the collection and conveyance of solution and/or stormwater for the under drain LCRS system beneath the lined evaporation impoundment as part of this project. Perforated pipe shall be installed and buried in accordance with the specifications and to the locations, lines, and grades indicated on the drawings. Field verification and measurement to fit shall be conducted prior to installation.

1.3 REFERENCES

A. HDPE Conveyance Pipe: ASTM designations D-543, D-1248, D-3350, D-2447, D-3035, F-714, D-3261, D-1693, D-2837 and F-412.

B. Perforated Drain Pipe: ASTM designations D-405, D-543, D-618, D-883, D-1248, D-2122, D-2412, and F-412.

1.4 SUBMITTALS

A. Submit shop drawings, product and performance data, and manufacturer's certifications under provisions of Section 01300.

1.5 PROJECT RED-LINE FIELD DRAWINGS

A. Record location of pipe runs, connections, cleanouts and principle invert elevations.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements, lines, grades and elevations are as indicated on the drawings.

B. Make minor adjustments in the field for pipe routing and installed lengths.

C. Notify the Engineer of discrepancies between the drawing elevations, lines, and grades and actual field conditions. Field adjustments, with respect to elevations, lines, and grades shall be approved by the Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. HDPE Conveyance Pipe Materials

1. Phillips Drisco Pipe, Inc.: Series 1000 (PE 3408), Type III, Class C

2. Plexco, Amsted Industries: PE 3408, Type III, Class C.

3. Or equivalent

B. Submit product data for approval under provisions of Section 01300.

2.2 PIPE MATERIALS

A. HDPE Conveyance Piping shall consist of the following properties:

Nominal Size	Pressure Rating	SDR
6-inches	100 PSI	17
12-inches	100 PSI	17
18-inches	100 PSI	17

B. Perforated drain/collection piping shall be a Class C material and meet or exceed the following properties:

Nominal Size	Perforation Flow Capacity	Pipe Stiffness @ 5% Deflection	Elongation
6-inches	24 gal/min/ft*	24 PSI	10% max.

*Three (3) inches of head

2.3 FILTER AGGREGATE AND BEDDING

A. Filter Aggregate or drain rock shall be placed to the lines and grades indicated on the drawings in such a manner as to not damage the collection pipe in any way.

B. Bedding materials shall be placed to the lines and grades indicated on the drawings and compaction shall be moderate and deliberate as to protect the collection pipe at all times.

C. Free draining gravel and bedding materials shall meet the gradation requirements of Section 02200.

2.4 ACCESSORIES

A. Solid couplings, tees, and other fittings shall be used of the same material type and manufacturer approved adhesives.

B. Fittings and adapters to join dissimilar material types shall conform to the manufacturers recommendations and procedures of both types. Special accessories or fabrication of fittings shall require submittals for Engineer approval.

C. Drainage nets shall be installed as shown on the drawings and field adjusted with the Engineer's Approval.

D. Flanged fittings with the used of steel bolts shall be approved by the Engineer. Buried flanged fittings may be prohibited or may require stainless steel bolts or asphaltic mastic coatings be applied to protect from erosion. Field judgment will be applied at the Engineer's discretion.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

B. Verify that pipe materials have been shipped, unloaded, and stored properly and absent of cracks, crimps, holes, tears, splits, or other damage rendering all or part of the material unusable.

3.2 PREPARATIONS

A. Hand trim excavations to required elevations. Correct over excavation with compacted soil in accordance with Section 02200 Earthwork.

B. Remove large stones or other hard matter, which could damage drainage piping or impede consistent backfilling or compaction.

C. Trench floors shall be free from standing water, mud, and saturated soil. In the event these conditions exist, dewatering of the trench, mucking out saturated material, or postponement of pipe installation are available options for the Contractor. Placing excess dry material on top of wet or saturated material is unacceptable.

D. Over excavations within the trench shall be filled with suitable material and compacted in accordance with Section 02200 Earthwork.

E. Survey all pipe routing, lines, and grades for conformance to the specifications and drawings. Verify proper grade and slope. Field adjustments shall be approved by the Engineer.

3.3 PERFORATED PIPE INSTALLATION

A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.

B. Place drainage and collection piping on prepared subgrade, drain rock, or bedding as indicated on the drawings.

C. Lay pipe to slope gradients noted on Drawings with maximum variation from true slope of 1/4 inch in 10 feet.

D. Place perforated pipe with perforations facing down. Mechanically join or adhere pipe ends.

E. Install aggregate at sides over joint and top of pipe. Provide top cover compacted thickness of 12 inches or as indicated on the drawings.

F. Place filter fabric over leveled top surface of aggregate cover prior to subsequent backfilling operations.

G. Place aggregate in maximum 6 inch lifts, consolidating each lift.

H. Refer to Section 02200 for compaction requirements. Do not displace or damage pipe when compacting.

3.4 HDPE PIPE INSTALLATION

A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.

B. Place drainage or conveyance piping on prepared subgrade or bedding as indicated on the drawings.

C. Lay pipe to slope gradients noted on Drawings with maximum variation from true slope of 3/4 inch in 10 feet.

D. Dragging the fuse welded HDPE pipe into place may be an economical method of installation, provided the pipe isn't damaged from sharp rocks or excessive abrasion created by pulling the pipe great distances. Minimize dragging where possible.

E. All fusion welding of HDPE pipe butt and sidewall joints shall conform to the manufacturer's instructions and recommendations. Qualified operator(s) of the appropriate fusion equipment shall have a. minimum of one (1) year of pipe fusing experience and be knowledgeable of the specialized equipment and visual quality control procedures for field joining pipe.

F. HDPE pipe shall not be handled or installed to cause any bend greater than 30 times the pipe diameter without recommended fittings or angled field joints. Kinking of the pipe during fabrication or installation will not be allowed.

G. Before fusion welding, make allowances and incorporate into QC procedures for the climate and the elevation at this site.

H. Compact backfill of HDPE pipe trench or over excavation in accordance with Section 02200.

I. Where pipe daylights, provide sufficient extension beyond earth slope to place riprap protection.

3.5 HDPE PIPE INSPECTION SUMP STRUCTURE INSTALLATION

A. Place concrete bottom ballast to the general dimensions shown on the drawings to prevent potential floating of the structure. Concrete materials and installation shall be in accordance with Section 03300.

B. Deploy and imbed HDPE pipe sump structure into the fresh concrete a minimum of one (1) foot. Implement concrete vibration to ensure complete encapsulation of the pipe.

C. Install the HDPE pipe sump structure to vertical plumb in all directions and to the approximate elevation shown on the drawings.

D. Orient the inlet/outlet fittings with respect to the corresponding pipe routes.

E. Allow the concrete to cure a minimum of three (3) days before beginning backfill.

F. Compact backfill for the inspection sump structure over excavation in accordance with Section 02200.

3.6 FIELD QUALITY CONTROL

A. Field inspection shall be performed under provisions of Section 01400.

B. Request inspection by the engineer prior to and immediately after placing aggregate cover over pipe.

C. Perform a pressure test the HDPE piping in accordance with the manufacturer's instructions and the appropriate SDR performance data prior to backfill.

D. Provide the Engineer and Owner the opportunity to witness any and all pressure tests conducted on the piping.

3.7 PROTECTION

A. Protect finished installation under provisions of Section 01400.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

3.8 COORDINATION

A. Coordinate installation of perforated collection pipe and conveyance drain pipe with related activities such as: trenching, liner installation, geonet installation, and drain rock backfilling. Coordination activities shall consider the provisions within Sections 02200, 02776 and 02777.

B. Coordinate installation, inspections, and testing with associated activities and the Engineer.

END OF SECTION

SECTION 02776

HDPE LINER

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIC ELSEWHERE

A. Section 02200 — Earthwork

B. Section 02250 — Low Permeability Soil Liner

C. Section 02777 - Drainage Geonet

D. Section 02779 — Geosynthetic Clay Liner (GCL)

E. Section 03300 — Cast-In-Place Concrete

1.2 GENERAL DEFINITIONS

A. Field Seam - Seam welded during liner installation.

B. Factory Seam - Seam made during factory fabrication of the sheeting. Factory seams shall have tensile strength properties equal to or greater than the parent material. Bidders shall submit a sample of a factory seam with their bids.

C. Fish Mouth - Term used to describe the appearance of a bulge or gap along the weld line of a liner seam. The gap is formed when the welded length of one liner panel exceeds that of the adjoining panel; the excess material forms the fish mouth following seam welding.

D. Panel - A single factory-fabricated section of the liner membrane.

E. The liner is constructed of High-Density Polyethylene (HDPE).

1.3 SUBMITTALS

A. Submit shop drawings for the HDPE liner system installation in accordance with Section 01300 Submittals and this section.

B. Submit liner manufacturer and installer qualifications, product performance data, certification of acceptance for the liner foundation, and QC and daily install reports in accordance with Section 01300 Submittals and this section.

C. Submit a summary of the Lining Contractor's experience with the placement of 60 and 80 mil High Density Polyethylene (HDPE). As a minimum, Lining Contractor will have5 years of continuous installation experience with in excess of l million square feet of HDPE liner installed.

D. The Lining Contractor's approved construction layout drawings will specify all components and details required to meet these specifications. The responsibility of the Owner's Contractor, and the Lining Contractor will be clearly defined.

E. Provide manufacturer testing results with the following frequency:

1. Density - Two per resin batch number

2. Tensile Properties - One per 1000 feet of manufactured sheet

3. Carbon Black - Two per resin batch number thickness - one per 1000 feet of manufactured sheet

4. Volatile Loss - Certification by resin supplier with each resin batch

F. Submit test results to the Engineer for approval prior to delivery of the HDPE membrane to the job site. Alternate testing methods may be used with prior approval by the Engineer.

G. Submit to the Engineer a peel strength value and the test procedure used to determine the peel strength 30 days before delivering liner to the site. This value will be used to evaluate field seam quality.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Gundle Lining Systems, Inc., 1340 East Richey Road, Houston, Texas, 77073.

B. National Seal. Company, 600 Nordi 1st Bank Drive, Palatine, Illinois, 60067.

C. Poly-America, Inc. 2000 West Marshall Drive, Grand Prairie, Texas, 75051.

D. Serrot Corporation, 5401 Argosy Drive, Hunington Beach, California, 92649.

E. Field Lining Systems, Inc. 6970 N. W. Grand Aye, Glendale, Arizona 85301.

F. Similar products may be substituted subject to approval by the Engineer.

2.2 MATERIALS

A. Provide a 60 and 80-mil-thick HDPE membrane that meets or exceeds the physical properties identified in Table A.

B. Closed-cell neoprene will have a minimum tensile strength of 1,200 psi in conformance with ASTM D412 and D2240.

C. Silicon sealant will conform to Federal Specifications TT-5230a.

D. The Contractor will submit for review and approval samples of the liner materials, to include liner, neoprene, mastic and silicon seal.

E. Materials shall meet or exceed the following requirements:

Table A

Material Properties High Density Polyethylene (HDPE)

Unsupported (U)

Property	Test Method	40-mil Value	60-mil Value
Gauge (nominal)		40	60
Thickness, mils minimum	ASTM DI593 Para. 8.13	40	60
Density (g/cc minimum)	ASTM D792 Method A	0.935-0.95	0.935 0.95
Minimal Tensile Properties (each direction)	ASTM D 638	-	-
1. Tensile Strength at Yield (lbs/in, width)		90	140
2. Tensile Strength at Break (lbs/in, width)		160	240
3. Elongation at Yield (percent)		13	13
4. Elongation at Break (percent)		700	700
Tear Resistance (lbs minimum)	ASTM D1004 Die C	30	45
Low Temperature. °F	ASTM D 1204 212°F. 15 min.	-40	-40
Dimensional Stability (each direction, percent change maximum)	ASTM D1204 212°F. I min.	+2	+2
Resistance to Soil Burial (percent change maximum of original value)	ASTM D3083 (as modified by NSF)	-	-
1. Tensile Strength Yield		+ 10	+ 10
2. Tensile Strength at Break		+ 10	± 10
3. Elongation at Yield % change maximum of original value)		+ 10	± 10
4. Elongation at Break (% change maximum of original value)		± 10	+ 10
5. Modulus of Elasticity (psi x 105)		1.1	
Environmental Stress Crack (minimum, hrs.)	ASTM D1693 (as modified by NSF)	1500	1500
Bonded Seam or Shear Strength (factory seam breaking factor, ppi width)	ASTM D3083 (as modified by NSF)	86	126
Peel Adhesion (lb./in. minimum)	ASTM D413 (as modified by NSF)	48	70
Dead Load Room Temperature 73°F. 50% Bonded Seam Load	NSF method	Pass	Pass
Elevated Temperature 158°F. 25% Bonded Seam Load	NSF method	Pass	Pass
Resistance to Soil Burial Peel Adhesion Bonded Seam Strength (percent chance maximum in original value)	ASTM D3083 (as modified by NSF)	-20	-20
FTB Film Team Bond			

2.3 EQUIPMENT

A. Use only welding material of a type recommended and supplied by the manufacturer, delivered to the site in the original sealed containers, each with an

1. Prior to installation of the upper liner, the Lining Subcontractor shall inspect and verify the geosynthetic clay liner (GCL) is installed in accordance with the specifications and is ready to receive overlying materials. Verify GCL is secure and free from objects or protrusions that potentially could puncture the upper liner.

3.3 INSTALLATION

A. The Lining Subcontractor shall be responsible for inspection of the sheet rolls at the job site. Should rolls show damage from transit, they will be so identified by the Lining Subcontractor and set aside.

B. During unrolling of the lining material, the Lining Subcontractor shall carry out visual inspection of the sheet surface. Any faulty areas shall be marked and repaired by the Lining Subcontractor in a manner approved by the Engineer. The Engineer will make periodic, independent inspection of the liner, and any additional faulty areas discovered shall be repaired.

C. The Lining Subcontractor shall lay out and overlap individual panels of liner material prior to welding with a minimum 4 to 6 inch overlap, using manufacturer's trained technicians. Extreme care shall be taken by the installer in the preparation of the areas to be welded. Clean and prepare the area to be welded according to installation procedures provided by the material manufacturer and subject to approval by the Engineer.

D. Install textured HDPE liner on slopes greater than 3:1 and as shown on the drawings. Textured liner shall be installed with the textured surface face up. The locations of the textured surface is generally where the geonet material is to be placed to prevent slipping.

E. Fusion seam/weld to be performed by using a steel wedge heated to a temperature between 600F and 8SOF and pressing it onto the overlapped zone of the two liners to be joined. Extrudate (fillet) seams to be formed by extruding a ribbon of molten polymer over the edge of, or in between, the two surfaces to be joined.

F. All field seams shall be fusion seams unless otherwise directed by drawings, specifications, or the Engineer.

G. Tightly bond all welds on completion of the work. Replace or repair with an additional piece of HDPE membrane any panel area showing injury due to excessive scuffing, puncture, or distress from any cause.

H. Allow no "fish mouths" within the seam area. Where "fish mouths" occur, cut and overlap the material and apply an overlap-extrusion weld.

I. Welding of liner material on which visible moisture is present will not be permitted

J. Lift the liner material into place; dragging the material across the prepared surface or other surface likely to scratch or scuff the liner material will not be permitted.

K. Allow no horizontal seams along face of dam except as approved by the Engineer.

L. Install liner anchorage as required in the Drawings.

M. Install windsock component of liner system as required in the Drawings.

N. Coordinate liner installation activities with geonet, and geosynthetic clay, liner installation activities.

O. Place concrete pads at each pipe penetration/boot assembly. Coordinate concrete formwork and placement between liner Subcontractor and General Contractor as necessary.

P. Install a minimum of two stainless steel bands at each pipe boot. Perform extrusion welding to adhere the HDPE liner boot to the HDPE pipe. Place a HDPE cover panel over the stainless steel bands and weld each end by the extrusion method.

Q. The Liner Subcontractor shall coordinate materials and sequencing for all temporary and permanent anchorage of the liner with the General Contractor and install permanent anchorage in accordance with Section 02200 Earthwork.

3.4 FIELD SEAM TESTING/QUALITY CONTROL

A. The Contractor or Liner Subcontractor shall perform all testing and quality control procedures in accordance with section 01400 and consistent with approved quality control plans.

B. The Liner Subcontractor will employ destructive and on-site non-destructive testing on all welds to ensure watertight homogeneous seams. All field welds will have seam strengths as shown in Item D.

C. The Lining Subcontractor's quality control technician will inspect each seam. Mark and repair in accordance with approved procedures any area showing a defect. The Liner Subcontractor will indicate on the field installation drawings the locations, types and correction for defects.

D. Each day, prior to liner welding, produce a test weld 3 feet in length with each welding machine. Perform test welding under the conditions that will exist for liner welding. Mark each test weld with date, ambient temperature, welding machine number, and seamer's name. Cut samples of the test welds I inch in width and perform peel and shear testing.

The specimen passes when:

1. The break is Film Tearing Bond (FTB).

2. The break is ductile (elongating until failure).

3. The strength of break is:

- 70 percent (wedge welder) or 60 percent (extrusion welder) of sheet minimum strength for peel test.

- 90 percent of sheet minimum yield strength for shear test.

A break of the weld sheet interface is considered a non-FTB (failure) while a break through the weld is considered FTB if the break is ductile.

E. The Lining Subcontractor shall remove random weld samples from the installed welded sheeting for destructive shear and peel, tests at locations designated by the Engineer. Test a minimum of three samples per day or approximately one per 500 feet of weld, whichever is more to determine seam 'tensile properties and peel strength. Frequency and location of samples shall be coordinated with the Engineer whereupon duplicate samples for quality assurance will be collected.

F. The Lining Subcontractor shall vacuum test the entire length of each extrusion weld seam with a minimum vacuum pressure of 8 psi, or an Engineer-approved equivalent testing procedure.

G. The Lining Contractor shall mark, log and identify each type of repair to be made as a discrepant area.

H. The Engineer retains the right to reject any field made seam for cause. Cause shall be defined to include poor workmanship, defective welds or insufficient overlap. Any field seam rejected for such causes will be repaired or replaced to the satisfaction of the Engineer at no additional expense to the Owner.

I. Perform QC testing in the field on all pipe boot assemblies. Perform spark or air tests for each component of each boot as required.

3.5 WARRANTY AND GUARANTEE

A. Obtain from the manufacturer a written guarantee for a time period of at least 10 years after installation during which the liner materials under this project shall be free from defects. Such written guarantee shall provide for the total and complete repair or replacement of the defect or defective area of lining materials upon written notification and demonstration by the Owner of the specific non-conformance of the lining material with the project Specifications. Such defects or non-conformance shall be repaired or replaced at no cost to the Owner within 30 days of notification or as approved by the Owner.

B. Obtain from the installer/Subcontractor a written guarantee for a time period of at least 2 years after installation during which the workmanship using liner materials under this project shall be free from defects. Such written guarantee shall provide for the total and complete repair or replacement of the defect or defective area of installation, field repair, field testing, or other work using lining materials upon written notification and demonstration by the Owner of the specific non-conformance of the lining material installation with the project Specifications. Such defects or non-conformance shall be repaired or replaced at no cost to the Owner within 30 days of notification or as approved by the Owner.

END OF SECTION

SECTION 02777

DRAINAGE NET

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02776 - HDPE Liner

1.2 STANDARD SPECIFICATIONS

A. Conform to current ASTM Reference Standards D-1238, D1248, D1505, D-1603, D-1682, D-1777, D-4533, D-4716.

B. U.S. Army Corps of Engineers Guide Specification.

1.3 SUBMITTALS FOR APPROVAL

A. Submit product data under provisions of Section 01300.

B. Submit samples under provisions of Section 01300.

C. Submit design data under provisions of Section 01300.

D. Submit test reports under provisions of Section 01400.

E. Submit manufacturer's certificate under provisions of Section 01400 that products meet or exceed specified requirements.

F. The Contractor will provide manufacturer's Shop Drawing of the drainage geonet layout plan and details for the Engineers review and approval prior to drainage geonet procurement. Submit four (4) sets of full sized, complete shop and illustration drawings. Detail all jointing and anchorage.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum three years documented experience.

B. Installer: Company specializing in applying the work of this Section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. A production certificate stating that each drainage geonet conforms to the material properties published by the suppliers shall be provided with each shipment.

B. Drainage geonet shall be protected from ultraviolet light exposure precipitation or other inundation, dirt, puncture, cutting, or other damaging or deleterious conditions.

C. Drainage geonet rolls shall be shipped and stored in relatively opaque and water tight wrappings.

D. The drainage geonet may be cut to the appropriate width using a knife or suitable instruments.

1.6 WARRANTY

A. Provide 5-year warranty.

B. Warranty: Include coverage for ultraviolet (UV) resistance to sunlight for 3 years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. TENAX: Product Geonet CE-I Series.

B. National Seal Company: Product - Poly-Net (PN)

C. Similar products may be substituted, subject to approval by the Engineer.

2.2 MATERIALS

A. Drainage geonet used for the impoundment between two layers of liners shall have the following minimum properties:

Fabric Property	**Value**
Density	0.940 g/cm^3
Thickness	0.25 in
Melt Flow Index	0.5 g/l0 min
Tensile Strength M.D.	510 lbs/ft
Tensile Strength T.D.	350 lbs/ft
Tear Resistance M.D.	11 lbs
Hydraulic Conductivity (@ i = l and vertical stress)	2 x 10-3 @ 2,500 psf

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that underlying surfaces are ready to receive work.

B. Verify field measurements are as shown on drawings.

C. Verify that required utilities are available, in proper locations, and ready for use.

D. Beginning of drainage geonet installation means Installer accepts existing surface conditions and underlying liner work.

3.2 INSTALLATION

A. Clean lined surfaces of dust and loose material.

B. Install in accordance with manufacturer's instructions.

C. Geonet panels shall be placed side-by-side and end-to-end. Butt joints shall not cause gaps between panels greater than 3/8-inch.

D. Overlap of geonet causing severe undulations greater than 1/2 inch in the liner will be unacceptable.

E. Contractor is responsible for anchoring exposed geonet to protect against wind damage until upper liner placement.

F. Temporary and permanent anchoring or joining supplies shall be a material-type or placed in such a manner as to not puncture or potentially puncture either the lower or upper liner panels.

G. Materials and procedures shall be implemented to protect the lower HDPE liner during installation of the geonet.

3.3 REPAIRS

A. Holes or tears shall be repaired with a drainage geonet patch and carefully cut to fit.

3.4 PROTECTION

A. Protect finished installation under provisions of Section 01400.

B. Do not permit vehicle or equipment traffic on drainage geonet.

END OF SECTION

SECTION 02779

GEOSYNTHETIC CLAY LINER

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 - Earthwork

B. Section 02776 Liner

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the Text by basic designation only. Use the latest revision date available unless otherwise indicated.

B. American Society for Testing Materials (ASTM).

1. ASTM E496 - Test Method for Plate Water Absorption of Cohesive Soils.

2. ASTM D4643 (modified) Test Method for Determination of Water Content of Soil.

3. ASTM D5084 - Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (modified).

4. ASTM D35.01.8 1.07 - Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.

5. ASTM D3776 - Test Method for Mass Per Unit Area of Textiles.

6. ASTM D4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles.

7. ASTM D3786 - Test Method for the Mullen Burst Strength of Textiles.

C. U.S. Pharmacopeia National Formularv XVII, page 1210

1. USP-NF-XVH, Test Method for the Free Swell of Bentonite Clay.

D. Geosynthetics Research Institute, Drexel University

1. GRI-GCL-1, Test Method for the Confined Swell of Geosynthetic Clay Liners.

1.3 SUBMITTALS

A. The contractor shall provide manufacturer's Shop Drawings, product performance data, manufacturer quality control certificates, and samples of the geosynthetic clay liner layout plan and details for the Engineer's review and approval in accordance with the provisions of Section 01300.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping

1. GCL shall be supplied in rolls wrapped individually in relatively impermeable and opaque protective covers.

2. GCL rolls shall be marked or tagged with the manufacturer's name, product identification, roll number, roll dimension, and roll weight.

B. Storage and Protection

1. The Contractor will provide on-site storage area for GCL rolls from time of delivery until installed.

2. After Contractor mobilization, store and protect geotextile from dirt, water, ultraviolet exposure, and other sources of damage.

3. Preserve integrity and readability of GCL roll labels.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. The active ingredient of the GCL shall be natural sodium bentonite. The bentonite shall be encapsulated between two polypropylene textiles.

B. The geosynthetic clay liner (GCL) specified on the drawings shall be sodium bentonite with synthetic reinforcing layers.

C. The minimum bentonite material properties shall be as follows:

Property	Test method	Minimum values
Sodium bentonite content	X-ray Fraction	100%
Free swell	USG-NF-XVII	20 ml (MARV)
Fluid loss	API 13 A/B	12 m1
Moisture content	ASTM D4643	15%
Thickness	ASTM D1777	.15 in
Bentonite content @ 20% moisture	Weigh 12' x roll width	80 psf
Permeability a) 2 psi effective stress b) 30 psi effective stress	ASTMD5O84 ASTMD5O84	5×10^{-9} cm/s (Max. ARV) $<5\times10^{-10}$ (typical)

D. The minimum geo-textile backing properties shall be as follows:

Property	Test Method	Value	Units
Weight	ASTM 03776	3.0	oz/sy
Grab Tensile	ASTM 04632	90	lb.
Mullen Burst	ASTM D3786	150	psi

E. For side slopes steeper than 7H:IV the GCL shall be lock-stitched with high strength polypropylene thread to provide internal shear strength reinforcing. The internal shear reinforcing mechanism shall resist failure due to thread pull-out over long-term creep situations.

F. The textiles shall be sufficiently porous to allow bentonite flow-through such that the permeability of the overlap seams is equal to or less than the permeability of the body of the GCL sheet without the addition of paste bentonite.

G. The final GCL product shall have the following properties:

Property	Test Method	Value	Units
Bentonite Content @ 20% Moisture Content	Weigh 12" x Roll Width	1.0	lbs/sq.ft.
Confined Swell	GRI-GCL-1	250	%
Permeability under 5 psi effective confining pressure	ASTM D5084	5 x 10-9	cm/sec
Overlap Seam Permeability under 5 psi effective confining pressure	ASTM D5084	5×10^{-9}	cm/sec
Hydrated Internal Shear Resistance*	ASTM D35.01.181.07 (Draft)	10	degrees
Hydrated Internal Shear Resistance **	ASTM D35.01.181.07 (Draft)	500	psf

*For side slopes less than or equal to 7H:1V
**For side slopes steeper than 7H:1V

H. The bentonite shall be continuously adhered to both geo-textiles to ensure that the bentonite will not be displaced during handling, transportation, storage, and installation, including cutting, patching and fitting around penetrations.

I. The bentonite sealing compound, granules, or powder used to seal around penetrations and make repairs shall be made of the same natural sodium bentonite as the GCL and shall be as recommended by the GCL manufacturer.

J. Provide GCL product performance data showing resistance to hydrostatic head greater than 30 feet, resistance to water migration through overlaps, and resistance to water migration under the membrane.

2.2 ACCEPTABLE MANUFACTURERS

A. James Clem Corporation, 234 Gordon Road, Fairmount, GA 30139 – Claymax

B. Or equal.

2.3 EXPERIENCE

A. The manufacturer of the GCL shall have a minimum of 4 years of continuous experience in the manufacture of similar GCL products. The manufacturer must demonstrate, by submitting a list of previous projects, a minimum of 10 million square feet of manufacturing experience of similar GCL products.

B. The installer of Subcontractor for GCL shall have a minimum of one (1) year of experience installing GCL or similar products. The installer of Subcontractor for GCL shall demonstrate by submitting a list of previous projects, a minimum of one (1) million square feet of GCL.

2.4 MATERIAL WARRANTY

A. The manufacturer shall provide a five *(5)* year warranty to the Owner against manufacturing defects. The warranty shall include defective product found to be not in compliance with the requirements of this section. The warranty shall include the supply of the replacement GCL material. The warranty shall not include the cost of re-installation, defects or failures due to improper installation.

2.5 WORKMANSHIP

A. The installation Subcontractor shall provide a one (1) year warranty for the workmanship of the GCL installation in accordance with the requirements of these contract documents and the manufacturer's instructions and recommendations. The warranty shall include repair of damaged or improperly installed GCL, or replacement of material found to be out of compliance with the specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor shall inspect all GCL received on-site for damage or defect prior to installation. Notify the Engineer of any such damage, defect, and wetted or saturated material before installation.

B. The engineer will collect samples of GCL to be installed for conformance testing.

3.2 SUBGRADE PREPARATION

A. The subgrade shall be prepared in a mariner consistent and in accordance with the requirements in Section 02200.

B. The subgrade shall be properly compacted so as not to settle and cause excessive strains in the GCL or other geosynthetic liner materials.

C. Ensure that rutting or raveling is not caused by installation equipment.

D. Ensure a surface free of debris, roots, or angular stones larger than 1/2-inch.

3.3 INSTALLATION

A. GCL Deployment shall, at a minimum, comply with the following:

1. Handle GCL in a manner to ensure it is not damaged during installation.

2. On slopes, anchor the GCL securely and deploy it down the slope in a controlled manner.

3. Weight the GCL with sandbags or equivalent in the presence of wind.

4. Cut the GCL with a hook blade, scissors, or other approved device. Protect adjacent materials from potential damage due to cutting of GCL.

5. Prevent damage to underlying layers during placement of GCL.

6. During GCL deployment, do not entrap in or beneath GCL, stones, trash, or moisture that could damage GCL.

7. Visually examine entire GCL surface. Ensure no potentially harmful foreign objects, such as needles, are present.

8. Do not place GCL in the rain or at times of impending rain.

9. Do not place GCL in areas of ponded water.

10. Replace GCL that is hydrated before placement of overlying geomembrane or approved soil cover.

11. In general, only deploy GCL that can be covered during that day by geomembrane or approved soil cover.

12. For needle-punched GCLs, add granular or powder bentonite to the overlapped areas at rate of 1/4 lb. per lineal foot.

13. Face the non-woven or secondary woven carrier geotextile against the soil or geotextile filter fabric.

14. Face the woven carrier geotextile against geomembrane.

15. On the side slopes, run GCL to the bottom of the slope as indicated.

B. Overlaps:

1. On slopes, overlap GCL to the manufacturer's match line.

2. In general, no horizontal seams are allowed on side slopes.

3. For needle-punched GCLs, apply granular or powder bentonite to overlapped area at a rate required by the manufacturer.

4. At sumps, overlap GCLs at least 1 foot.

5. At bottom of collection sumps. unroll an extra layer of GCL on top of previously installed GCL. Avoid placing seams on top of underlying seams.

6. Overlap GCL onto low-permeability soil at least 5 feet.

C. Defects and Repairs:

1. Repair all flaws or damaged areas by placing a patch of the same materials extending at least 1 foot beyond the flaw or damaged area.

2. For needle-punched GCLs, add granular or powder bentonite to the overlapped edges of the patch at a rate of 1/4 lb. per lineal foot.

D. Interface with other products: Ensure the following when deploying overlying materials:

1. GCL and underlying materials are not damaged.

2. Minimal slippage of GCL on underlying layers occurs.

3. No excess tensile stresses occur in GCL.

4. If necessary, approved adhesive can be used to keep overlap seams and patches in place during placement of overlying materials.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 - Cast-in-Place Concrete

1.2 STANDARD SPECIFICATIONS

A. Conform to current ASTM Reference Standards A615, A617, A185, and A497; to ACI 315 "Manual for Standard Practice for Detailing Reinforced Concrete Structures;" and to ACI 318 "Building Code Requirements For Reinforced Concrete."

1.3 SUBMITTALS FOR APPROVAL

A. Prepare and submit to the Engineer reinforcement detailed shop drawings for all structures, including bar-placement drawings, bar-bending diagrams, and bar lists in accordance with Section 01300.

PART 2 - PRODUCTS

2.1 REINFORCING BARS

A. Reinforcing bars shall be deformed bars conforming to ASTM A6 15, grade 60, including supplementary requirements, or ASTM A6 17, grade 60.

B. Welded wire fabric or reinforcing mesh shall be 2.9 gauge wire with mesh openings of six (6) inches square.

PART 3 - EXECUTION

3.1 GENERAL

A. Ensure that the reinforcement conforms to the requirements as shown on the Drawings and on approved Shop Drawings.

B. Locate splices where required for construction. The location of splices may be altered, subject to approval by the Engineer. Tension welds or mechanical connections may be used in place of splices and shall conform to the requirements of ACI 318. Splice synthetic reinforcement in accordance with manufacturers recommendations.

C. Splicing bars at additional locations, other than those shown on the Drawings, for the convenience of the Contractor are acceptable subject to written approval by the Engineer.

D. Before reinforcement is embedded in concrete, clean the surfaces of the bars, fabric and the surfaces of any supports of flaky rust, loose mill scale, dirt, grease, or other foreign substances that, in the opinion of the Engineer, are objectionable. Heavy flaky rust that can be removed by firm rubbing with burlap, or equivalent treatment, is considered objectionable.

E. Accurately place reinforcement to meet the following tolerances:

1. The amount of concrete-covering reinforcement in structures shall not deviate from that specified by more than 1/4 inch if the specified cover is 3 inches or less.

2. The spacing of reinforcing shall not deviate more than 1/2 inch from the required spacing.

F. Secure reinforcement in position so that it will not be displaced during the placing of the concrete. Exercise special care to prevent any disturbance of the reinforcement in concrete that has already been placed. Do not field bend or straighten bars to the extent of permanent set, except as approved by the Engineer or as shown on the Drawings. Bars bent without approval shall be replaced, at the Contractor's expense, with approved bars that conform to the Drawings. Do not tack-weld reinforcing bars except at locations shown on the Drawings or where approved by the Engineer. All welding of reinforcing steel shall be performed by qualified welders and welding procedures. Use concrete, metal, or other approved material for chairs, hangers, spacers, and other supports for reinforcement. Do not allow portions of such supports to be exposed on concrete surfaces. Unless otherwise shown on the Drawings, allow at least 1 inch between reinforcement and any anchor bolts, form ties, or other embedded metalwork.

G. Welded wire fabric shall be installed in areas as indicated on the drawings. Overlaps of mesh to be at least six (6) inches. Connecting panels of mesh to be tied together with 16-18 gauge wire at spacings no greater than four (4) feet and at each corner.

H. Welded wire fabric shall be installed prior to or maneuvered during concrete placement to ensure a vertical position between 1/3 to 1/2 the overall thickness of the slab. This position shall be maintained at all times.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 - Earthwork

B. Section 03200 - Concrete Reinforcement

1.2 REFERENCE STANDARDS

A. Conform to ACI 318 "Building Code Requirements For Reinforced Concrete" and as described in this Section.

1.3 SUBMITTALS FOR APPROVAL

A. Submit concrete mix design in accordance with Section 01300 Submittals at least 14 days prior to concrete work.

1.4 SCOPE

A. Section is applicable to concrete sump ballasts, sump bottoms, cast in place culverts, gauge footers, and pipe penetration pads.

1.5 QUALITY CONTROL TEST PROGRAM

A. General

1. Provide adequate quality control measures to ensure compliance of the concrete in accordance with the test methods identified below.

2. The Contractor shall utilize only qualified personnel, approved by the Engineer, to perform designated tests for the Quality Control Program.

B. Test Methods

1. Obtain samples and conduct tests in accordance with the test methods listed below:

a. Sampling aggregates - ASTM D75.

b. Sampling fresh concrete - ASTM C172.

c. Concrete uniformity - ASTM C94, annex AI.

d. Density (unit weight) and yield ASTM C138, except that a 0.25-cubic-foot container may be used for aggregate sizes up to 1-1/2 inches and a 0.5-cubic-foot container may be used for aggregate sizes up to 3 inches.

e. Air content - ASTM C231.

f. Slump - ASTM C143.

g. Temperature - Determine temperature by placing a thermometer in the concrete at the time of placement.

h. Making and curing concrete test specimens in the field ASTM C31.

i. Capping cylindrical concrete specimens - ASTM C617.

j. Compressive strength of cylindrical concrete specimens ASTM C39 for cast cylinders and ASTM C42 for cores.

k. Record and submit to the Engineer the results of all Quality Control Testing for cast-in-place concrete within 24 hours of testing.

PART 2 - PRODUCTS

2.1 GENERAL

A. Concrete

1. Use concrete composed of cementitious materials (cement and fly ash), sand, coarse aggregate, water, and admixtures as specified and approved, all well-mixed and at the proper consistency. Concrete for the culverts and the shall have 28-day compressive strength of 3000 psi.

B. Nominal Maximum Size of Concrete Aggregate

1. Use coarse aggregate that is as large as practicable, consistent with the required strength, spacing of reinforcement and embedded items, and placement thickness requirements of ACI 318 (Sec. 3.3.3).

C. Mix Proportions

1. Suitable strength for concrete shall assure that 100 percent of all test cylinders meet or exceed the design strength.

2. Based on the cylinder strength test results, adjust the mix design and average concrete strength to achieve the required concrete strength that has suitable workability, impermeability, density, and durability without the use of excessive cementitious materials. The Contractor will not be entitled to any additional allowance over the prices bid in the schedule because of adjustments to the mix proportions.

3. The net water-cement materials ratio, exclusive of water absorbed by the aggregates, shall not exceed 0.50.

D. Consistency

1. Do not add water to compensate for stiffening of the concrete after mixing. Uniformity of concrete consistency from batch to batch will be required.

2. The s1ump of concrete at placement shall be as follows:

Unless otherwise permitted or specified, the concrete shall be proportioned and produced to have a slump of 4 in. or less if consolidation is to be by vibration, and 5 in. or less if consolidation is to be by methods other than vibration. A tolerance of up to I in. above the maximum indicated shall be allowed for one batch in any five consecutive batches tested. Concrete of lower than usual slump may be used provided it is properly placed and consolidated. The slump shall be determined by ASTM C143.

2.2 CHEMICAL ADMIXTURES

A. Do not use chemical admixtures that introduce more than 0.001 percent chloride, by weight of cementitious materials, (do not use calcium chloride admixtures) in concrete in which aluminum, galvanized metalwork, or steel is to be embedded.

B. Use an air-entraining admixture in all concrete. The admixture shall conform to ASTM C260. Use a sufficient amount of the air-entraining admixture to effect a total air content in the concrete at the placement as shown in table below:

Total Air Content

Nominal maximum size coarse aggregate	Total air, percent by volume of concrete
3/4 inch	6.0 plus or minus 1
1 inch	5.5 plus or minus 1
1 1/2inches	4.5 plus or minus 1

2.3 WATER

A. In making and curing concrete and mortar, use water that is free from objectionable quantities of silt, organic matter, salts, and other impurities, as determined by the Engineer. Water from the natural wash or operation flows is not improved nor is it allowed for concrete placement use.

2.4 AGGREGATES

A. Gradation of Aggregates

1. Use sand with a gradation that conforms to the limits designated in ASTM C33 for fine aggregate.

2. Use coarse aggregate with a gradation that conforms to the limits designated in ASTM C33 for size No. 57 coarse aggregate for 1-inch MSA and size No. 467 for 1-1/2-inch MSA.

2.5 CURING MATERIALS

A. Wax-base type I and water-emulsified, resin-base type II curing compounds will conform to the requirements of U.S. Bureau of Reclamation "Specifications for Concrete Curing Compound," dated October 1, 1980.

B. CRC-101 curing compound will conform to the requirements of Resources Service "Specifications for Clear Resin-base Curing Compound, CRC 101," dated January 1, 1981.

C. Provide curing compounds of uniform consistency and quality within each container and from shipment to shipment.

D. Polyethylene film for curing concrete will be white and will conform to the requirements of ASTM C171.

E. Curing water will meet the requirements of Paragraph 2.05 for water used in mixing concrete.

2.6 CONCRETE JOINT MATERIAL

A. Bituminous joint filler will be non-extruding, bituminous-filler type in accordance with Federal Specification HH-F-341, type 1. The filler will be 15-pound asphalt or coal tar saturated roofing felt.

B. Use SynKo-Flex preformed plastic waterstops as manufactured by SynKo-Flex Products, Inc., Houston, Texas, (713) 963-9403, or approved equal meeting the requirement of Fed. Spec. SS-S-21 OA, for construction joints in water retaining structures. Alternatively, PVC waterstops may be used in these joints, only if approved by the Engineer. Samples of materials and splices shall be submitted to the Engineer prior to the utilization of the material. The Engineer shall visually inspect and test the materials and splices, at his option, for compliance to specification requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Locate structures as shown on the Drawings or as otherwise directed by the Engineer. The sequence of construction of the structures will be subject to the Engineer's approval. Build structures to the prescribed lines, grades, and dimensions. The dimensions of each structure as shown on the Drawings will be subject to modifications as deemed necessary by the Engineer to adapt the structure to the conditions disclosed by the excavation or to meet other field changes. No additional allowance above the unit price bid in the schedule will be made due to the dimensions fixed by the Engineer or any minor modifications or extensions to adapt the structures to the structure site, as determined by the Engineer.

B. Where the thickness of any portion of a concrete structure is variable, vary the thickness uniformly between the dim shown.

C. Place construction joints as shown on the Drawings or as required for construction. Relocation, addition, or elimination of any construction joint will be subject to the Engineer's written approval. Steel reinforcement will be continuous through construction joints. Place monolithically wherever possible.

D. Place and attach to each structure all forming timber, metal, or other accessories necessary for completion as shown on the Drawings. The cost of such work, for which specific unit prices are not provided in the schedule, will be included in the price bid in the schedule.

E. The Contractor shall not permit backfill, loading or traffic of any kind on structures until the concrete has cured a minimum of seven (7) days, or until 70% of the 28-day compressive strength has been attained.

F. The use of ready mixed concrete that has remained onsite after delivery more than 45 minutes shall not be permitted.

3.2 QUALITY CONTROL CONCRETE TESTING

A. The Engineer will perform Quality Control testing for cast-in-place concrete which will include the following tests and frequency of testing performed on randomly selected test batches:

1. Tests

a. Workability/consistency by slump test.

b. Air content.

c. Unit weight of fresh concrete.

d. Temperature of fresh concrete.

e. Compressive strength of hardened concrete.

f. Aggregate gradations and moistures.

2. Frequency of Testing

a. The Engineer will conduct Quality Assurance tests as required in Al to maintain concrete consistency. Testing frequency for tests 3.02.A.l.a through 3.02.A.1.f will be a minimum of one test per 50 cubic yards or increment thereof.

b. No additional payment will be made for Quality Control Testing Program. All costs for the QC Program as established in these specifications will be included in the applicable price bid in the schedule.

3.3 MIXING

A. General

1. Mix the concrete ingredients thoroughly in mixers designed to ensure uniform distribution of all the component materials throughout the concrete at the end of the mixing period.

B. Truck Mixers

1. Equip truck mixers with an accurate water meter that has a dial or digital indicator located between the supply tank and mixer. Locate a reliable revolution counter near the water meter that can be readily reset to zero to record the total number of revolutions of the drum for each batch.

2. Equip mixers with an affixed metal plate that indicates drum volume, for both mixing and agitating, and maximum and minimum drum rotation speeds.

3. Continue mixing for not less than 50 revolutions nor more than 100 revolutions of the drum after all the ingredients are in the drum; 5 percent of the water may be withheld. Use a minimum mixing speed of 12 revolutions per minute. After mixing is completed, use the equipment manufacturer's designated agitation speed for additional revolutions. After withheld water is added, mix at the specified mixing speed for a minimum of 30 revolutions. Do not exceed the design water content. After a period of agitation, a few

drum revolutions at mixing speed will be required just before discharging.

4. Discharge concrete within 1-1/2 hours after the introduction of mix water and cementitious materials into the mixer. Include with each concrete batch delivered from commercial ready-mix plants, a written certificate of batch component weights and batching time.

3.4 TEMPERATURE OF CONCRETE

A. The temperature of all concrete will be between 400 F and 900 F when placed.

B. If the Engineer determines that weather conditions would cause excessive concrete temperatures at placement, employ methods to maintain concrete temperatures as specified. No additional compensation will be paid to Contractor for utilization of these methods.

3.5 TOLERANCES FOR CONCRETE CONSTRUCTION

A. General

1. Perform concrete construction within acceptable tolerances. More than one tolerance may be for a particular concrete structure; however, the specified variation for one element of a structure shall not apply if it causes another element of the structure to exceed its tolerance.

2. Tolerances not specified or shown on the Drawings for a particular structure shall be those specified for similar work. Specific tolerances shown on the Drawings in connection with any dimension shall govern.

3. Set and maintain concrete forms within the limits necessary to ensure that completed Work shall be remedied in accordance with Paragraphs 3.09.C and 3.09.D.

B. Variations from Specified Lines. Grades, and Dimensions

1. Variation is defined as the distance between the actual position of the structure, or any element of the structure, and the specified position for the structure or the particular element. Plus or minus variations, shown as +, indicate a permitted actual position up or down and in or out from the specified position. Variations not designated with a plus or minus indicate the maximum difference permitted between designated successive points on the completed element of construction.

Variations for Specified Lines, Grades, and Dimensions

A. Departure from established alignment	1 inch
B. Departure from established alignment	1 inch
C. Variation from the plumb or the specified batter in the lines and surfaces	Exposed, in 10 feet 1/2 inch Backfilled, in 10 feet 1 inch
D. Variation from the level or from the grades indicated on the drawings in slabs, beams, horizontal grooves and railing offsets	Exposed, in 10 feet 1/2 inch Backfilled in 10 feet 1 inch
E. Footings:	
1. Variation of dimensions in plan	Minus 1/2 inch Plus 2 inches when formed or, plus 3 inches when placed against unformed excavation
2. Misplacement or eccentricity	2 percent of the footings width in the direction of misplacement but not more than 2 inches
3. Reduction in thickness	Minus 5 percent of specified thickness
F. Variation in the sizes and locations of slabs	1/2 Inch

C. Tolerances for concrete surface irregularities are as follows:

1. Abrupt Irregularities on Formed and Unformed Surfaces are ½ inch.

2. Gradual Irregularities on Formed and Unformed Surfaces are 1 inch.

3. Specified position is defined as the lines, grades, and dimensions described in these Specifications or shown on the Drawings, or as otherwise prescribed by the Engineer.

4. Hardened concrete structures will be checked by the Engineer and will be subject to inspection and measurement as needed to determine that the structures are within the tolerances specified.

D. Repair of Hardened Concrete not within Specified Tolerances

1. Repair hardened concrete that is not within specified tolerances to bring it within those tolerances in a manner approved by the Engineer. Repair concrete only after consultation with the Engineer regarding the method of repair. Notify the Engineer when the repair will be made.

2. Grind concrete surfaces exposed to view so that no aggregate particles are exposed more than 1/4 inch in cross-section at the finished surface. Where grinding has caused, or will cause, exposure of aggregate particles greater than 1/4 inch in cross-section at the finished surface, excavate concrete and provide new concrete.

E. When concrete placements result in hardened concrete that does not meet specified tolerances, submit to the Engineer upon request an outline of all preventative actions, such as modifications to forms, modified procedure for setting screeds, and different finishing techniques, to be implemented by the Contractor to avoid repeated failures. The Engineer reserves the right to delay concrete placements until the

Contractor implements preventative actions approved by the Engineer. All costs associated with the delay shall be at the expense of the Contractor, to include any schedule impact costs that may result during the implementation of corrective actions.

3.6 PREPARATIONS FOR PLACING

A. General

1. Do not place concrete until all formwork, installation of embedded items, and preparation of placement surfaces have been approved by the Engineer.

2. Ensure that all surfaces of forms and embedded materials are free from curing compound, dried mortar from previous placements, and other foreign substances before the adjacent or surrounding concrete placement is begun.

3. Before beginning concrete placement, supply a sufficient number of properly operating vibrators and operators and additional replacement vibrators, as approved by the Engineer. The Engineer may delay the start of the concrete placement until the number of available working vibrators is acceptable.

B. Foundation Surfaces

1. All surfaces upon or against which concrete is to be placed shall be free from frost, water, mud, debris, oil, objectionable coatings, and loose, semi-detached and unsound fragments regardless of their degree of anchorage.

2. Earth and rock foundations shall be damp when concrete is placed. Nonporous earth subgrades shall be moist to a depth of 1 inch, and free-draining subgrades shall be moist to a depth of 3 inches. Rock will be moist with no standing water present.

3.7 PLACING

A. General

1. Prepare surfaces upon or against which concrete is to be placed as specified or as directed by the Engineer. Take precautions necessary to prevent damage or deterioration of the foundation.

2. Do not retemper concrete. Waste all concrete that has become too stiff for proper placement.

3. Do not place concrete in standing water except with Engineer's written permission. Do not place concrete in running water or subject it to running water until hardened.

4. Deposit concrete as nearly as practical in its final position and in so depositing there shall be no vertical drop greater than 5 feet, except where suitable equipment is provided to prevent segregation and where specifically authorized by the Engineer. Do not allow the concrete to flow in such a manner that the lateral movement will cause segregation of the coarse aggregate from the concrete mass. Employ methods and equipment for depositing concrete in forms that minimize clusters of coarse aggregate. Scatter clusters that occur before the concrete is vibrated.

5. Place all concrete, except concrete placed on unformed slopes, in horizontal layers. The depths of vibrated layers shall not exceed 24 inches. The Engineer may require lesser depths of layers where concrete cannot otherwise be placed and consolidated in accordance with these Specifications. Make all construction joints that intersect exposed concrete surfaces straight and level or plumb except as shown otherwise on the Drawings.

6. When consolidating concrete which is placed over formed openings after the delay period has elapsed and placement resumes, adequately consolidate at the interface of the fresh concrete and the underlying plastic concrete. The vibrator shall repeatedly penetrate and thoroughly reconsolidate the upper portion of the underlyihg concrete which was placed before the delay.

7. Avoid cold joints when placing concrete in any part of the Work. A cold joint is an unplanned joint resulting when a concrete surface hardens before the next batch is placed against it. In the event of equipment breakdown or other unavoidable prolonged interruption of continuous placing, when unconsolidated concrete may harden such that later vibration will not fully consolidate it, immediately consolidate the concrete to a stable and uniform slope. If delay of placement is then short enough to permit penetration of the underlying concrete, resume placement with thorough penetration and revibration of the concrete surface placed before the delay. If concrete cannot be penetrated with a vibrator, treat the cold joint as a construction joint, if the design requirements are such that a construction joint is practicable. If a construction joint will impair the structural integrity, as determined by the Engineer, repair the concrete as determined by the Engineer. Repairs in some instances shall include removal of all or a portion of the previously placed concrete. The Contractor shall not be entitled to any payment for the removal and replacement work required nor the materials utilized.

8. Do not place concrete in rain sufficiently heavy or prolonged to wash mortar from concrete or to result in a cold joint.

B. Transportation of Concrete

1. Use methods and equipment for transporting concrete from the batch plant to its final placement that do not cause measurable segregation of coarse aggregate or slump loss exceeding 2 inches.

2. Use buckets, chutes, conveyors, or concrete pumps to deposit concrete as near as practical to its final position. Do not use aluminum pipe or aluminum chutes to deliver concrete. Use concrete buckets capable of promptly discharging the concrete, and a dumping mechanism capable of consecutively discharging at one location small portions of concrete from a full bucket. Use buckets and conveyors designed for attaching drop chutes or tremies to deposit concrete whenever concrete must be dropped more than 5 feet from the bucket to the placing surface.

3. Use buckets, chutes, hoppers, pumps, transit mix trucks, and other equipment that readily handles and places concrete of the specified slump. Replace inadequate transporting equipment, as determined by the engineer, with acceptable equipment.

C. Consolidation of Concrete

1. Consolidate concrete to remove all undesirable air voids from the concrete, including air voids tapped against the forms and construction joints, to eliminate rock pockets and honeycomb areas, and to force the concrete snugly against all surfaces of forms, construction joints, and embedments. Additional effort may be required to adequately consolidate concrete adjacent to construction joints and sloping surfaces. Such additional effort shall be at the Contractor's expense.

2. Use immersion-type vibrators, in nearly vertical position, to consolidate concrete. The vibrating head shall penetrate and revibrate the concrete in the upper portion of the underlying layer. Avoid contact of the vibrating head with embedded items and with formed surfaces that will later be exposed to view. Do not place concrete upon previously placed concrete that has not been thoroughly consolidated.

3. Operate immersion-type vibrators at speeds of at least 7,000 revolutions per minute when immersed in concrete. Immediately replace improperly operating vibrators with acceptable vibrators.

3.8 JOINTS

A. Construction Joints

1. A construction joint is a planned joint where two placements of concrete meet, across which development and maintenance of bond are required, and through which any reinforcement that may be present is not interrupted. Roughen all construction joints and remove all laitance in preparation for adjoining concrete. Methods of roughening the surface and removing laitance may include mechanical abrasion, bushhammering, sandblasting, acid etching, or high-pressure waterjetting of hardened (not green) concrete; all methods are subject to the approval of the Engineer.

2. Thoroughly clean construction joint surface of loose or defective concrete, coatings, sand, curing compound, and other foreign material.

3. After this initial cleanup and at the last opportunity before placing concrete, thoroughly wash the concrete surface with water or air-water jets, and uniformly surface-dry. Take precautions necessary to preclude damage and/or deterioration of the foundational material when using air-water jets.

4. All construction joints shall require adequate bond. After cleaning, before new concrete is placed, vertical joints shall be thoroughly wetted. Prior to placement of concrete in walls, the bottom construction joint must be slushed with one to two inches of neat cement grout. The neat cement grout shall have a water-cement ratio less than or equal to that of the concrete and a consistency similar to thick paint. The fresh concrete shall be placed before the grout has attained its initial set. The bottom two inches of the forms and bulkheads shall be caulked or otherwise made liquid tight to prevent leakage of the neat cement grout.

5. Install Synko-Flex or equal waterstops in construction joints in water retaining structures installed in accordance with the manufacturer's recommendations.

3.9 FINISHES AND FINISHING

A. Apply floated finish to concrete surfaces that are not permanently concealed by fill material or concrete.

B. Floated finish may be performed by use of hand- or power-driven equipment. Start floating as soon as the screened surface has stiffened sufficiently and perform as long as necessary to produce a surface that is free from screed marks and uniform in texture. Tool edges of entrance slabs and other joints and edges, where shown on the Drawings or as directed by the Engineer.

C. Formed concrete surfaces shall be within the variations for lines, grades, dimensions and tolerances identified in Tables 03300-2 and 03300-3. Repair finished concrete that is not within the specified tolerances in accordance with Paragraph 3.15.

D. Slope exposed surfaces for drainage where shown on the Drawings or as directed. Slope for drainage surfaces that will be exposed to the weather and that would normally be level. Slope narrow surfaces, such as tops of walls and curbs approximately 3/8 inch per foot; slope broader surfaces, such as slabs and decks approximately 1 percent, unless the use of other slopes or level controls is indicated on the Drawings or is directed by the Engineer.

3.10 PROTECTION

A. Protect fresh concrete from rain, hail, sleet, or snow to prevent erosion of the concrete whenever such precipitation, either periodic or sustaining, is imminent or occurring. When precipitation or freezing weather appears imminent, immediately make ready at the placement site all materials that may be required to protect fresh concrete. The Engineer may delay placement of concrete until adequate provisions for protection against weather are made with no additional payment or time extension.

B. Protect fresh concrete surfaces from contamination and foot traffic until the concrete has hardened. Protect hardened concrete surfaces against damage from foot traffic and other construction activity by covering with protective mats, plywood, or by other effective means, as approved by the Engineer.

C. Keep concrete curing membranes intact and maintain other curing materials and processes as necessary to assure continuous curing for the minimum specified curing time. Protect curing membranes and use other curing methods as described.

3.11 CURING

A. General

1. Furnish all materials and perform all work required for curing concrete.

2. Cure exposed vertical surface of the upstream facing elements and the exposed surfaces of the downstream facing elements either by water or by the use of wax-base or water-emulsified, resin-base curing compound. Apply the curing compound with rollers or by spraying, provided that shields are used to protect all surfaces not required to receive curing compound. The curing compound shall be white. Cure other surfaces of the upstream and downstream facing elements by water.

3. Cure all other concrete either by water curing or by using wax-base or water-emulsified, resin-base curing compound, except as otherwise provided below.

4. Treat all concrete surfaces as specified to prevent loss of moisture from the

concrete until the required curing period has elapsed or until immediately before placement of other concrete or backfill against those surfaces. Allow only sufficient time to prepare construction joint surfaces between discontinuance of curing and placement of adjacent concrete.

5. Remove forms within 24 hours after the concrete has hardened sufficiently to prevent structural collapse or other damage. Where required, repair all surface imperfections immediately after form removal and before curing. Complete surface repairs within 2 hours after form removal and immediately start curing by the applicable method specified. Keep concrete surfaces continuously moist after form removal until initiation of curing.

6. Concrete shall be water-cured for a minimum of 14 days from the time the concrete is placed.

7. Apply wax-base or water-emulsified, resin-base compound to designated concrete surfaces to provide a water-retaining film. Reapply the curing compound as necessary to maintain a continuous, water-retaining film .on the surfaces for 14 days.

8. Apply CRC-101 curing compound as approved by the Engineer to designated concrete surfaces to provide a water-retaining film. Reapply the curing compound as necessary to maintain a continuous, water-retaining film on the surfaces for 14 days.

9. Apply curing materials to all exposed concrete surfaces, including; spillways, diversion channel inlet structure and grouted riprap.

3.12 REPAIR OF CONCRETE

A. General

1. Repair concrete in accordance with this paragraph, Paragraph 3.09, and Bureau of Reclamation "Standard Specifications for Repair of Concrete," dated January 4, 1982.

a. Repair minor form surface damage, such as sack rubbing Or surface grinding, within 2 hours after form removal. Complete dry packconcrete replacement less than 10 inches thick, and Portland cementmortar repairs within 7 days of the original concrete placement. Use approved epoxy-resin bonding systems for any repairs on concrete less than 10 inches thick. Perform repairs involving epoxy-resin bonding systems after 7 days and before 60 days from the original placement. Complete replacement of concrete over 10 inches thick and all other repairs within 60 days after the original placement.

END OF SECTION

SECTION 05400

MISCELLANEOUS METAL

PART 1 – GENERAL

1.1 RELATED WORK

A. Section 03300 Cast-in-Place Concrete

B. Section 02714 Drainage and Collection Piping

1.2 SCOPE

A. This Specification covers all labor, materials, equipment, and services necessary to provide the miscellaneous metals as indicated on the drawings.

B. The extent of miscellaneous metal work is shown on the drawings, and includes items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipes, and castings which are not a part of the structural steel or other metal systems in other sections of these Specifications.

C. The types of miscellaneous metal items include, but are not limited to, the following:

1. Miscellaneous steel trim and embedments

2. Anchor, flange, and lid bolts

3. Sump Lids

1.3 REFERENCE STANDARDS

A. Reference to Standard and/or Specifications herein shall be interpreted to mean the latest revisions unless noted otherwise. The following abbreviations may appear in the specification:

1.	AISC	Manual of Steel Construction
2.	AISC	Structural Steel Detailing
3.	ASTM	American Society for Testing Materials
4.	AWS	American Welding Society
5.	FS	Federal Specifications

B. The following Standards shall be made a part of this Specification:

1.	AISC	Manual of Steel Construction
2.	AISC	Structural Steel Detailing
3.	ASTM A6	Standard Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use

4.	ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
5.	ASTM A36	Standard Specification for Structural Steel
6.	ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
7.	ASTM 53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
8.	ASTM A1O8	Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality
9.	ASTM A307	Standard Specification for Carbon Steel, Bolts and Studs, 60,000 psi Tensile Strength
10.	ASTM A366	Standard Specification for Steel, Sheets, Carbon, Cold-Rolled, Commercial Quality
11.	ASTM A501	Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
12.	ASTM A512	Standard Specification for Cold-Drawn Butt Weld Carbon Steel Mechanical Tubing
13.	ASTM A525	Standard Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process
14.	ASTM A526	Standard Specification for Steel Sheet Zinc Coated (Galvanized) by the Hot-Dip Process
15.	ASTM A563	Standard Specification for Carbon and Alloy Steel Nuts
16.	ASTM A568	Standard Specification for Steel Sheet, Carbon and High-Strength, Low Alloy, Hot-Rolled and Cold-Rolled
17.	ASTM A569	Standard Specification for Steel, Carbon (0.15 Max Percent). Hot-Rolled Sheet and Strip Commercial Quality
18.	AWS D1.1	Structural Welding Code Steel
19.	AWS QCI	Standard and Guide for Qualification and Certification of Welding Inspectors

C. Permission for deviation from these standards and/or specifications must be approved in writing by the Engineer in advance.

1.4 SUBMITTALS

A. The Contractor shall submit shop drawings, bolt and anchoring material schedules, and manufacturer's data sheets, to the Engineer for approval, prior to fabrication or installation in accordance with Section xxxx.

PART 2 - PRODUCT

2.1 METAL SURFACES

A. For the fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding or by welding and grinding prior to cleaning, treating, and application of surface finishes, including zinc coatings.

2.2 MISCELLANEOUS STEEL

A. Structural steel shapes, plates, and bars shall conform to ASTM A36.

B. Cold-finished carbon steel bars shall conform to ASTM Al 08.

C. Hot-rolled carbon steel sheet and strip shall conform to ASTM A569.

D. Cold-rolled carbon steel sheets shall conform to ASTM A366.

E. Galvanized carbon steel sheets shall conform to ASTM A526 with zinc coating conforming to ASTM *A525,* G90.

F. Cold-drawn carbon steel tubing shall conform to ASTM AS 12.

G. Carbon steel pipe shall conform to ASTM A53, Grade A, Schedule 40, unless noted otherwise. Pipe shall be black finish unless noted as galvanized.

H. Stainless steel bolts, bars, or batten strips shall conform to ASTM designations A193/193M, A700, A666, G33, and A540/A540M.

2.3 ANCHORS

A. Anchor bolts 3/4-inch and larger shall conform to ASTM A36 threaded bars, with nuts conforming to ASTM A563, Grade A heavy hexagon.

B. Anchor bolts smaller than 3/4 inch shall conform to ASTM A307, Grade A, with hexagon heads, with nuts conforming to ASTM *A563,* Grade A hexagon.

C. Unless otherwise indicated on the drawings, fabrication details for all anchor bolts shall conform to ASTM A307.

D. Threaded-type concrete inserts shall be galvanized ferrous castings, intern ally threaded to receive 3/4" diameter machine bolts; either malleable iron shall conform to ASTM 4M A47, or cast steel complying with ASTM A27.

2.4 BOLT FASTENERS

A. The installation of flanged fittings, batten strips, pipe bands, and miscellaneous metalwork may require the use of stainless steel bolts if encapsulation is not feasible. In such cases, bolts shall be selected within ASTM standards. The use of stainless steel bolts will be determined in the field by the Engineer based on job conditions.

B. Galvanized bolts as specified in paragraph 2.03 may be used in most cases, provided a corrosive environment is not expected, encapsulation can be achieved, or the Engineer's approval is obtained.

2.5 SUMP LIDS

A. Metal sump lids shall be 4.75 feet x *3.5* feet in overall dimensions, or within available standard sizes. Prefabricated sump lids may be used upon Engineer approval of product data cut-sheet. Shop fabricated sump lids may be used upon Engineer approval of shop drawings. The thickness and general configuration shall meet the requirements of the precast concrete utility box as specified on the construction drawings and construction specifications.

2.6 WELDING ELECTRODES

A. Welding electrodes shall be E-7OXX low-hydrogen type.

PART 3 - EXECUTION

3.1 FABRICATION

A. General fabrication shall be in accordance with AISC and AWS requirements. Finished work shall conform to the tolerances set forth in these specifications and shall be sufficiently accurate to permit field erection without reaming and with only a moderate amount of drifting.

B. Fabrication tolerances shall be as specified in AISC Code of Standard Practice, and ASTM A6.

C. All material shall be free of serious deformation, bends, twists or kinks. Straightening of damaged material shall not be permitted except where specifically approved in writing by the Engineer.

D. When shop inspected, at least 2/3 of the number of holes in any group shall admit the bolts at right angles to the plane of the connection; otherwise the piece shall be rejected. When 2/3 or more of the number of holes in the group admit the bolts, the remaining holes shall be corrected as follows:

1. Holes unfair by less than 1/16" shall be reamed to admit the bolt.

2. Holes unfair by more than 1/16" shall be filled with weld metal, ground smooth and drilled to admit the bolt for substation structures only. For other structures, this repair process shall require prior written approval of the Engineer.

3. Slotted holes shall not be permitted unless approved by the Engineer or indicated on the contract drawing.

E. Filler, splice and stiffener plates shall have full surface contact, with all beads, burrs and other deformations removed along the edges and around the holes in the plates.

F. All work points indicated on the contract or detail drawings shall be adhered to in the fabrication.

G. Material wrongly fabricated so that its erection in the field necessitates extra work, shall be the responsibility of the Vendor, and he shall pay for the entire cost of correction of shop errors and for the replacement of wrongly fabricated materials.

H. Anchor bolts furnished under these specifications shall be as listed and detailed on the drawings. Sleeves and anchor plates shall be provided where they are indicated on the drawings. Unless otherwise indicated on the drawings, fabrication details for anchor bolts shall comply with ASTM A307.

I. Anchor bolt assemblies, except for the lower 12 inches or bottom threads, shall be hot-dip galvanized after fabrication, top threads being undercut to provide a tolerance equal to ANSI Class 2A. The lower end of the assembly, including bottom threads, nuts, washers, and plates shall be prime painted after final shop fit up. Each bolt without a sleeve shall be furnished with two nuts and sufficient threads to permit a nut to be installed on each side of the concrete form or template.

J. Embedded materials shall be accurately fabricated and assembled. Warped or bent sections, which do not fit into the concrete forms as required, shall be replaced with suitable material. All materials embedded in concrete shall be galvanized after fabrication except steel framing members, reinforcing steel, base-plates, concrete anchors, and pipe hanger supports.

3.2 WELDING

A. General

1. All welding operations shall be done in accordance with AWS DI .1 requirements without exception. Welding procedures, and welders! welder operators shall be qualified and certified in accordance with AWS DI .1. All records shall be on file and available for review by the Engineer with appropriate reasonable notice.

2. Each weld shall be uniform in width and size throughout its full length. Each layer of welding shall be smooth and free of slag, cracks, pinholes and undercut, and shall be completely fused to the adjacent weld beads and base metal. In addition, the cover pass shall be free of coarse ripples, high crown and deep ridges or valleys between beads.

3. Butt welds shall be slightly convex, of uniform height and have full penetration.

4. Fillet welds shall be of specified size with full throat and the legs of uniform length. All craters are to be filled to develop full throat dimension throughout the length of the weld.

5. Seal welds shall have full contour weld beads, or in the case of corner welds, a full throat and legs.

6. All welds shall be chipped and wire brushed to remove all flux, scale and spatter, prior to galvanizing, metallizing or painting.

7. All exposed welds shall be ground smooth, without reducing weld strength or required cross-section, prior to galvanizing, metallizing or painting.

8. Repair chipping or grinding of welds shall be done in such a manner as not to gouge, groove or reduce the base metal thickness.

9. All unsatisfactory welds shall be removed by chipping, grinding or arc air with grinding clean up methods.

3.3 PROTECTIVE COATINGS

A. All metal members, including connection plates, brackets and hangers, shall be commercially blast cleaned after fabrication in accordance with SSPC-5P6. Cleaned steel shall be galvanized or painted as specified in the contract and/or this specification after fabrication.

B. All exposed metal including, but not limited to. handrails and batten strips shall be primed upon completion and acceptance by the Engineer prior to metal fabrication.

C. Metal bolts, flange rings, and bands may require encapsulation by asphalt mastic or, HDPE liner patches to protect from corrosion. Encapsulation shall be at the Engineer's discretion.

D. The selection and use of galvanized metals shall be in accordance with the ASTM standards and the requirements set forth in the Contract Documents.

3.4 WORKMANSHIP

A. Use materials of the type, size, and thickness shown or if not shown of the required type, size, and thickness to produce adequate strength and durability of the finished product for the intended use. Work to the dimensions of fabrication and support.

B. Form exposed work true to line and level with accurate angles and surfaces and straight, sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

C. Weld corners and seams continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

D. Form exposed connections with hairline joints, which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flat-head (counter-sunk) screws or bolts.

E. Provide for anchorage of type shown, coordinated with supporting structure and the progress schedule. Fabricate as required to provide adequate support for the intended use of the work.

F. Cut, reinforce, drill, and tap miscellaneous metal work as may be required to receive finish hardware and similar items of work.

G. Use hot-rolled steel bars for work fabricated from bar stock, unless work is indicated to be fabricated from cold-rolled or cold-finished stock.

3.5 QUALITY CONTROL

A. Comply with the provisions of the applicable codes and standards.

B. Fabricate and install miscellaneous metal following quality control procedures developed and implemented in accordance with Section 01400.

C. The supplier and installer shall provide visual inspection of all shop welds and shall correct all defective welds in accordance with the referenced AWS code. Personnel performing visual inspection of welds shall be qualified and certified in accordance with AWS QCI.

D. Field measurements shall be taken prior to preparation of shop drawings and fabrication to ensure proper fluting of the work.

E. The Contractor shall furnish inserts and anchoring devices which must be set in concrete masonry for the installation of miscellaneous metal work. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices.

END OF SECTION

APPENDIX D

CONSTRUCTION QUALITY ASSURANCE PLAN

TABLE OF CONTENTS

1.0 INTRODUCTION 1
- 1.1 SCOPE OF THIS DOCUMENT 1
- 1.2 DEFINITION: QUALITY CONTROL VS QUALITY ASSURANCE 1

2.0 PARTIES TO THE WORK 3

3.0 CQA CONSULTANT 6
- 3.1 CQA PROJECT DIRECTOR 6
- 3.2 CQA FIELD MANAGER 7
- 3.3 CQA FIELD MONITORS 8

4.0 MEETINGS AND SITE VISITS 10
- 4.1 PRE-CONSTRUCTION MEETING 10
- 4.2 PROGRESS MEETINGS AND REPORTS 11
- 4.3 SITE VISITS 11
- 4.4 MANUFACTURING PLANT VISIT 12

5.0 GEOSYNTHETIC CLAY LINER (GCL) CONSTRUCTION QUALITY ASSURANCE 13
- 5.1 GCL MANUFACTURING 13
  - *51.1 Manufacturer's Certification* *13*
  - *5.1.2 Rolls* *13*
- 5.2 CONFORMANCE TESTING 14
  - *5.2.1 Sampling Procedures* *14*
  - *5.2.2 Conformance Test Procedures* *14*
  - *5.2.3 Conformance Test Results* *15*
- 5.3 GCL SHIPPING HANDLING, AND STORAGE 15
  - *5.3.1 Shipping* *15*
  - *5.32 Handling* *15*
  - *5.3.3 Storage* *16*
- 5.4 GCL INSTALLATION 16
  - *5.4.1 Deployment* *16*
    - *5.4.1.1 Placement Operations* *16*
    - *5.4.1.2 Weather Conditions* *17*
    - *5.4.1.3 Damage to the Materials* *17*
  - *5.4.2 Joining* *18*
  - *5.4.3 Anchorage* *18*
  - *5.4.4 Repairs* *18*

6.0 GEOMEMBRANE LINER CONSTRUCTION QUALITY 19

ASSURANCE 19
- 6.1 GEOMEMBRANE MANUFACTURING 19
  - *6.1.1 Manufacturer's Certification* *19*
  - *6.1.2 Rolls* *20*
- 6.2 GEOMEMBRANE CONFORMANCE TESTING 20
  - *6.2.1 Sampling Procedures* *20*
  - *6.2.2 Conformance Test Procedures* *20*
  - *6.2.3 Conformance Test Results* *21*

6.3 GEOMEMBRANE SHIPPING, HANDLING, AND STORAGE 21
6.3.1 Shipping 21
6.3.2 Handling 22
6.3.3 Storage 22
6.4 GEOMEMBRANE INSTALLATION 22
6.4.1 Deployment 22
6.4.1.1 Placement Operations 22
6.4.1.2 Weather Conditions 23
6.4.1.3 Damage to the Materials 23
6.4.2 Seaming 23
6.4.3 Construction Testing 25
6.4.3.1 Non-destructive Seam Testing 25
6.4.3.2 Destructive Seam Testing 26
6.4.4 Sampling Procedures 28
6.4.5 Geosynthetics Laboratory Testing 29
6.4.6 Anchorage 29
6.4.7 Repairs 29

7.0 DRAINAGE NET CONSTRUCTION QUALITY ASSURANCE 31
7.1 DRAINAGE NET MANUFACTURING 31
7.1.1 Manufacturers' Certification 31
7.1.2 Drainage Net Rolls 32
7.2 DRAINAGE NET CONFORMANCE TESTING 32
7.2.1 Sampling Procedures 32
7.2.2 Conformance Test Procedures 32
7.2.3 Conformance Test Results 33
7.3 DRAINAGE NET SHIPPING, HANDLING, AND STORAGE 33
7.3.1 Shipping 33
7.3.2 Handling 34
7.3.3 Storage 34
7.4 DRAINAGE NET INSTALLATION 34
7.4.1 Deployment 34
7.4.1.1 Placement Operations 34
7.4.1.2 Weather Conditions 36
7.4.1.3 Damage to the Materials 36
7.4.2 Seaming 36
7.43 Repairs 37

8.0 SOILS CONSTRUCTION QUALITY ASSURANCE 38
8.1 SOIL MATERIALS SELECTION 38
8.1.1 Structural Fill Materials 38
8.1.2 Overliner 38
8.1.3 Gravel 38
8.2 PLACEMENT AND COMPACTION CRITERIA 38
8.2.1 Structural Fill Materials 39
8.2.2 Gravel 39
8.2.3 Liner Subgrade Surface Preparation 39
8.3 SOILS TESTING 39
8.3.1 Laboratory Soils Testing 39
8.3.1.1 Laboratory Conformance and Quality Control Testing 39
8.3.1.2 Laboratory Testing Frequency 40
8.3.2 Field Soils Testing 40

9.0 CQA FINAL REPORT 42

APPENDIX D-1 QUALIFICATIONS OF PARTIES

APPENDIX D-2 PROPERTY & TEST METHOD REFERENCE TABLES

1.0 INTRODUCTION

1.1 SCOPE OF THIS DOCUMENT

This Construction Quality Assurance Plan (CQA Plan) applies to the provision of Construction Quality Assurance (CQA) services for the manufacture and installation of geosynthetics components and the supply, placement and compaction of soils components of systems to construct the evaporation impoundments. In particular, this CQA Plan has been prepared on behalf of Gila Bend Power Partners, L.L.C. the Owner of the Gila Bend Power Project located in Gila Bend, Arizona for specific application to the construction of an evaporation impoundment and lining systems. Industrial Power Technology of Santa Rosa, California has prepared this CQA plan.

This CQA Plan addresses the construction of the geosynthetics. soils components. and mechanical components of the evaporation impoundments. This specifically includes a bottom barrier layer consisting of a Geosynthetic Clay Liner (GCL) and a top Leachate Collection and Recovery System (LCRS) barrier layer consisting of a primary 80-mil HDPE liner, a drainage net, and a secondary 60-mil HDPE liner. Significant care must be applied to the monitoring and documentation of the activities described in this document. This CQA Plan therefore outlines in detail the CQA procedures that are to be provided and shall be considered in conjunction with the project plans and specifications. Any conflict between the requirements of this document and the plans and specifications shall be reported to the Engineer, for clarification or adjudication, as required. In general, however, the requirements of the specifications shall prevail.

1.2 DEFINITION: QUALITY CONTROL VS QUALITY ASSURANCE

There is often considerable confusion between the meanings of quality control and quality assurance. This plan refers to the provision of quality assurance, in this case specifically referring to the CQA of the soils and geosynthetics comprising the evaporation impoundments and LCRS systems. In the context of this document:

- <u>Quality Control</u> refers to those actions taken by the Contractor (including those parties charged with the manufacture, fabrication, and installation of the geosynthetics materials. and the placement and compaction of the soils materials, which provide a means to determine and sometimes quantify the characteristics of the product. The results of a quality control program are compared to the Specifications or other contractual or regulatory requirements. During each aspect of the handling of these materials, quality control shall be provided by the manufacturer, supplier, fabricator, or installer of geosynthetics or by a any agreed combination of the foregoing.

2.0 PARTIES TO THE WORK

The successful completion of the production and installation of the LCRS systems is dependent on the interaction and cooperation of many parties. The following parties are represented in the project.

- Engineer. The Engineer for this project is Industrial Power Technology of Santa Rosa, CA.
- Earthworks Contractor. The Earthworks Contractor is responsible for the mass earthworks necessary for the development of final slopes, and preparation of the liner. Additional site grading associated with the storm water management structures and other site provisions are also included in the Earthworks Contractor's responsibilities.
- Geosynthetics Manufacturer. The Manufacturer(s) of the geosynthetics, including the geomembranes and geotextiles.
- Geosynthetics Installer. The Geosynthetics Installer is responsible for the field handling, storing, placing, and protection of the geosynthetic components of the evaporation impoundments.
- CQA Consultant. The CQA Consultant is responsible for the monitoring and documentation of the activities of the Earthworks Contractor and the Geosynthetics Installer. The CQA Consultant may also monitor and document the quality control practices of the Manufacturer during production of the geomembranes for the project.
- Geosynthetics Laboratory. The Geosynthetics Laboratory is the party, independent of the Geosynthetics Manufacturer or Installer, that is responsible for the laboratory testing program carried out to determine the materials' conformance to the Specifications.
- Soils Laboratory. The Soils Laboratory is a party, independent of the Earthworks Contractor, that is responsible for the laboratory testing program carried out to determine the soil materials' conformance to the Specifications. In addition, quality control testing may be conducted to determine the as-compacted conditions of the soil materials for conformance with the Specifications. The CQA Consultant is responsible for the selection of samples from the site, and shipping them to the Soils Laboratory.
- Owner. The Owner is Gila Bend Power Partners, L.L.C.

- <u>Responsible Regulatory Agencies</u>. The Responsible Regulatory Agency for the design and construction of the evaporation impoundment is Arizona Department of Environmental Quality (ADEQ).

3.0 CQA CONSULTANT

The CQA Consultant is responsible for the provision of construction quality assurance services for the installation of the lining system. The personnel of the CQA Consultant include:

- CQA Project Director. The CQA Project Director shall be a registered professional engineer (P.E.) in the Arizona and is responsible for all of the activities of the CQA Consultant. Duties include reviewing all on-site activities, laboratory test results and directly addressing any deficiencies that are encountered. In addition, the CQA Project Director will make periodic site visits to review the operations and progress.

- CQA Field Manager. The on-site representative of the CQA Consultant, the CQA Field Manager, liaises directly with the designated Gila Bend Power Partners, L.L.C. representative, the Earthworks Contractor. and the Geosynthetics Installer, and supervises all CQA Monitors on site, if any.

- CQA Field Monitors. The CQA Field Monitors assist the CQA Field Manager with the provision of monitoring and documentation of the activities of the Earthworks Contractor and the Geosynthetics Installer. CQA Field Monitors may not be required.

The specific functions and responsibilities of these personnel are presented in the following sections.

3.1 CQA PROJECT DIRECTOR

The CQA Project Director is the professional engineer in direct charge of the CQA program and certifies the work for submittal to the regulatory agency, In particular, the CQA Project Director:

- Reviews the design, plans and specifications for the project.

- Reviews the CQA Plan for the project and ensures that any project specific revisions are incorporated into the Specifications.

- Administers the CQA program including: the supervision of the on-site personnel, daily review of progress with the CQA Field Manager, review of all daily and weekly reports, review and interpretation of all laboratory test data, and engineering review of any aspects of the liner system during installation.

- Attends the pre-construction meeting and other meetings on request.
- Periodically visits the site to review progress and to provide quality control of the CQA program.
- Reviews any changes to the design, Plans, or Specifications necessitated by field conditions, and reports any recommendations to the on-site representative.
- Prepares, with the CQA Field Manager, the final report of the CQA program.

3.2 CQA FIELD MANAGER

The CQA Field Manager is the full-time on-site representative of the CQA Consultant. The CQA Field Manager:

- Performs site visits, as required, to the geomembrane manufacturing facility, if possible during the production of the geomembrane materials to be installed at the site.
- Serves as the on-site representative of the CQA Consultant and supervises all other CQA personnel.
- Reviews the personnel qualifications of the Geosynthetics Installer for conformance to the CQA requirements.
- Reviews the CQA Plan, project Plans, and Specifications for the site, and ensures that all CQA personnel are fully informed of the requirements of the work.
- Assigns the daily responsibilities of all CQA personnel to ensure that all relevant activities of the Earthworks Contractor and the Geosynthetics Installer are monitored and documented.
- Reviews all daily reports by all CQA personnel and prepares his own daily reports and weekly summary reports.
- Attends all site progress meetings as required plus any CQA-specific meetings necessary to review the installation and CQA activities.
- Collects, collates, and reviews the documentation provided by the Geosynthetics Manufacturers and the Geosynthetics Installer relevant to the materials and the installation operations.

- Collects, collates and reviews the documentation provided by the suppliers of the soils materials to be used as components of the LCRS systems.

- Selects sample locations for conformance testing of all soils and soil admixtures in accordance with the frequencies and test requirements specified. forwards these samples to the Soils Laboratory, and reviews all results for conformance and acceptability.

- Selects sample locations for conformance testing of all geosynthetics in accordance with the frequencies and test requirements specified. forwards these samples to the Geosynthetics Laboratory and reviews all results for conformance and acceptability.

- Notes any on-site activities that could result in damage to the system.

- When necessary, designates another of the on-site CQA personnel to act on his behalf whenever he is absent from the site, to ensure continuity during operations.

- Prepares, with the CQA Project Director, the final report of the CQA program.

In addition, the CQA Field Manager regularly reports on both, a verbal basis and through periodic submittal of the daily and weekly CQA reports, to the designated Gila Bend Power Partners L.L.C. representative to ensure that any problems are identified on a timely basis and acted on to minimize any potential negative effects.

3.3 CQA FIELD MONITORS

A sufficient number of CQA Field Monitors shall be assigned to the site to ensure that the activities of the Earthworks Contractor and the Geosynthetics Installer are adequately monitored and documented. Depending on the scope of the work, the CQA Field Manager shall serve in a monitoring role in addition to supervising the other personnel and at any given time, may serve as the only Field Monitor on site. The activities to be monitored and duties to be carried out within the scope of the overall CQA program include:

- Geosynthetics materials logistics, including delivering and unloading, stockpiling, protecting, and on-site transporting prior to deployment.

- Examination of all soils and soil admixtures delivered to the site for use as a component of the LCRS systems and collection of samples for laboratory testing for conformance to the Specifications.

- Monitoring of the deployment of all geomembranes and geotextiles (including monitoring all geosynthetics for damage or flaws, marking any such areas for repair, and monitoring all geotextiles for cleanliness before deployment): and documenting the location, size, time. and date of these activities.
- Monitoring and documenting the seaming and joining of all geomembranes.
- Performing a final walk-over of all completed areas before deployment of the next layer. to ensure that all flaws and/or damage have been identified, repaired, tested, and passed.
- Monitoring and documenting all soils and soil admixtures used in the LCRS systems to ensure that the correct materials are used: specified thicknesses are maintained; and proper compaction, if required, is undertaken to achieve minimum required densities, as determined through *in situ* testing.
- Noting and documenting any on-site activities that could result in damage to the system and reporting to the CQA Field Manager so that corrective action can be expedited.
- Monitoring and documenting the excavation geosynthetics placement, backfilling, and compaction (and testing. if required) of all anchor trenches and berms.

4.0 MEETINGS AND SITE VISITS

Meetings of all parties involved with the installation of the liner systems are required at various times during the program, to establish work schedules, resolve problems, and generally maintain good lines of communication. These are outlined in the following sections.

4.1 PRE-CONSTRUCTION MEETING

The Pre-construction Meeting is held in advance of the start of construction, to introduce all parties and resolve any particular issues prior to the commencement of work and to establish the requirements for construction quality assurance.

The CQA Plan shall be made available to all parties. and the particular requirements for testing and repair of the geosynthetics shall be highlighted.

In addition, the following points shall be discussed:

- The standards for quality control procedures used for the geosynthetics shall be discussed in the context of the CQA Plan and a methodology for review and acceptance agreed between the CQA Consultant and the Geosynthetics Installer.
- The Earthworks Contractor's and the Geosynthetics Installer's schedules.
- Assignment of the responsibilities to each party, and confirmation that the personnel provided shall be sufficient to meet these requirements.
- The timing and distribution of reports shall be confirmed for both work schedules and CQA documentation.
- The lines of authority and communication shall be determined.

Either as part of the Pre-construction Meeting, or separately, additional topics pertinent to the CQA program should be discussed between the CQA Consultant, the Earthworks Contractor and the Geosynthetics Installer, including:

- A site walk-around to determine the status of sub-grade preparation and to review material storage locations on site.

- The methods of deployment for geotextiles and geomembranes.
- Reviewing the repair procedures that will be required for different types of flaws or damage. and the requirements for seaming, testing, monitoring and documentation of all repairs.
- Reviewing the precautions to be taken to protect the sub-grade from deterioration due to placement of the geosynthetics and exposure to weather conditions prior to placement of the cover materials.

This meeting shall be fully documented by the CQA Consultant and minutes circulated to all present plus any other affected parties.

4.2 PROGRESS MEETINGS AND REPORTS

Periodic progress meetings shall be held on a schedule to be determined by the Engineer in order to review the status of the schedule, problems and measures for resolution of problems. These meetings shall be documented, as required, and the decisions reached promulgated to all affected parties.

The CQA Consultant shall prepare daily progress reports documenting the activities of the Earthworks Contractor and the Geosynthetics Installer for each day worked. In addition, the CQA Consultant shall prepare a weekly summary report for the designated Gila Bend Power Partners, L.L.C. representative which outlines progress, problems. and resolutions. Areas of concern and potential future problems shall also be outlined, and addressed at the next planned Progress Meeting, unless of sufficient importance or urgency as to warrant an ad hoc meeting.

4.3 SITE VISITS

The CQA Project Director shall conduct site visits, to ensure that all outstanding issues are resolved on a timely basis and to review personally the progress and methodology of the Installer. The schedule of these site visits will be determined by project demands. In addition, the CQA Project Director will have to make site visits when a problem arises which cannot be easily resolved or which impacts the design of the facility. In that regard, the CQA Project Director should make periodic site visits in the company of the Engineer, in order to review the progress and any aspects of the project that are particularly critical to the performance of the system.

4.4 MANUFACTURING PLANT VISIT

A site visit to the relevant manufacturing plants for the different geosynthetics may be required. These plant visits shall review the quality control procedures applied to the production of the geosynthetics. These visits should be made by the Engineer and the CQA Consultant.

5.0 GEOSYNTHETIC CLAY LINER (GCL) CONSTRUCTION QUALITY ASSURANCE

Fabricated composite materials. consisting of sodium bentonite soils sandwiched between two geotextile carrier and cover layers and fabricated into rolls, are presented in this section. Although a composite of soils and geosynthetics, these materials serve the function of a soil liner.

5.1 GCL MANUFACTURING

51.1 Manufacturer's Certification

The Manufacturer of the GCL shall provide to the designated Gila Bend Power Partners, L.L.C. representative for review by the CQA Consultant, prior to the installation of any of the materials, the following information:

- The origin (producer) and identification (brand name and number) of the bentonite;
- A list of properties and characteristics of the geotextiles used to encapsulate the bentonite;
- Copies of the quality control certificates for the composite showing the results of quality control testing;
- A list of the guaranteed values for the menu of properties indicated on Table 1, contained in Appendix B of this CQA Plan; and
- A notarized certification that the materials delivered to the site have test values for each property listed on Table 1 which meet or exceed the property values guaranteed for that material.

The CQA Consultant shall review this documentation. and confirm that the materials specified correspond to the materials for which the documentation has been prepared. These certifications shall be included in the final report of the CQA program. Any discrepancies shall be reported to the designated Gila Bend Power Partners, L.L.C. representative, with details of the discrepancies and the nature of the materials actually on site.

5.1.2 Rolls

The Manufacturer of the GCL shall provide quality control certificates representing each roll of material to be provided to the project, to the designated Gila Bend Power Partners, L.L.C.

representative. These certificates shall be notarized, and signed by the Manufacturer's Production Manager or Quality Control Manager, and shall provide the sampling procedures and results of quality control testing. to include, at least, bentonite content, mass per unit area, and hydraulic conductivity performed in accordance with the test procedures indicated in Table I.

The CQA Consultant shall verify that these certificates represent all rolls of GCL provided to the project and meet the specifications and the requirements of Table I of this CQA Plan. The CQA Consultant shall include this documentation in the final report of the CQA program.

5.2 CONFORMANCE TESTING

5.2.1 Sampling Procedures

Samples of GCLs for conformance testing shall be sufficiently large as to provide enough material to meet the test requirements. In general, for the standard properties noted in Subsection 5.1.2.2, for all GCLs, approximately 10.0 ft^2 shall be sufficient. Additional material would be required if additional specimens are required to be tested.

The sample should not include material from the outermost wrapping of the roll. The CQA Consultant shall mark the machine direction on the sample using an arrow. If the sample must be cut further for shipping, match lines should be shown on all pieces to illustrate the original configuration of the sample. The CQA Consultant shall forward the samples to the Geosynthetics Laboratory for testing. The exposed edges of the samples shall be taped or otherwise protected to prevent the loss of bentonite.

Unless otherwise specified, samples for standard conformance testing shall be collected at the minimum rate of one per 100,000 ft^2 of GCL supplied.

5.2.2 Conformance Test Procedures

Testing shall be carried out by the Geosynthetics Laboratory to determine the values for the appropriate properties, tested in accordance with the test procedures indicated in Table 1. The standard properties to be conformance tested include:

- mass per unit area:
- grab tensile strength; and

- hydraulic conductivity.

5.2.3 Conformance Test Results

The results of the testing shall be reported to the CQA Consultant. The CQA Consultant shall review the results for conformance with the specifications and the requirements of Table 1. Any non-conforming test results shall be reported to the designated Gila Bend Power Partners, L.L.C. representative, the GCL Manufacturer, and the Geosynthetics Installer. Re-sampling shall be conducted and the tests repeated. Until the results of the repeat testing are available, no geotextiles represented by the sample in question may be deployed. If the second round of tests confirms the non-conformance of the sample, the roll from which the sample was taken shall be rejected. as well as any other rolls that are considered to be represented by that sample. as determined by the CQA Consultant from a review of the GCL Manufacturer's quality control testing and certification. Additional testing of previously unsampled rolls, determined to be represented by the failed sample, may be conducted at the expense of the GCL Manufacturer, to determine the acceptability of those rolls based on the same acceptance criteria.

In certain circumstances, depending on the nature of the failing test, Gila Bend Power Partners, L.L.C. may, on the recommendation of the Engineer and/or CQA Consultant, accept the failed material if the property not meeting the specifications is deemed to not be critical to the performance of the GCL in its particular application, and will not have any adverse consequences with regard to the performance of the LCRS system. The CQA Consultant shall include the results of all conformance testing in the final report of the CQA program.

5.3 GCL SHIPPING HANDLING, AND STORAGE

5.3.1 Shipping

Shipping of the GCL rolls shall be by the GCL Manufacturer or other party as contracted to the GCL Manufacturer. Upon receipt at the site, responsibility for the rolls shall transfer to the Geosynthetics Installer. The shipping of the rolls shall conform to the requirements of the GCL Manufacturer, but in any event shall be carried out in a manner, which shall protect the rolls from damage in transit. A protective cover shall be placed on each roll to protect the geotextile components of the GCL against the adverse effects of ultraviolet radiation, and wetting of the bentonite core.

5.32 Handling

Unloading and handling of the rolls on site shall be the responsibility of the Geosynthetics installer. The Geosynthetics Installer shall ensure that any equipment and operators responsible for the movement of the rolls about the site do so in a manner that will minimize the exposure to damage or deleterious conditions.

5.3.3 Storage

The GCL rolls shall be stored on site in a secure location that will minimize the exposure to dirt or potential damage due to the proximity of working equipment, vandalism, etc. In some cases, rolls can be marshaled at various locations to minimize transit distances and delays during deployment. It is absolutely essential that the GCL rolls are protected from exposure to water or other liquids in any form. Due to the nature of the product and its mechanism of function, any rolls of material that are exposed to precipitation or are otherwise wetted should be set aside for examination by the designated Gila Bend Power Partners, L.L.C. representative, the CQA Consultant and the Geosynthetics Installer to establish the degree of damage. In some cases, the material may be salvaged, but wetting of the materials will complicate or even impede deployment and the normal course of action should be that the material be discarded. Prior to deployment, any rolls of GCLs that become contaminated with foreign materials shall be examined to ensure that the material has not been compromised.

5.4 GCL INSTALLATION

5.4.1 Deployment

5.4.1.1 Placement Operations

During the Pre-construction Meeting, the Geosynthetics Installer shall outline the methods of deployment of the GCL materials to be used. Some constraints will apply in this regard to ensure that the methods employed do not in any way damage the GCLs or the underlying conveyance piping. In this regard, however, the Geosynthetics Installer should be familiar with the deployment recommendations of the Manufacturer of the materials, the special conditions in the specifications and the recommendations of the Engineer. These procedures shall be discussed for acceptability during this meeting, and the agreed procedures documented in the minutes of that meeting.

Prior to the placement of any GCL materials, the Geosynthetics Installer may marshal rolls in various locations so as to facilitate deployment and minimize the transit distance during deployment. Provided that the handling and storage requirements, outlined in Subsection 5.3. above, are satisfied, the CQA Consultant is not required to oversee or document this particular activity. Particular emphasis is however, made for the requirement to keep these rolls dry at all times.

Prior to, during, and subsequent to deployment, the CQA Consultant shall ensure that:

- On slopes, deployment shall be down not across the slope;
- Deployment shall always be from the highest point to the lowest:
- The materials shall only be cut using approved cutters, and care taken to ensure that materials underlying the GCLs are not damaged or disturbed during cutting; and
- The materials shall be kept clean at all times up to and including the time of placement of the geotextile covering the GCL.

The CQA Consultant shall continuously monitor and document the deployment of the GCLs.

5.4.1.2 Weather Conditions

In general, GCL material deployment shall not be carried out during any form of precipitation, in the presence of excessive moisture (e.g.. fog or dew), in an area of ponded water, or during periods of high winds. In addition, as these materials are to be covered by a LCRS system, only as much of the GCL should be deployed in a given shift as can be covered by the geotextile and/or soil cover in that shift, to minimize the exposure of the material to the weather (i.e., to prevent hydration of the bentonite). Alternatively, the Geosynthetics Installer shall place an interim cover layer (such as a geomembrane-type liner) to keep the GCL dry until the LCRS system can be placed. The Geosynthetics Installer shall be responsible for any damage caused to the GCL due to the failure to place the geomembrane above the GCL in a timely fashion, regardless of any interim measures provided.

The CQA Consultant shall ensure that these requirements are adhered to, and that the weather conditions during deployment are properly documented.

5.4.1.3 Damage to the Materials

The CQA Consultant shall record all areas requiring repair due to damage during shipping, handling or deployment, or manufacturing flaws in the materials. The CQA Consultant shall prescribe the method of repair to be used, based on the nature and size of the problem and judgment based on experience. All repairs shall be performed in accordance with the requirements of Subsection 5.4.4 of this CQA Plan. In cases where the material is pervasively damaged and repair is impractical, the material so affected shall be marked accordingly, removed and set aside to avoid reuse. These materials shall be removed from the site, and appropriate credit recorded to Gila Bend Power Partners, L.L.C.

5.4.2 Joining

Panels of the GCL materials shall be joined by simple overlapping. Adjacent panels shall be overlapped between 6 and 9 inches on the sides and 12 inches at roll ends and the overlap shall have granular bentonite placed over the overlapped edge.

The CQA Consultant shall continuously monitor the joining operations for these materials. Upon completion, the CQA Consultant shall visually examine all overlaps and verify that the requirements outlined above have been satisfied.

5.4.3 Anchorage

The edges of the GCL-lined areas, in particular at the top of the steep slope, shall be secured to prevent slippage and preserve the continuity and integrity of the GCL. Perimeter edges of the GCLs shall be anchored in anchor trenches as shown on the project plans.

5.4.4 Repairs

Any damage or flaws to the GCLs shall be repaired by the placement of a patch of GCL over the flaw or damage, extending at least 1 ft. beyond the flaw or damage in every direction, and have granular bentonite placed over the exposed edge. Alternatively, the GCL panel shall be replaced. The CQA Consultant shall monitor and document all repairs.

6.0 GEOMEMBRANE LINER CONSTRUCTION QUALITY ASSURANCE

Material consisting of high density polyethylene (HDPE) resin, fabricated in sheets and delivery to the site on rolls, are presented in this section. These materials serve the function of a barrier layer.

6.1 GEOMEMBRANE MANUFACTURING

6.1.1 Manufacturer's Certification

The Manufacturer of the geomembrane shall provide to the designated Gila Bend Power Partners, L.L.C. representative, for review by the CQA Consultant. prior to the installation of any of the materials. the following information:

- The origin (procedure), identification (brand name and number) and production date of the resin).
- Copies of the quality control certificates for the resin used to produce each geomembrane for the project.
- Copies of the quality control certificates for the geomembrane showing the results of quality control testing.
- A list of the guaranteed values for the menu of properties indicated on Table 1. contained in Appendix B of this CQA Plan.
- A notarized certification that the materials delivered to the site have test values for each property listed on Table 1 which meet or exceed the property values guaranteed for that material.

The CQA Consultant shall review this documentation, and confirm that the materials specified correspond to the materials for which the documentation has been prepared. These certifications shall be included in the final report of the CQA program. Any discrepancies shall be reported to the designated Gila Bend Power Partners, L.L.C. representative, with details of the discrepancies and the nature of the materials actually on site.

6.1.2 Rolls

The Manufacturer of the geomembrane shall provide quality control certificates representing each roll of material to be provided to the project, to the designated Gila Bend Power Partners, L.L.C. representative. These certificates shall be notarized, and signed by the Manufacturer's Production Manager or Quality Control Manager, and shall provide the sampling procedures and results of quality control testing.

The CQA Consultant shall verify that these certificates represent all rolls of geomembrane provided to the project, and meet the Specifications and the requirements of Table 1 of this CQA Plan. The CQA Consultant shall include this documentation in the final report of the CQA program.

6.2 GEOMEMBRANE CONFORMANCE TESTING

6.2.1 Sampling Procedures

Samples of geomembranes for conformance testing shall be sufficiently large as to provide enough material to meet the test requirements. If additional specimens are required to be tested, additional material would be required.

The sample should not include material from the outermost wrapping of the roll. The CQA Consultant shall mark the machine direction on the sample using an arrow. If the sample must be cut further for shipping, match lines should be show-n on all pieces to illustrate the original configuration of the sample. The CQA Consultant shall forward the samples to the Geosynthetics Laboratory for testing.

Unless otherwise specified, samples for standard conformance testing shall be collected at the minimum rate of one per 100,000 ft^2 of geomembrane supplied.

6.2.2 Conformance Test Procedures

Testing shall be carried out by the Geosynthetics Laboratory to determine the values for the appropriate properties tested in accordance with the ASTM test methods indicated in Table 1. The standard properties to be conformance tested include:

- Mass per unit area
- Grab tensile strength

- Thickness
- Carbon black content
- Carbon black dispersion

6.2.3 Conformance Test Results

The results of the testing shall be reported to the CQA Consultant. The CQA Consultant shall review the results for conformance with the Specifications and the requirements of Table 1. any nonconforming test results shall be reported to the designated Gila Bend Power Partners, L.L.C. representative, the geomembrane Manufacturer, and the Geosynthetics Installer. Resampling shall be conducted and the tests repeated. Until the results of the repeat testing are available, no geomembranes represented by the sample in question may be deployed. If the second round of tests confirms the nonconformance of the sample, the roll from which the sample was taken shall be rejected. as well as any other rolls that are considered to be represented by that sample. as determined by the CQA Consultant from a review' of the geomembrane Manufacturer's quality control testing and certification. Additional testing of previously unsampled rolls determined to be represented by the failed sample may be conducted, at the expense of the geomembrane Manufacturer, to determine the acceptability of those rolls based on the same acceptance criteria.

In certain circumstances, depending on the nature of the failing test, Gila Bend Power Partners, L.L.C. may, on the recommendation of the Engineer and/or CQA Consultant, accept the failed material if the property not meeting the Specifications is deemed to not be critical to the performance of the geomembrane in its particular application, and will not have any adverse consequences with regard to the performance of the liner system. The CQA Consultant shall include the results of all conformance testing in the final report of the CQA program.

6.3 GEOMEMBRANE SHIPPING, HANDLING, AND STORAGE

6.3.1 Shipping

Shipping of the geomembrane rolls shall be by the Geomembrane Manufacturer or other party as contracted to the Geomembrane Manufacturer. Upon receipt at the site, responsibility for the rolls shall transfer to the Geosynthetics Installer. The shipping of the rolls shall conform to the requirements of the Geomembrane Manufacturer, but in any event shall be carried out in a manner which shall protect the rolls from damage in transit.

6.3.2 Handling

Unloading and handling of the rolls on site shall be the responsibility of the Geosynthetics Installer. The Geosynthetics Installer shall ensure that any equipment and operators responsible for the movement of the rolls about the site do so in a manner that will minimize the exposure to damage or deleterious conditions.

6.3.3 Storage

The geomembrane rolls shall be stored on site in a secure location that will minimize the exposure to dirt or potential damage due to the proximity of working equipment, vandalism, etc. In some cases, rolls can be marshaled at various locations to minimize transit distances and delays during deployment.

6.4 GEOMEMBRANE INSTALLATION

6.4.1 Deployment

6.4.1.1 Placement Operations

During the Pre-construction Meeting. the Geosynthetics Installer shall outline the methods of deployment of the geomembrane materials to be used. Some constraints will apply in this regard, to ensure that the methods employed do not in any way damage the geomembrane. In this regard, however, the Geosynthetics Installer should be familiar with the deployment recommendations of the Manufacturer of the materials, the special conditions in the Specifications and the recommendations of the Engineer. These procedures shall be discussed for acceptability during this meeting. and the agreed procedures documented in the minutes of that meeting.

Prior to the placement of any geomembrane materials, the Geosynthetics Installer may marshal rolls in various locations so as to facilitate deployment and minimize the transit distance during deployment. Provided that the handling and storage requirements, outlined in Subsection 5.3. above are satisfied, the CQA Consultant is not required to oversee or document this particular activity.

Prior to, during, and subsequent to deployment, the CQA Consultant shall ensure that:

- On slopes, deployment shall be down, not across the slope.

- Deployment shall always be from the highest point to the lowest.
- The materials shall only be cut using approved cutters.
- The materials shall be kept clean at all times.

The CQA Consultant shall continuously monitor and document the deployment of the geomembrane.

6.4.1.2 Weather Conditions

In general, geomembrane material deployment shall not be carried out during heavy precipitation. in an area of ponded water, or during periods of high winds.

The CQA Consultant shall ensure that these requirements are adhered to, and that the weather conditions during deployment are properly documented.

6.4.1.3 Damage to the Materials

The CQA Consultant shall record all areas requiring repair due to damage during shipping, handling. or deployment, or manufacturing flaws in the materials. The CQA Consultant shall prescribe the method of repair to be used, based on the nature and size of the problem, and judgment based on experience. All repairs shall be performed in accordance with the requirements of Subsection 5.4.8 of this CQA Plan. In cases where the material is pervasively damaged and repair is impractical, the material so affected shall be marked accordingly, removed, and set aside so as to avoid reuse. These materials shall be removed from the site, and appropriate credit recorded to Gila Bend Power Partners, L.L.C.

6.4.2 Seaming

The Geosynthetic Installer must provide the Engineer and CQA Consultant with a seam and panel layout drawing and update this drawing daily as the job proceeds. No panels should be seamed until the panel layout drawing has been accepted by the Engineer. The CQA Consultant and Geosynthetics Contractor must agree to a seam numbering system before the start of seaming operations. One procedure is to identify the seam by adjacent panels. For example, the seam located between Panels 306 and 401 would be Seam No. 306-401.

Prior to geomembrane welding, each welder and welding apparatus must be tested, at a minimum, twice a day in accordance with the Specifications to determine if the equipment is functioning properly. The CQA Field Manager must observe all welding operations, quantitatively test each trial weld for peel and seam strength, and record the results. It is very important that the trial weld be completed under conditions similar to those under which the panels will be welded. The trial weld must meet specified requirements for peel and seam strength, as specified in Table 2 of Appendix B. If, at any time, the CQA Field Manager believes that an operator or welding apparatus is not functioning properly, a weld test must be performed. If there are wider changes in temperature (±30°F), humidity, or wind speed, the test weld shall be repeated. The test weld must be allowed to cool to ambient temperature before testing.

During geomembrane welding operations, the CQA Field Manager must verify the following:

- The contractor has the number of welding apparatus and spare parts necessary to perform the work.
- Equipment used for welding will not damage the geomembrane.
- The extrusion welder is purged prior to beginning a weld until all the heat-degraded extrudate is removed (extrusion welding only).
- Seam grinding has been completed less than one hour before seam welding. and the upper sheet is beveled (extrusion welding only).
- The ambient temperature measured 6 inches above the geomembrane surface is between 40° and 110°F.
- The end of old welds, more than 5 minutes old are ground to expose new material before restarting a weld (extrusion welding only).
- The contact surfaces of the sheets are clean, free of dust, grease, dirt, debris, and moisture prior to welding.
- The weld is free of dust, rocks, and other debris.
- For cross seams, the seam is ground to a smooth incline prior to welding (fusion welding only).
- The seams are overlapped a minimum of 3 inches for extrusion and fusion welding, or in accordance with manufacturer's recommendations, whichever is more stringent.

- No solvents or adhesives are present in the seam area.
- The procedure used to temporarily hold the panels together does not damage the panels and does not preclude CQA testing.
- A strip of geomembrane, wide enough and long enough to protect the hot wedge welder from running on the sub-grade is placed below the geomembrane. This piece may be as long as the seam itself or shorter and moved along with the seaming equipment. If necessary, a firm substrate such as a flat board or similar hard surface is placed directly under the weld overlap to achieve firm support.
- The panels are being welded in accordance with the Plans and Specifications.
- There is no free moisture in the weld area.

6.4.3 Construction Testing

6.4.3.1 Non-destructive Seam Testing

The purpose of nondestructive testing is to detect discontinuities or holes in the seam, and it indicates whether a seam is continuous and non-leaking. Nondestructive tests for geomembranes include vacuum testing and air pressure testing. Nondestructive testing must be performed over the entire length of the seam.

Nondestructive testing is performed entirely by the contractor. The CQA Field Manager's responsibility is to observe and document performance of the testing in compliance with the Specifications and document seam defects and their repairs.

Nondestructive testing procedures are described below:

- For welds tested by the vacuum method, the weld is placed under suction utilizing a vacuum box made of rigid housing, with a transparent viewing window, a soft neoprene rubber gasket attached to the open bottom perimeter, a vacuum gauge on the inside, and a valve assembly attached to the vacuum hose connection. The box is placed over a seam section which has been thoroughly saturated with a soapy water solution. The rubber gasket on the bottom perimeter of the box must fit snugly against the soaped seam section of the liner, to ensure a leak-tight seal. The vacuum pump is energized and the vacuum box pressure reduced to approximately 5 psi gauge. Any pinholes, porosity or non-bonded areas are detected by the appearance of soap bubbles in the vicinity of the defect. Dwell time must not be less than 15 seconds.

- Pressure testing is used to test double seams that have an enclosed air space between them. Both ends of the air channel should be sealed. The pressure feed device, usually a needle equipped with a pressure gauge, is inserted into the channel. Air is then pumped into the channel to a minimum pressure of 30 psi. A 2-minute relaxing period is allowed for the pressure to stabilize. The air chamber must sustain the pressure for five minutes without losing more than 2 psi. Following a passed pressure test, the opposite end of the tested seam must be punctured to release the air. The pressure gauge must return to zero; if not, a blockage is most likely present in the seam channel. Locate the blockage and test the seam on both sides of the blockage. The penetration holes must be sealed after testing.

During nondestructive testing, the CQA Field Monitor must perform the following work:

- Review Technical Specifications regarding test procedures.
- Verify that equipment operators are fully trained and qualified to perform their work.
- Verify that test equipment meets project Specifications.
- Verify the entire length of each seam is tested in accordance with the Specifications.
- Observe all continuity testing and record results on the panel/seam log and the panel layout drawing.
- Verify that all testing is completed in accordance with the project Specifications.
- Identify the failed areas by marking the area with a waterproof marker compatible with the geomembrane and inform the contractor of any required repairs, then record the repair area on the panel/seam log.
- Verify that all repairs are completed and tested in accordance with the project Specifications.
- Record all completed and tested repairs on the repair sheet and the panel layout drawing.

6.4.3.2 Destructive Seam Testing

Destructive seam tests will be performed at intervals of at least one test per 500 linear feet for geomembrane seams. However, the CQA Field Monitor must perform additional tests if he or she suspects a seam which does not meet specification requirements. Reasons for performing additional tests may include, but are not limited to:

- Wrinkling in seam area
- Excess crystallinity
- Suspect seaming equipment or techniques
- Weld contamination
- Insufficient overlap
- Adverse weather conditions
- Possibility of moisture, dust, dirt, debris, and other foreign material in the seam
- Failing tests

There are two types of destructive testing required for the geomembrane installation: peel adhesion (peel) and bonded seam strength (shear). The purpose of peel and shear tests is to evaluate seam strength and to evaluate long-term performance. Shear strength measures the continuity of tensile strength through the seam and into the parent material. Peel strength determines weld quality. Test welds must be allowed to cool naturally to ambient temperature prior to testing. Destructive testing must be performed concurrently with seaming operations. not at the completion of the entire installation.

The CQA Field Manager will select locations where seam samples will be cut for laboratory testing. Select these locations as follows:

- A minimum of one test per 500 feet of seam length. This is an average frequency for the entire installation; individual samples may be taken at greater or lesser intervals.
- A maximum' frequency must be agreed to by the geosynthetic contractor, CQA Field Manager, and the Project Manager at the Pre-construction Meeting. However, if the number of failed samples exceeds 2 percent of the tested samples, this frequency may be increased at the discretion of the CQA Field Manager. Samples taken as the result of failed tests do not count toward the total number of required tests.

Do not inform the geosynthetic contractor in advance of selecting the destructive sample locations.

6.4.4 Sampling Procedures

The geosynthetic contractor will remove samples at locations identified by the resident engineer or monitor. The CQA Field Monitor must:

- Observe sample cutting.
- Mark each sample with an identifying number which contains the seam number, destructive test number, welder, date, and time.
- Record the sample location on the panel layout drawing and panel-seam log.
- Record the sample location, weather conditions. and reason sample was taken (e.g.. random sample, visual appearance, result of a previous failure. etc.) on the destructive seam test form.

Two types of samples must be taken at each test location. First, obtain samples per Specifications. The Geosynthetics Installer must test these samples in the field using a tensiometer capable of quantitatively measuring shear and peel strengths. The CQA Field Manager must observe the tests. A geomembrane seam sample passes when the break is a ductile, film tearing bond (FTB). A film tearing bond means the test strip must break at the edge or the outside of the seam, but not in the seam. In addition, the seam strength must meet the values specified in Table 2 of Appendix B.

If one or both of the 1-inch specimens fails, in either peel or shear, the Geosynthetics Installer can, at his discretion: (1) reconstruct the entire seam between passed locations, or (2) take another test sample 10 feet from the point of the failed test and repeat this procedure. If the second test passes., the Geosynthetics Installer can either reconstruct or cap strip the seam between the two passed test locations. If subsequent tests fail, the sampling and testing procedure is repeated, until the length of the poor quality seam is established. Repeated failures indicate that either the seaming equipment, or operator, is not performing properly and appropriate corrective action must be taken immediately.

Once the field test specimens have passed, a sample must be recovered between the passing field specimen locations for laboratory testing. The sample must be 42 inches long by 12 inches wide, with the weld centered along the length. Divide the recovered sample into three parts: one 12-inch by 12-inch section for the contractor, one 12-inch by 18-inch for the third party' laboratory for testing and one 12-inch by 12-inch for the owner to archive. Record the results of laboratory testing on a destructive seam test form, the panel/seam log, and the panel layout drawing.

If the laboratory test fails in either peel or shear, the contractor must either reconstruct the entire seam, or recover additional samples at least 10 feet on either side of the failed sample for retesting. Sample size and disposition must be as described in the preceding paragraph. This process is repeated until passed tests bracket the failed seam section. All seams must be bounded by locations from which passing laboratory tests have been taken. Laboratory testing governs seam acceptance. In no case can field testing of repaired seams be used for final acceptance.

6.4.5 Geosynthetics Laboratory Testing

All CQA destructive samples must be shipped to the Geosynthetics Laboratory to verify seam quality. Testing includes bonded seam strength and peel adhesion. Test at least five specimens from each sample in each method used. Minimum test values are presented in the Specifications. The Geosynthetics Laboratory must provide test results within 24 hours to the CQA Field Manager. Certified test results are to be provided within five days. The CQA Field Manager or monitor must immediately notify the CQA Project Director in the event of a calibration discrepancy or failed test results.

6.4.6 Anchorage

The edges of the geomembrane-lined areas, in particular at the top of the slope, shall be secured to prevent slippage and preserve the continuity and integrity of the geomembrane. Perimeter edges of the geomembrane shall be anchored as shown on the project plans.

6.4.7 Repairs

Any portion of the geomembrane with a flaw, which fails a nondestructive or destructive test, where destructive tests were cut, or where nondestructive tests left cuts or holes must be repaired in accordance with the Specifications. The CQA Field Manager must locate and record all repairs on the repair sheet and panel layout drawing. Repair techniques include the following:

- Patching, used to repair large holes, tears, large panel defects, undispersed raw materials, contamination by foreign matter, and destructive sample locations.
- Extrusion, used to repair small defects in the panels and seams. In general, this procedure should be used for defects less than 1 inch in the largest dimension.

- Capping, used to repair failed welds or to cover seams where welds or bonded sections cannot be nondestructively tested.

- Removal, used to replace areas with large defects where the preceding methods are not appropriate. Also used to remove excess material (wrinkles, fishmouths, intersections, etc.) from the installed geomembrane. Area of removal shall be patched or capped.

Repair procedures include the following:

- Abrade geomembrane surfaces to be repaired (extrusion welds only) no more than one (1) hour prior to the repair.

- Clean and dry all surfaces at the time of repair.

- Verify the acceptance of the repair procedures, materials and techniques by the CQA Field Manager in advance of the specific repair.
- Extend patches or caps at least 6 inches beyond the edge of the defect and around all corners of marterial to be patched and the patches, to a radius of at least 3 inches. Bevel the top edges of patches prior to extrusion welding.

The CQA Consultant shall monitor and document all repairs.

7.0 DRAINAGE NET CONSTRUCTION QUALITY ASSURANCE

7.1 DRAINAGE NET MANUFACTURING

A polyethylene drainage net to be installed between the primary and secondary liner as part of LCRS.

7.1.1 Manufacturers' Certification

The Drainage Net Manufacturer(s) shall provide to the designated Gila Bend Power Partners, L.L.C. representative, for review by the CQA Consultant, and prior to the installation of any of the drainage net materials, the following information:

- The origin (producer), identification (brand name and number), and production date of the resin.
- Copies of the quality control certificates for the resin production for resin used to produce each drainage net for the project.
- Copies of the quality control certificates for each drainage net, showing that the results of quality control testing for the following tests satisfied the Gila Bend Power Partners, L.L.C. Specification: grab strength, trapezoidal tear strength, puncture strength, and thickness.
- A list of the materials comprising each drainage net, expressed as percent by weight.
- A list of the guaranteed values for the menu of properties indicated on Table 2, contained in Appendix B of this CQA Plan, for each drainage net delivered to the site.
- A notarized certification that the drainage net materials delivered to the site have test values for each property listed on Table 2 which meet or exceed the respective property values guaranteed for that material.

The CQA Consultant shall review this documentation. and confirm that the materials specified correspond to the materials for which the documentation has been prepared. These certifications shall be included in the final report of the CQA program. Any discrepancies shall be reported to Gila Bend Power Partners, L.L.C., with details of the discrepancies and the nature of the materials actually on site.

7.1.2 Drainage Net Rolls

The Drainage Net Manufacturer shall provide quality control certificates representing each roll of drainage net to be provided to the project, to the designated Gila Bend Power Partners, L.L.C. representative.

These certificates shall be notarized, and signed by the Drainage Net Manufacturer's Production Manager or Quality Control Manager, and shall provide:

- A listing of the roll numbers provided to the project for each roll of drainage net.
- The sampling procedures and results of quality control testing to include, at least, thickness, mass per unit area, and grab tensile strength performed in accordance with the test procedures indicated in Table 2.

The CQA Consultant shall verify that these certificates represent all rolls of drainage net provided to the project and meet the Specifications and the requirements of Table 2 of this CQA Plan. The CQA Consultant shall include this documentation in the final report of the CQA program.

7.2 DRAINAGE NET CONFORMANCE TESTING

7.2.1 Sampling Procedures

Samples of drainage net for conformance testing shall be per the Specifications. In general, for the standard properties noted in Subsection 6.2.2., approximately 10.0 ft^2 shall be sufficient. If additional specimens are required to be tested, additional material would be required.

The samples should not include material from the outermost wrapping of the roll. The CQA Consultant shall mark the machine direction on the sample using an arrow. If the sample must be cut further for shipping, match lines should be shown on all pieces to illustrate the original configuration of the sample. The CQA Consultant shall forward the samples to the Geosynthetics Laboratory for testing.

Unless otherwise specified, samples for standard conformance testing shall be collected at the minimum rate of one per 100,000 ft^2 of drainage net supplied.

7.2.2 Conformance Test Procedures

Testing shall be carried out by the Geosynthetics Laboratory to determine the values for the appropriate properties tested in accordance with the ASTM test methods indicated in Table 3. The standard properties to be conformance tested include:

- Thickness
- Grab tensile strength
- Puncture strength
- Trapezoidal tear strength

7.2.3 Conformance Test Results

The results of the testing shall be reported to the CQA Consultant. The CQA Consultant shall review the results for conformance with the Specifications and the requirements of Table 3. Any nonconforming test results shall be reported to the designated Gila Bend Power Partners, L.L.C. representative, the Drainage Net Manufacturer(s), and the Geosynthetics Installer. Re-sampling shall be conducted and the tests repeated. Until the results of the repeat testing are available, no drainage net represented by the sample in question may be deployed. If the second round of tests confirms the nonconformance of the sample, the roll from which the sample was taken shall be rejected, as well as any other rolls that are considered to be represented by that sample, as determined by the CQA Consultant from a review of the Drainage Net Manufacturers' quality control testing and certification. Additional testing of previously unsampled rolls determined to be represented by the failed sample may be conducted, at the expense of the Drainage Net Manufacturer, to determine the acceptability of those rolls based on the same acceptance criteria.

In certain circumstances, depending on the nature of the failing test, Gila Bend Power Partners, L.L.C. may, on the recommendation of the Engineer and/or CQA Consultant, accept the failed material if the property not meeting the Specifications is deemed to not be critical to the performance of the drainage net in its particular application, and will not have any adverse consequences with regard to the performance of the drainage net or the liner system. The CQA Consultant shall include the results of all conformance testing in the final report of the CQA program.

7.3 DRAINAGE NET SHIPPING, HANDLING, AND STORAGE

7.3.1 Shipping

Shipping of the drainage net rolls shall be by the Drainage Net Manufacturers or other party as contracted to the Drainage Net Manufacturers. Upon receipt at the site, responsibility for the drainage net rolls shall transfer to the Geosynthetics Installer. The shipping of the drainage net rolls shall conform to the requirements of the Drainage Net Manufacturers, but in any event shall be carried out in a manner which shall protect the rolls from damage in transit.

7.3.2 Handling

Unloading and handling of the drainage net rolls on site shall be the responsibility of the Geosynthetics Installer. The Geosynthetics Installer shall ensure that any equipment and operators responsible for the movement of the drainage net rolls about the site do so in a manner that will minimize the exposure to damage or deleterious conditions.

7.3.3 Storage

The drainage net rolls should be stored on site in a secure location that will minimize the exposure to dirt or potential damage due to the proximity of working equipment, vandalism, etc. In some cases, rolls of drainage net can be marshaled at various locations to minimize transit distances and delays during deployment. In addition, the drainage net rolls shall be protected from exposure to ultraviolet light, precipitation or other wetting, and any dirt, dust, or mud which may be on site. Any protective wrappings provided for the rolls for shipping should be kept in place until the rolls are deployed. In that regard, the integrity and performance of the drainage net is dependent on the protection provided by the protective covers on the drainage net rolls. The CQA Consultant shall examine the rolls of drainage net immediately upon delivery, and from time to time during handling and storage on site. Any missing or damaged protective coverings shall be noted and documented. In the case of missing or damaged protective coverings at the time of delivery to the site, those rolls shall be segregated and examined for signs of damage or degradation due to the exposure to ultraviolet light. These instances shall be reported to the designated Gila Bend Power Partners, L.L.C. representative.

7.4 DRAINAGE NET INSTALLATION

7.4.1 Deployment

7.4.1.1 Placement Operations

During the Pre-construction Meeting, the Geosynthetics Installer shall outline the methods of deployment of the drainage net to be used. Considerable freedom is available to the Geosynthetics

Installer in this regard. These procedures shall be discussed for acceptability during this meeting, and the agreed procedures documented in the minutes of the meeting.

Prior to the placement of any drainage net, the Geosynthetics Installer may marshal rolls in various locations so as to facilitate deployment and minimize the transit distance during deployment.

Provided that the handling and storage requirements outlined in Subsection 6.3. above are satisfied, the CQA Consultant is not required to oversee this particular activity.

Prior to, during, and subsequent to deployment, the CQA Consultant shall ensure that:

- The equipment or procedures used for deployment of rolls or panels is in conformance with the procedures discussed and approved at the Pre-construction Meeting.
- No equipment is allowed to track directly on the drainage net surface.
- Any flaws or damage from the manufacture or transportation of the drainage net are marked for repair.
- Any pervasively flawed or damaged materials shall be set aside for evaluation by the CQA Consultant and Geosynthetics Installer, in order to determine if the problem is recurrent, and to decide whether the rolls of drainage net so affected are repairable.
- Drainage Nets shall be cut using only approved methods.
- Drainage Nets shall be installed clean, with no entrapment or contamination of stones, soil, foreign matter, or even dust that could adversely affect the performance of the drainage net. and care shall be taken to preserve that condition until covered.
- Any personnel working on or around the drainage nets before, during, and after deployment are not smoking, eating. or drinking, wearing hard soled shoes, or undertaking any other activities that could damage the drainage net or compromise site safety in any way.
- Manipulation of the rolls or panels of the drainage net does not entail excessive dragging of the material.
- A CQA Field Monitor observes drainage net materials either during or just after deployment and performs a walkover of the material, marking the flaws and/or damage for future repair, and ensuring that the other requirements for deployment noted above are met.

In addition, the CQA Consultant shall establish a table in the CQA documentation records which correlates the roll number or other identification given by the Geosynthetics Installer or Drainage Net Manufacturers to the location where deployed.

7.4.1.2 Weather Conditions

In general, drainage net deployment should not be carried out during any form of precipitation. in the presence of excessive moisture (e.g., fog or dew). in an area of ponded water. or during periods of high winds.

The CQA Consultant shall ensure that these requirements are adhered to and that the weather conditions during deployment are properly documented.

7.4.1.3 Damage to the Materials

The CQA Consultant shall record all areas requiring repair due to damage during shipping. handling. or deployment, or manufacturing flaws in the materials. The CQA Consultant shall prescribe the method of repair to be used, based on the nature and size of the problem, and judgment based on experience. All repairs shall be performed in accordance with the requirements of Subsection *6.4.3* of this CQA Plan. In cases where the drainage net is pervasively damaged and repair is impractical, the material so affected shall be marked accordingly, removed, and set aside so as to avoid reuse. These materials shall be removed from the site, and appropriate credit recorded to Gila Bend Power Partners, L.L.C.

7.4.2 Seaming

All drainage nets shall be sewn to provide continuous coverage using a sewing procedure and stitch type approved by the Engineer at the Pre-construction Meeting. Prior to seaming the rolls of drainage nets shall be overlapped by a minimum of 6 inches.

All sewing shall be carried out using polymeric thread with chemical resistance and endurance properties equivalent to the drainage net.

The CQA Consultant shall periodically monitor the seaming operations for drainage net. Upon completion, the CQA Consultant shall confirm that all drainage nets have been properly sewn.

7.43 Repairs

Any damage or flaws to the drainage net shall be repaired by the placement of a patch of the same drainage net over the flaw or damage, extending at least 1 foot beyond the flaw or damage in every direction. The patch shall be seamed in the same manner as the production drainage net seams, as outlined in Subsection 6.4.2 of this CQA Plan.

On slopes, if a tear in the drainage net or other flaw or damage extends horizontally more than 10 percent of the roll width, that roll shall be removed from the slope and, if otherwise meeting the Specifications, used in a non-slope location, and repaired as outlined above.

The CQA Consultant shall monitor and document repairs to the drainage net.

8.0 SOILS CONSTRUCTION QUALITY ASSURANCE

The soils components of the liner system and engineered fills associated with the impoundments and slope regrading will consist of a variety of materials, dictated by the availability of locally occurring soils. On-site soils include organic rich sandy silt/silty sand with gravel and sand and rounded gravel/silty sand. The construction quality assurance of these soil materials is presented in the following subsections.

8.1 SOIL MATERIALS SELECTION

The soil materials used in the construction of the liner system will consist of a variety of materials, dictated by the availability of locally occurring soils.

8.1.1 Structural Fill Materials

Structural fill materials to be used for engineered fills shall consist of inorganic soils free of debris and particles greater than 3 inches in size. The soil should be compactable with a moisture content in the range for which the specified compaction is attainable.

Structural fill materials to be used for other than engineered fills may consist of any locally occurring soil with an organic content less than 20 percent.

8.1.2 Overliner

Overliner material, consisting of select onsite soils, shall conform to the gradation requirements and in no case include oversize particles that can damage the liner. Continuous monitoring of overliner material placement is required to provide assurance the soil is dumped and spread uniformly without damaging the liner with heavy equipment.

8.1.3 Gravel

Gravel to be used for collector drains for the LCRS Drainages shall consist of free draining granular materials with less than 5 percent passing the No. 200 sieve.

8.2 PLACEMENT AND COMPACTION CRITERIA

8.2.1 Structural Fill Materials

General engineered fills for the main berm, intermediate berms or other fills supporting structures should be compacted in lifts not exceeding 6 inches in compacted thickness, compacted to at least 95 percent of the Modified Proctor maximum dry density.

Fills for landscaping purposes shall be placed in lifts not exceeding 18 inches thickness, nominally compacted to 90 percent of the Modified Proctor maximum dry density.

8.2.2 Gravel

The gravel shall be placed in a single lift. These soils do not require any particular compactive effort. Care must be taken during placement not to damage the underlying geosynthetics.

8.2.3 Liner Subgrade Surface Preparation

Prior to the placement of the GCL, the sub-grade surface shall be scarified, smooth graded, and lightly compacted, where possible, to seal the surface. All rocks, roots or other objects that could damage the GCL/geomembrane shall be removed.

8.3 SOILS TESTING

8.3.1 Laboratory Soils Testing

Laboratory testing of the soils materials and soil admixtures to be used at the site shall be carried out for the purpose of materials selection prior to construction and for materials quality control and evaluation during construction operations. The CQA Consultant shall be responsible for the collection of samples and shipping of samples to the designated Soils Laboratory.

8.3.1.1 Laboratory Conformance and Quality Control Testing

Conformance testing associated with the selection of suitable materials for use in the capping system will be carried out by the Soils Laboratory and evaluated by Gila Bend Power Partners, L.L.C., the Engineer, and the CQA Consultant in advance of the commencement of construction.

In the process of the evaluation and selection of suitable fiil materials for all purposes in the evaporation impoundment construction, laboratory testing shall be undertaken in accordance with the test procedures indicated:

- Moisture content: ASTM D2216
- Moisture/density relationship (Modified Proctor): ASTM D1557

These tests are carried out under the supervision of the Engineer and/or CQA Consultant prior to construction. In addition, during construction, additional tests are carried out to provide quality control and ensure that the source of the materials does not vary significantly or adversely from one area of the source to another and that the properties that are required in the Specifications are met. The frequency and need for a given test is discussed in Subsection 7.3.1.2, following.

8.3.1.2 Laboratory Testing Frequency

The frequency of testing required during the selection process for soil materials is a function of the quantity of each soil type required. in addition to the existing documentation of the source. In general, however, testing shall be conducted in accordance with the requirements of the project Specifications, but in any event, at a minimum frequency of one test per 20,000 cubic yards of material for each test procedure. The precise menu of tests for a given application shall be as noted below.

Quality control testing conducted during the placement and compaction of the soil materials shall be carried out at frequencies for different soil applications and types as follows:

Test	Overliner Materials	Gravel	Structural Fill Material
Moisture Content	I per 5.000 yd^3	N/A	I per 10.000 cy
Particle Size	I per 5.000 yd^3	per 5.000 yd^3	I per 10.000 cy
Proctor	I per 5.000 yd^3	N/A	I per 50.000 cy

It should be noted that in all cases, at least one test shall be carried out, regardless of the quantity of materials placed and compacted, where relevant. The CQA Consultant shall review all laboratory test results and forward an evaluation of all testing to the designated Gila Bend Power Partners, L.L.C. representative and the Earthworks Contractor.

8.3.2 Field Soils Testing

The CQA Consultant shall be responsible for providing field *in situ* testing of the soils after placement and compaction, to determine their as-compacted properties and confirm conformance with the

Specifications.

Field quality control testing is carried out as a component of the construction quality assurance program by the CQA Consultant. The principal *in* situ testing carried out is the field determination of density and moisture content. This testing is conducted using a nuclear moisture-density gauge in accordance with ASTM D2922 and D3017.

9.0 CQA FINAL REPORT

Upon final closure of the site, the CQA Consultant will prepare the CQA Final Report. This report will be the final record of the Quality Assurance information for the site. In general. the report shall include all submittal items discussed in this CQA Plan. This should include, at a minimum:

- The GCL and geomembrane manufacturer's certification documents.
- The GCL and geomembrane conformance testing results and action taken against any material that was found to be out of specification.
- The HDPE liner panel plan. as constructed, including the location of all sampling locations and any failed welds and their associated repair dimensions.
- Field notes from the installation procedure, including such information as weather and unusual circumstances.
- The results of all destructive testing on the GCL and geomembrane.
- The drainage net manufacturer's certification documents.
- The drainage net conformance testing results and action taken against any material that was found to be out of specification.
- Any field notes created during installation of the drainage net.
- The results of all soils testing, including both in situ testing and laboratory testing.

The report should also provide a narrative description, in general. of the site's construction, noting all unusual occurrences encountered (i.e., failed seams extreme weather. etc.). This report will be provided to the Owner.

APPENDIX D-1

QUALIFICATIONS OF PARTIES

APPENDIX D-1
QUALIFICATIONS OF PARTIES

The following identification and qualifications should be required of all parties.

A.1 ENGINEER

Industrial Power Technology, Santa Rosa, California.

A.2 EARTHWORKS CONTRACTOR

The qualifications of the Earthworks Contractor are specific to the construction contract. and independent of the geosynthetic quality assurance program for the installation.

A.3 GEOSYNTHETICS RESIN SUPPLIERS

The qualifications of the Resin Suppliers are specific to the Manufacturers' requirements. The Resin Suppliers should have a demonstrated history of providing consistent resin properties for use in their particular geosynthetic type.

A.4 GEOSYNTHETICS MANUFACTURERS

The Geosynthetics Manufacturers shall be able to provide sufficient production capacities and qualified personnel to meet the demands of the project. The Geosynthetics Manufacturers shall be pre-qualified and approved by the Engineer and Gila Bend Power Partners, L.L.C.

A.5 GEOSYNTHETICS INSTALLER

The Geosynthetics Installer shall be trained and qualified to install geosynthetic clay liners, HDPE geomembranes and drainage nets. The Geosynthetics Installer shall be specifically approved and/or licensed by the Manufacturers of the geosynthetics to be installed in the system. A copy of the approval letter or license shall be submitted by the Geosynthetics Installer to Gila Bend Power Partners, L.L.C.

A.6 CONSTRUCTION QUALITY ASSURANCE CONSULTANT

To be determined.

A.7 GEOSYNTHETICS LABORATORY

The Geosynthetics Laboratory shall have experience in testing geosynthetics and be familiar with American Society for Testing and Materials (ASTM), Federal Test Method Standards (FTMS), National Sanitation Foundation (NSF), and other applicable test standards. The Geosynthetic Laboratory shall be capable of providing test results within 24 hours of receipt of samples and shall maintain that standard throughout the installation.

A.8 SOILS LABORATORY

The Soils Laboratory shall have experience in testing all types of soils and be familiar with American Society for Testing and Materials (ASTM), Corps of Engineers (COE) and other applicable test standards. The Soils Laboratory shall be capable of providing test results within 2-hours of receipt of samples and shall maintain that standard throughout the installation.

A.9 OWNER

Gila Bend Power Partners, L.L.C.

APPENDIX D-2

PROPERTY & TEST METHOD REFERENCE TABLES

FOR GEOSYNTHETIC MATERIALS

TABLE 1

HIGH DENSITY POLYETHYLENE GEOMEMBRANE PROPERTIES AND TEST METHODS

Property	Standard	Units	Minimum Specified Values	Test Method
Average Thickness	Minimum Average	Mils	60	ASTM D751
Minimum Thickness	Minimum		54	ASTM D751
Density	Minimum	g/cm^3	0.94	ASTM D1505 or ASTM D792
Resin Melt Index	Maximum Range	g/l0 min.	0.1 - 1.1	ASTM D1238 Cond. 190/2.16
Tensile Properties	Each Direction			
Yield Strength	Minimum	lb/in	132	ASTM D638
Break Strength	Minimum	lb/in	228	ASTM D638
Elongation at Yield	Minimum	%	10	ASTM D638
Elongation at Break	Minimum	%	600	ASTM D638
Tear Strength	Minimum	lb	42	ASTM D4533
Puncture Resistance	Minimum	lb	108	ASTM D4833
Low Temperature	Minimum	°C	-60	ASTM D746
Carbon Black Content	Maximum Range	%	2.0 – 3.0	ASTM D1603
Carbon Black Dispersion	---	---	A-l or A-2	ASTM D3015
Dimensional Stability	Maximum Change	%	2.0	ASTM D1204
Environmental Stress Crack	Minimum	Hours	2,000	ASTM D1693

Notes:

1. Yield strength is based on a yield stress of 2,200 psi.
2. Break strength is based on a break stress of 3,800 psi.
3. Tear strength is based on a tear unit strength of 700 lb/in.
4. Puncture resistance is based on a unit puncture resistance of 1,800 lb/in.

TABLE 2

HIGH DENSITY POLYETHYLENE GEOMEMBRANE

SEAM STRENGTH PROPERTIES

Property	Standard	Units	Minimum Specified Values	Test Method
Average Thickness	Minimum Average	Mils	60	ASTM D75 I
Bonded Seam Strength	Minimum	lb/in	132	ASTM D4437
Peel Adhesion				
Fusion	Minimum	lb/in	90	ASTM D4437
Extrusion	Minimum	lb/in	78	ASTM D4437

Notes:

1. Seam strength is based on a yield stress of 2.200 psi,
2. Peel adhesion is based on a yield stress of 1,500 psi for fusion seams and 1.300 psi for extrusion seams.

TABLE 3

GEOTEXTILE

PROPERTIES AND TEST METHODS

Property	Standard	Units	Minimum Specified Values	Test Method
Mass Per Unit Area	Minimum	oz/yd^{-2}	10	ASTM D5261
Grab Strength	Minimum	lb	225	ASTM D1682
Puncture Strength	Minimum	lb	125	ASTM D3787
Bursting Strength	Minimum	psi	400	ASTM D3786
Trapezoid Tear	Minimum	lb	90	ASTM D4533
Permittivity	Minimum	sec^{-1}	0.8	ASTM D4491

TABLE 4

GEOSYNTHETIC CLAY LINER

PROPERTIES AND TEST METHODS

Property	Standard	Units	Minimum Specified Values	Test Method
BENTONITE	Minimum			
Mass Per Unit Area	Minimum	lb/ft^2	1.0	---
Montmorillonite content	Maximum	%	90	---
Moisture Content	Typical	%	10	ASTM D4643
GCL				
Mass Per Unit Area	Minimum	lb/ft^2	1.1	ASTM D3776
Thickness	Minimum	In.	0.2	ASTM D1777
Grab Tensile (Machine Direction)	Minimum	lb.	120	ASTM D4632
Puncture Resistance	Minimum	lb.	150	ASTM D4833
Water Permeability	Maximum	cm/sec	$1.0 - 10^{-9}$	ASTM D5084

Note:

1. Only one of the sandwich geotextiles serves the function of reinforcement of the composite material. Hence, only properties specific to that fabric are presented.

APPENDIX E

COST ESTIMATE ASSUMPTIONS

LIST OF ASSUMPTIONS
CONCEPTUAL CONSTRUCTION COST ESTIMATE
EVAPORATION IMPOUNDMENTS
GILA BEND POWER PROJECT

1. The top 12 inches of agricultural soil is stripped, stockpiled, and hauled offsite due to its potential for high root and other organic content. Stripping is required primarily where the liner system is being installed to remove organic and other similar deleterious materials. The stripped top soil will be stockpiled to the site north of the plant site. The top soil will require environmental sampling and testing to assess any potential contamination due to historical agricultural uses, such as pesticides. No direct haul for re-use is assumed.

2. Clear and grubbing is required in non-agricultural areas to remove weeds and desert vegetation. Organic debris is hauled off to a landfill.

3. The existing concrete irrigation ditches will be demolished and hauled off to a landfill.

4. The drainage channels and impoundment cells will be an approximately balanced cut/fill excavation, yielding an insignificant excess of material. Portions of any excess may be used for the following:

    - Minor fill and landscaping.
    - Plant site pad fill.
    - Excess soil will be stockpiled onsite to the west of the plant site for future use.

5. Scraper equipment will likely conduct mass excavation for evaporation pond, or impoundment construction.

6. The interior and exterior berms of the impoundment cells are to be removed and re-compacted as structural fill and not left as in situ material to ensure appropriate moisture content and compaction density for berm stability.

7. For purposes of structural fill, low permeability soil liner, and overliner materials, it has been assumed, until further geotechnical investigation can be performed, that onsite soils can be used without formal screening operation.

8. It has been assumed that clay is available onsite for use as low permeability soil liner, although there is no geotechnical borrow investigation that supports that a clay deposit exists onsite.

9. Only moisture conditioning has been assumed, no formal screening to remove oversize material is required.

10. The low permeability soil liner and geomembrane liners require comprehensive conformance testing and full-time monitoring to fulfill the CQA program. The costs are estimated to reflect a level of effort associated with this type of work.

11. A 6 feet high chain link fence with three-strand barbed wire is required around the perimeter of the facility. The fence consists of industrial gauge wire fabric and heavy-duty posts.

12. The placement and spreading of overliner material on top of the HDPE liner is to be

conducted using lightly loaded rubber tired or tracked vehicles. The likelihood of HDPE damage is low as inherent with similar projects of this type. The HDPE should be protected at all times from traffic from construction equipment to ensure its integrity of membrane and seams. A small size track dozer is assumed to spread the overliner material from temporary thickened roads built for the haul truck access.

13. Structural fill involving hand labor and equipment to place and compact to backfill the liner anchor trenches is required.

14. The unit price for geosynthetic, polyethylene manufactured products are market sensitive to the petroleum industry, which of late has increased in raw material prices. Therefore the unit pricing for such line items as HDPE piping, PE collection piping, HDPE liner, and PE geonet.

15. A unit price for geocomposite clay liner (GCL) has been included as an alternate to low permeability soil liner, in the event clay deposits do not exist at this site or the unit cost to process is more expensive.

16. The coarse gravel layer in the impoundment cells are included to provide drivability during salt removal. The gravel allows the rubber tire loader and highway trucks to drive into each cell and load salt. The unit price provides for crushed, angular coarse rock to be used. This rock is generally more expense than rounded river run, but will provide a more stable base for which to drive on.

17. Landscaping gravel has been included to cover the outside slope and top of perimeter berms around the evaporation pond to prevent erosion, mitigate dust.

18. A gravel blend base (AB material or similar) is required to provide durable, low maintenance access roads to and around the evaporation ponds. The gravel will allow drivability to the valves and LCRS sumps. Periodic inspections of the outside of perimeter berms will likely be required. The access road could also be used for security patrols.

19. Staff level gages are required to monitor the accumulation levels in the pond.

APPENDIX B

LABORATORY ANALYTICAL REPORTS

ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES COLLECTED FROM WELLS IN TOWNSHIP 5 SOUTH, RANGE 5 WEST, SECTION 20 (JUNE, 2000)

HARGIS + ASSOCIATES, INC.
HYDROGEOLOGY • ENGINEERING

1400 East Southern Avenue, Suite 620
Tempe, AZ 85282-5679
Phone: 480.345.0888
Fax: 480.730.0508

October 23, 2000

VIA REGULAR MAIL

Ms. Stacie Alter
MALCOLM-PIRNIE
One South Church Avenue
Suite 540
Tucson, AZ 95701-1643

Re: Water Quality Results for Paloma Ranch Wells

Dear Ms. Alter:

Enclosed please find water quality results for groundwater samples collected from production wells located at Paloma Ranch, Gila Bend, Arizona. The legal descriptions of each of the two wells were used for the water quality sample identifiers. Please call if you have questions.

Sincerely,

HARGIS + ASSOCIATES, INC.

Jeffrey C Yentes for

Micheal R. Long, RG
Principal Hydrogeologist, Director Arizona Operations

MRL/JCY:clt

Enclosure

clt886-I0100

File ? 88660

Del Mar Analytical

2852 Alton Ave., Irvine, CA 92606 (949) 261-1022 FAX (949) 261-1228
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9830 South 51st St., Suite B-120, Phoenix, AZ 85044 (480) 785-0043 FAX (480) 785-0851

Hargis & Associates, Inc. - Tempe
1400 E. Southern Ave., Ste. 620
Tempe, AZ 85282
Attention: Michael Long

Client Project ID: GBPP 886
Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00
Issued: 06/30/00

CASE NARRATIVE

LABORATORY NUMBER	SAMPLE DESCRIPTION	SAMPLE MATRIX
PJF0386-01	C(5-5) 20DCC	Water
PJF0386-02	C(5-5) 20DCC	Water
PJF0386-03	C(5-5) 20CBB	Water
PJF0386-04	C(5-5) 20CBB	Water

MPLE RECEIPT: Samples were received intact, on ice, and with chain of custody documentation.

)LDING TIMES: Holding times were met.

ESERVATION: Samples requiring preservation were verified prior to sample analysis.

./QC CRITERIA: All analyses met method criteria.

;SERVATIONS: No significant observations were made.

BCONTRACTED: No analyses were subcontracted to an outside laboratory.

.L MAR ANALYTICAL, PHOENIX (AZ0426)

H Price
eth Price
roject Manager

Del Mar Analytical

2852 Alton Ave., Irvine, CA 92606 (949) 261-1022 FAX (949) 261-1228
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Hargis & Associates, Inc. - Tempe
1400 E. Southern Ave., Ste. 620
Tempe, AZ 85282
Attention: Michael Long

Client Project ID: GBPP 886
Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

TOTAL RECOVERABLE METALS

nalyte	Method	Batch	Reporting Limit mg/l	Sample Result mg/l	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
ample ID: PJF0386-01 (C(5-5) 20DCC - Water)								
ntimony	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
rsenic	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
arium	EPA 200.7	P0F2206	0.010	ND	1	6/22/00	6/23/00	
eryllium	EPA 200.7	P0F2206	0.0040	ND	1	6/22/00	6/23/00	
admium	EPA 200.7	P0F2206	0.0050	ND	1	6/22/00	6/23/00	
alcium	EPA 200.7	P0F2206	2.0	**41**	1	6/22/00	6/23/00	
hromium	EPA 200.7	P0F2206	0.010	ND	1	6/22/00	6/23/00	
opper	EPA 200.7	P0F2206	0.020	ND	1	6/22/00	6/23/00	
ead	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
agnesium	EPA 200.7	P0F2206	0.50	**2.5**	1	6/22/00	6/23/00	
ercury	EPA 245.1	P0F2203	0.00020	ND	1	6/22/00	6/22/00	
ickel	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
otassium	EPA 258.1	P0F2206	1.0	**6.6**	1	6/22/00	6/23/00	
ium	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
	EPA 200.7	P0F2206	2.5	**31**	1	6/22/00	6/23/00	
ilver	EPA 200.7	P0F2206	0.0050	ND	1	6/22/00	6/23/00	
odium	EPA 273.1	P0F2206	5.0	**360**	1	6/22/00	6/23/00	
hallium	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
inc	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
ample ID: PJF0386-03 (C(5-5) 20CBB - Water)								
ntimony	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
rsenic	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
arium	EPA 200.7	P0F2206	0.010	**0.022**	1	6/22/00	6/23/00	
eryllium	EPA 200.7	P0F2206	0.0040	ND	1	6/22/00	6/23/00	
admium	EPA 200.7	P0F2206	0.0050	ND	1	6/22/00	6/23/00	
alcium	EPA 200.7	P0F2206	2.0	**57**	1	6/22/00	6/23/00	
hromium	EPA 200.7	P0F2206	0.010	ND	1	6/22/00	6/23/00	
opper	EPA 200.7	P0F2206	0.020	ND	1	6/22/00	6/23/00	
ead	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
agnesium	EPA 200.7	P0F2206	0.50	**3.8**	1	6/22/00	6/23/00	
ercury	EPA 245.1	P0F2808	0.00020	ND	1	6/28/00	6/28/00	
ickel	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
otassium	EPA 258.1	P0F2206	1.0	**7.9**	1	6/22/00	6/23/00	
elenium	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
ilica	EPA 200.7	P0F2206	2.5	**32**	1	6/22/00	6/23/00	
ilver	EPA 200.7	P0F2206	0.0050	ND	1	6/22/00	6/23/00	
odium	EPA 273.1	P0F2206	5.0	**410**	1	6/22/00	6/23/00	
hallium	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
inc	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	

DEL MAR ANALYTICAL, PHOENIX (AZ0426)

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Hargis & Associates, Inc. - Tempe
1400 E. Southern Ave., Ste. 620
Tempe, AZ 85282
Attention: Michael Long

Client Project ID: GBPP 886
Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

DISSOLVED METALS

Analyte	Method	Batch	Reporting Limit mg/l	Sample Result mg/l	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: PJF0386-02 (C(5-5) 20DCC - Water)								
Antimony, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Arsenic, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Barium, Dissolved	EPA 200.7	P0F2206	0.010	**0.70**	1	6/22/00	6/23/00	
Beryllium, Dissolved	EPA 200.7	P0F2206	0.0040	ND	1	6/22/00	6/23/00	
Cadmium, Dissolved	EPA 200.7	P0F2206	0.0050	ND	1	6/22/00	6/23/00	
Calcium, Dissolved	EPA 200.7	P0F2206	2.0	**43**	1	6/22/00	6/23/00	
Chromium, Dissolved	EPA 200.7	P0F2206	0.010	ND	1	6/22/00	6/23/00	
Copper, Dissolved	EPA 200.7	P0F2206	0.020	ND	1	6/22/00	6/23/00	
Lead, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Magnesium, Dissolved	EPA 200.7	P0F2206	0.50	**2.7**	1	6/22/00	6/23/00	
Mercury, Dissolved	EPA 245.1	P0F2808	0.00020	ND	1	6/28/00	6/28/00	
Nickel, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Potassium, Dissolved	EPA 258.1	P0F2206	1.0	**7.2**	1	6/22/00	6/23/00	
[illegible]ium, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
[illegible], Dissolved	EPA 200.7	P0F2206	2.5	**32**	1	6/22/00	6/23/00	
Silver, Dissolved	EPA 200.7	P0F2206	0.0050	ND	1	6/22/00	6/23/00	
Sodium, Dissolved	EPA 273.1	P0F2206	5.0	**370**	1	6/22/00	6/23/00	
Thallium, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Zinc, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Sample ID: PJF0386-04 (C(5-5) 20CBB - Water)								
Antimony, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Arsenic, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Barium, Dissolved	EPA 200.7	P0F2206	0.010	**0.035**	1	6/22/00	6/23/00	
Beryllium, Dissolved	EPA 200.7	P0F2206	0.0040	ND	1	6/22/00	6/23/00	
Cadmium, Dissolved	EPA 200.7	P0F2206	0.0050	ND	1	6/22/00	6/23/00	
Calcium, Dissolved	EPA 200.7	P0F2206	2.0	**57**	1	6/22/00	6/23/00	
Chromium, Dissolved	EPA 200.7	P0F2206	0.010	ND	1	6/22/00	6/23/00	
Copper, Dissolved	EPA 200.7	P0F2206	0.020	ND	1	6/22/00	6/23/00	
Lead, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Magnesium, Dissolved	EPA 200.7	P0F2206	0.50	**4.0**	1	6/22/00	6/23/00	
Mercury, Dissolved	EPA 245.1	P0F2808	0.00020	ND	1	6/28/00	6/28/00	
Nickel, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Potassium, Dissolved	EPA 258.1	P0F2206	1.0	**7.9**	1	6/22/00	6/23/00	
Selenium, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Silica, Dissolved	EPA 200.7	P0F2206	2.5	**34**	1	6/22/00	6/23/00	
Silver, Dissolved	EPA 200.7	P0F2206	0.0050	ND	1	6/22/00	6/23/00	
Sodium, Dissolved	EPA 273.1	P0F2206	5.0	**410**	1	6/22/00	6/23/00	
Thallium, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	
Zinc, Dissolved	EPA 200.7	P0F2206	0.050	ND	1	6/22/00	6/23/00	

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Hargis & Associates, Inc. - Tempe
1400 E. Southern Ave., Ste. 620
Tempe, AZ 85282
Attention: Michael Long

Client Project ID: GBPP 886
Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

INORGANICS

ɩnalyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			mg/l	mg/l				
ample ID: PJF0386-01 (C(5-5) 20DCC - Water)								
ɩlkalinity as CaCO3	SM2320B	P0F2727	5.0	**59**	1	6/27/00	6/28/00	
:hloride	EPA 300.0	P0F2314	50	**510**	100	6/22/00	6/22/00	
'luoride	EPA 300.0	P0F2314	1.0	**4.1**	10	6/22/00	6/22/00	
;itrate-N	EPA 300.0	P0F2314	0.10	**2.0**	1	6/22/00	6/22/00	
;itrite-N	EPA 300.0	P0F2314	0.10	ND	1	6/22/00	6/22/00	
			pH Units	pH Units				
ample ID: PJF0386-01 (C(5-5) 20DCC - Water)								
H	EPA 150.1	P0F2128	NA	**8.02**	1	6/21/00	6/21/00	HT-I
			umhos/cm	umhos/cm				
ample ID: PJF0386-01 (C(5-5) 20DCC - Water)								
pecific Conductance	SM2510B	P0F2307	2.0	**2100**	1	6/23/00	6/23/00	
			mg/l	mg/l				
ample ID: PJF0386-01 (C(5-5) 20DCC - Water)								
ulfate	EPA 300.0	P0F2314	5.0	**130**	10	6/22/00	6/22/00	
			°C	°C				
ample ID: PJF0386-01 (C(5-5) 20DCC - Water)								
emperature	EPA 170.1	P0F2129	NA	**18**	1	6/21/00	6/21/00	HT-I
			mg/l	mg/l				
ample ID: PJF0386-01 (C(5-5) 20DCC - Water)								
otal Dissolved Solids	SM2540C	P0F2329	20	**1100**	1	6/23/00	6/23/00	
ample ID: PJF0386-03 (C(5-5) 20CBB - Water)								
ɩlkalinity as CaCO3	SM2320B	P0F2727	5.0	**53**	1	6/27/00	6/28/00	
:hloride	EPA 300.0	P0F2314	50	**610**	100	6/22/00	6/22/00	
luoride	EPA 300.0	P0F2314	1.0	**4.3**	10	6/22/00	6/22/00	
:itrate-N	EPA 300.0	P0F2314	0.10	**2.1**	1	6/22/00	6/22/00	
'itrite-N	EPA 300.0	P0F2314	0.10	ND	1	6/22/00	6/22/00	

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Hargis & Associates, Inc. - Tempe
1400 E. Southern Ave., Ste. 620
Tempe, AZ 85282
Attention: Michael Long

Client Project ID: GBPP 886

Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

INORGANICS

›nalyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
			pH Units	pH Units				
›ample ID: PJF0386-03 (C(5-5) 20CBB - Water)								
›H	EPA 150.1	P0F2128	NA	**7.99**	1	6/21/00	6/21/00	HT-I
			umhos/cm	umhos/cm				
›ample ID: PJF0386-03 (C(5-5) 20CBB - Water)								
›pecific Conductance	SM2510B	P0F2307	2.0	**2400**	1	6/23/00	6/23/00	
			mg/l	mg/l				
›ample ID: PJF0386-03 (C(5-5) 20CBB - Water)								
›ulfate	EPA 300.0	P0F2314	5.0	**160**	10	6/22/00	6/22/00	
			°C	°C				
›ample ID: PJF0386-03 (C(5-5) 20CBB - Water)								
˜emperature	EPA 170.1	P0F2129	NA	**18**	1	6/21/00	6/21/00	HT-I
			mg/l	mg/l				
ample ID: PJF0386-03 (C(5-5) 20CBB - Water)								
˜otal Dissolved Solids	SM2540C	P0F2329	20	**1300**	1	6/23/00	6/23/00	

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Hargis & Associates, Inc. - Tempe
1400 E. Southern Ave., Ste. 620
Tempe, AZ 85282
Attention: Michael Long

Client Project ID: GBPP 886

Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

METHOD BLANK/QC DATA

TOTAL RECOVERABLE METALS

ıalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
tch: P0F2203 Extracted: 06/22/00										
nk Analyzed: 06/22/00 (P0F2203-BLK1)										
⁻cury	ND	0.00020	mg/l							
S Analyzed: 06/22/00 (P0F2203-BS1)										
⁻cury	**0.00541**	0.00020	mg/l	0.00500		108	85-115			
trix Spike Analyzed: 06/22/00 (P0F2203-MS1)					**Source: PJF0330-02**					
⁻cury	**0.00292**	0.00020	mg/l	0.00500	ND	58.4	85-115			M
trix Spike Dup Analyzed: 06/22/00 (P0F2203-MSD1)					**Source: PJF0330-02**					
⁻cury	**0.00294**	0.00020	mg/l	0.00500	ND	58.8	85-115	0.683	20	M
P0F2206 Extracted: 06/22/00										
nk Analyzed: 06/23/00 (P0F2206-BLK1)										
imony	ND	0.050	mg/l							
ːnic	ND	0.050	mg/l							
ium	ND	0.010	mg/l							
·llium	ND	0.0040	mg/l							
mium	ND	0.0050	mg/l							
ːium	ND	2.0	mg/l							
omium	ND	0.010	mg/l							
per	ND	0.020	mg/l							
d	ND	0.050	mg/l							
ːnesium	ND	0.50	mg/l							
‹el	ND	0.050	mg/l							
ıssium	ND	1.0	mg/l							
nium	ND	0.050	mg/l							
ːa	ND	2.5	mg/l							
er	ND	0.0050	mg/l							
ium	ND	5.0	mg/l							
llium	ND	0.050	mg/l							
	ND	0.050	mg/l							

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METHOD BLANK/QC DATA

TOTAL RECOVERABLE METALS

nalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
ıtch: P0F2206 Extracted: 06/22/00										
:S Analyzed: 06/23/00 (P0F2206-BS1)										
ıtimony	**1.10**	0.050	mg/l	1.00		110	85-115			
senic	**1.15**	0.050	mg/l	1.00		115	85-115			
rium	**1.06**	0.010	mg/l	1.00		106	85-115			
ryllium	**1.11**	0.0040	mg/l	1.00		111	85-115			
dmium	**1.12**	0.0050	mg/l	1.00		112	85-115			
lcium	**11.1**	2.0	mg/l	10.0		111	85-115			
r- -ium	**1.06**	0.010	mg/l	1.00		106	85-115			
	1.02	0.020	mg/l	1.00		102	85-115			
d	**1.09**	0.050	mg/l	1.00		109	85-115			
ıgnesium	**10.8**	0.50	mg/l	10.0		108	85-115			
:kel	**1.06**	0.050	mg/l	1.00		106	85-115			
tassium	**11.5**	1.0	mg/l	10.0		115	85-115			
enium	**1.14**	0.050	mg/l	1.00		114	85-115			
ica	**22.0**	2.5	mg/l	21.4		103	85-115			
ver	**0.0540**	0.0050	mg/l	0.0500		108	85-115			
lium	**54.4**	5.0	mg/l	50.0		109	85-115			
allium	**1.07**	0.050	mg/l	1.00		107	85-115			
ıc	**1.08**	0.050	mg/l	1.00		108	85-115			
ıtrix Spike Analyzed: 06/23/00 (P0F2206-MS1)					**Source: PJF0330-02**					
timony	**1.23**	0.050	mg/l	1.00	ND	120	70-130			
senic	**1.35**	0.050	mg/l	1.00	0.070	128	70-130			
rium	**1.10**	0.010	mg/l	1.00	0.041	106	70-130			
ryllium	**1.19**	0.0040	mg/l	1.00	ND	119	70-130			
dmium	**1.15**	0.0050	mg/l	1.00	ND	115	70-130			
lcium	**136**	2.0	mg/l	10.0	130	60.0	70-130			M-HA
romium	**1.07**	0.010	mg/l	1.00	0.011	106	70-130			
pper	**1.15**	0.020	mg/l	1.00	ND	114	70-130			
ıd	**1.11**	0.050	mg/l	1.00	ND	111	70-130			
gnesium	**67.5**	0.50	mg/l	10.0	60	75.0	70-130			
kel	**1.18**	0.050	mg/l	1.00	0.10	108	70-130			
ı	**13.7**	1.0	mg/l	10.0	ND	130	85-115			M

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Attention: Michael Long

Client Project ID: GBPP 886

Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

METHOD BLANK/QC DATA

TOTAL RECOVERABLE METALS

nalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
atch: P0F2206 Extracted: 06/22/00										
atrix Spike Analyzed: 06/23/00 (P0F2206-MS1)					**Source: PJF0330-02**					
lenium	**1.26**	0.050	mg/l	1.00	ND	126	70-130			
ica	**89.7**	2.5	mg/l	21.4	66	111	70-130			
ver	**0.0586**	0.0050	mg/l	0.0500	ND	117	70-130			
dium	**2630**	50	mg/l	50.0	2600	60.0	85-115			M
allium	**1.03**	0.050	mg/l	1.00	ND	103	70-130			
nc	**1.17**	0.050	mg/l	1.00	ND	117	70-130			
atrix Spike Dup Analyzed: 06/23/00 (P0F2206-MSD1)					**Source: PJF0330-02**					
y	**1.21**	0.050	mg/l	1.00	ND	118	70-130	1.64	20	
senic	**1.28**	0.050	mg/l	1.00	0.070	121	70-130	5.32	20	
rium	**1.10**	0.010	mg/l	1.00	0.041	106	70-130	0	20	
ryllium	**1.18**	0.0040	mg/l	1.00	ND	118	70-130	0.844	20	
dmium	**1.14**	0.0050	mg/l	1.00	ND	114	70-130	0.873	20	
lcium	**135**	2.0	mg/l	10.0	130	50.0	70-130	0.738	20	M-HA
romium	**1.04**	0.010	mg/l	1.00	0.011	103	70-130	2.84	20	
pper	**1.18**	0.020	mg/l	1.00	ND	117	70-130	2.58	20	
ad	**1.07**	0.050	mg/l	1.00	ND	107	70-130	3.67	20	
agnesium	**66.9**	0.50	mg/l	10.0	60	69.0	70-130	0.893	20	M
ckel	**1.17**	0.050	mg/l	1.00	0.10	107	70-130	0.851	20	
tassium	**13.7**	1.0	mg/l	10.0	ND	130	85-115	0	20	M
lenium	**1.22**	0.050	mg/l	1.00	ND	122	70-130	3.23	20	
ica	**88.8**	2.5	mg/l	21.4	66	107	70-130	1.01	20	
ver	**0.0586**	0.0050	mg/l	0.0500	ND	117	70-130	0	20	
dium	**2630**	50	mg/l	50.0	2600	60.0	85-115	0	20	M
allium	**1.05**	0.050	mg/l	1.00	ND	105	70-130	1.92	20	
nc	**1.18**	0.050	mg/l	1.00	ND	118	70-130	0.851	20	

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Hargis & Associates, Inc. - Tempe
1400 E. Southern Ave., Ste. 620
Tempe, AZ 85282
Attention: Michael Long

Client Project ID: GBPP 886
Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

METHOD BLANK/QC DATA

TOTAL RECOVERABLE METALS

nalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
ıtch: P0F2808 Extracted: 06/28/00										
ank Analyzed: 06/28/00 (P0F2808-BLK1)										
·rcury	ND	0.00020	mg/l							
:S Analyzed: 06/28/00 (P0F2808-BS1)										
rcury	**0.00549**	0.00020	mg/l	0.00500		110	85-115			
ıtrix Spike Analyzed: 06/28/00 (P0F2808-MS1)					**Source: PJF0194-01**					
·rcury	**0.00554**	0.00020	mg/l	0.00500	ND	111	85-115			
ıtrix Spike Dup Analyzed: 06/28/00 (P0F2808-MSD1)					**Source: PJF0194-01**					
·rcury	**0.00547**	0.00020	mg/l	0.00500	ND	109	85-115	1.27	20	

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METHOD BLANK/QC DATA

DISSOLVED METALS

ıalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
tch: P0F2206 Extracted: 06/22/00										
ınk Analyzed: 06/23/00 (P0F2206-BLK1)										
:imony, Dissolved	ND	0.050	mg/l							
enic, Dissolved	ND	0.050	mg/l							
ium, Dissolved	ND	0.010	mg/l							
yllium, Dissolved	ND	0.0040	mg/l							
lmium, Dissolved	ND	0.0050	mg/l							
cium, Dissolved	ND	2.0	mg/l							
o[illegible]m, Dissolved	ND	0.010	mg/l							
issolved	ND	0.020	mg/l							
d, Dissolved	ND	0.050	mg/l							
gnesium, Dissolved	ND	0.50	mg/l							
kel, Dissolved	ND	0.050	mg/l							
assium, Dissolved	ND	1.0	mg/l							
:nium, Dissolved	ND	0.050	mg/l							
ca, Dissolved	ND	2.5	mg/l							
'er, Dissolved	ND	0.0050	mg/l							
ium, Dissolved	ND	5.0	mg/l							
llium, Dissolved	ND	0.050	mg/l							
:, Dissolved	ND	0.050	mg/l							
'S Analyzed: 06/23/00 (P0F2206-BS1)										
:imony, Dissolved	1.10	0.050	mg/l	1.00		110	85-115			
:enic, Dissolved	1.15	0.050	mg/l	1.00		115	85-115			
ium, Dissolved	1.06	0.010	mg/l	1.00		106	85-115			
yllium, Dissolved	1.11	0.0040	mg/l	1.00		111	85-115			
lmium, Dissolved	1.12	0.0050	mg/l	1.00		112	85-115			
cium, Dissolved	11.1	2.0	mg/l	10.0		111	85-115			
'omium, Dissolved	1.06	0.010	mg/l	1.00		106	85-115			
›per, Dissolved	1.02	0.020	mg/l	1.00		102	85-115			
.d, Dissolved	1.09	0.050	mg/l	1.00		109	85-115			
gnesium, Dissolved	10.8	0.50	mg/l	10.0		108	85-115			
k[illegible] Dissolved	1.06	0.050	mg/l	1.00		106	85-115			

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Attention: Michael Long

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Received: 06/21/00

METHOD BLANK/QC DATA

DISSOLVED METALS

nalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
ıtch: P0F2206 Extracted: 06/22/00										
CS Analyzed: 06/23/00 (P0F2206-BS1)										
tassium, Dissolved	11.5	1.0	mg/l	10.0		115	85-115			
enium, Dissolved	1.14	0.050	mg/l	1.00		114	85-115			
ica, Dissolved	22.0	2.5	mg/l	21.4		103	85-115			
ver, Dissolved	0.0540	0.0050	mg/l	0.0500		108	85-115			
dium, Dissolved	54.4	5.0	mg/l	50.0		109	85-115			
allium, Dissolved	1.07	0.050	mg/l	1.00		107	85-115			
ır Dissolved	1.08	0.050	mg/l	1.00		108	85-115			
Spike Analyzed: 06/23/00 (P0F2206-MS1)					**Source: PJF0330-02**					
timony, Dissolved	1.23	0.050	mg/l	1.00	ND	120	70-130			
senic, Dissolved	1.35	0.050	mg/l	1.00	0.070	128	70-130			
rium, Dissolved	1.10	0.010	mg/l	1.00	0.041	106	70-130			
ryllium, Dissolved	1.19	0.0040	mg/l	1.00	ND	119	70-130			
dmium, Dissolved	1.15	0.0050	mg/l	1.00	ND	115	70-130			
lcium, Dissolved	136	2.0	mg/l	10.0	130	60.0	70-130			M-HA
romium, Dissolved	1.07	0.010	mg/l	1.00	0.011	106	70-130			
pper, Dissolved	1.15	0.020	mg/l	1.00	ND	114	70-130			
ad, Dissolved	1.11	0.050	mg/l	1.00	ND	111	70-130			
gnesium, Dissolved	67.5	0.50	mg/l	10.0	60	75.0	70-130			
kel, Dissolved	1.18	0.050	mg/l	1.00	0.10	108	70-130			
assium, Dissolved	13.7	1.0	mg/l	10.0	ND	130	85-115			M
enium, Dissolved	1.26	0.050	mg/l	1.00	ND	126	70-130			
ca, Dissolved	89.7	2.5	mg/l	21.4	66	111	70-130			
ver, Dissolved	0.0586	0.0050	mg/l	0.0500	ND	117	70-130			
lium, Dissolved	2630	50	mg/l	50.0	2600	60.0	85-115			M
allium, Dissolved	1.03	0.050	mg/l	1.00	ND	103	70-130			
ıc, Dissolved	1.17	0.050	mg/l	1.00	ND	117	70-130			

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Client Project ID: GBPP 886
Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

METHOD BLANK/QC DATA

DISSOLVED METALS

ınalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
ꞏatch: P0F2206 Extracted: 06/22/00										
1atrix Spike Dup Analyzed: 06/23/00 (P0F2206-MSD1)					**Source: PJF0330-02**					
ntimony, Dissolved	**1.21**	0.050	mg/l	1.00	ND	118	70-130	1.64	20	
rsenic, Dissolved	**1.28**	0.050	mg/l	1.00	0.070	121	70-130	5.32	20	
arium, Dissolved	**1.10**	0.010	mg/l	1.00	0.041	106	70-130	0	20	
eryllium, Dissolved	**1.18**	0.0040	mg/l	1.00	ND	118	70-130	0.844	20	
admium, Dissolved	**1.14**	0.0050	mg/l	1.00	ND	114	70-130	0.873	20	
alcium, Dissolved	**135**	2.0	mg/l	10.0	130	50.0	70-130	0.738	20	M-HA
hr~mium, Dissolved	**1.04**	0.010	mg/l	1.00	0.011	103	70-130	2.84	20	
Dissolved	**1.18**	0.020	mg/l	1.00	ND	117	70-130	2.58	20	
ad, Dissolved	**1.07**	0.050	mg/l	1.00	ND	107	70-130	3.67	20	
iagnesium, Dissolved	**66.9**	0.50	mg/l	10.0	60	69.0	70-130	0.893	20	M
ickel, Dissolved	**1.17**	0.050	mg/l	1.00	0.10	107	70-130	0.851	20	
otassium, Dissolved	**13.7**	1.0	mg/l	10.0	ND	130	85-115	0	20	M
elenium, Dissolved	**1.22**	0.050	mg/l	1.00	ND	122	70-130	3.23	20	
lica, Dissolved	**88.8**	2.5	mg/l	21.4	66	107	70-130	1.01	20	
lver, Dissolved	**0.0586**	0.0050	mg/l	0.0500	ND	117	70-130	0	20	
odium, Dissolved	**2630**	50	mg/l	50.0	2600	60.0	85-115	0	20	M
hallium, Dissolved	**1.05**	0.050	mg/l	1.00	ND	105	70-130	1.92	20	
inc, Dissolved	**1.18**	0.050	mg/l	1.00	ND	118	70-130	0.851	20	
atch: P0F2808 Extracted: 06/28/00										
lank Analyzed: 06/28/00 (P0F2808-BLK1)										
ercury, Dissolved	ND	0.00020	mg/l							
CS Analyzed: 06/28/00 (P0F2808-BS1)										
ercury, Dissolved	**0.00549**	0.00020	mg/l	0.00500		110	85-115			

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1400 E. Southern Ave., Ste. 620
Tempe, AZ 85282
Attention: Michael Long

Client Project ID: GBPP 886
Report Number: PJF0386

Sampled: 06/21/00
Received: 06/21/00

METHOD BLANK/QC DATA

DISSOLVED METALS

nalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
tch: P0F2808 Extracted: 06/28/00										
trix Spike Analyzed: 06/28/00 (P0F2808-MS1)					**Source: PJF0194-01**					
rcury, Dissolved	0.00554	0.00020	mg/l	0.00500	ND	111	85-115			
trix Spike Dup Analyzed: 06/28/00 (P0F2808-MSD1)					**Source: PJF0194-01**					
rcury, Dissolved	0.00547	0.00020	mg/l	0.00500	ND	109	85-115	1.27	20	

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METHOD BLANK/QC DATA

INORGANICS

nalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
ıtch: P0F2128 Extracted: 06/21/00										
ıplicate Analyzed: 06/21/00 (P0F2128-DUP1)					**Source: PJF0383-01**					
	7.68	NA	pH Units		7.58			1.31	10	
ıplicate Analyzed: 06/21/00 (P0F2128-DUP2)					**Source: PJF0393-01**					
	7.67	NA	pH Units		7.66			0.130	10	
ıplicate Analyzed: 06/21/00 (P0F2128-DUP3)					**Source: PJF0402-01**					
	7.21	NA	pH Units		7.21			0	10	
ference Analyzed: 06/21/00 (P0F2128-SRM1)										
	6.95	NA	pH Units	7.00		99.3	95-105			
ce Analyzed: 06/21/00 (P0F2128-SRM2)										
	7.00	NA	pH Units	7.00		100	95-105			
ference Analyzed: 06/21/00 (P0F2128-SRM3)										
	6.97	NA	pH Units	7.00		99.6	95-105			
ıtch: P0F2307 Extracted: 06/23/00										
ıplicate Analyzed: 06/23/00 (P0F2307-DUP1)					**Source: PJF0386-01**					
ecific Conductance	2120	2.0	umhos/cm		2100			0.948	10	
ıplicate Analyzed: 06/23/00 (P0F2307-DUP2)					**Source: PJF0395-01**					
ecific Conductance	1030	2.0	umhos/cm		1000			2.96	10	
ference Analyzed: 06/23/00 (P0F2307-SRM1)										
ecific Conductance	1430	2.0	umhos/cm	1410		101	90-110			

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roject Manager

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METHOD BLANK/QC DATA

INORGANICS

nalyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
tch: P0F2307 Extracted: 06/23/00										
ference Analyzed: 06/23/00 (P0F2307-SRM2)										
cific Conductance	**1480**	2.0	umhos/cm	1410		105	90-110			
tch: P0F2314 Extracted: 06/22/00										
ank Analyzed: 06/22/00 (P0F2314-BLK1)										
loride	ND	0.50	mg/l							
oride	ND	0.10	mg/l							
rate-N	ND	0.10	mg/l							
	ND	0.10	mg/l							
	ND	0.50	mg/l							
S Analyzed: 06/22/00 (P0F2314-BS1)										
loride	**1.91**	0.50	mg/l	2.00		95.5	90-110			
oride	**1.02**	0.10	mg/l	1.00		102	90-110			
rate-N	**0.924**	0.10	mg/l	0.903		102	90-110			
rite-N	**0.295**	0.10	mg/l	0.304		97.0	90-110			
fate	**3.79**	0.50	mg/l	4.00		94.7	90-110			
atrix Spike Analyzed: 06/22/00 (P0F2314-MS1)					**Source: PJF0330-02**					
loride	**1880**	500	mg/l	2000	2300	-21.0	80-120			M-HA
oride	**974**	100	mg/l	1000	ND	96.5	80-120			
rate-N	**911**	100	mg/l	903	ND	89.9	80-120			
rite-N	**311**	100	mg/l	304	ND	102	80-120			
fate	**3630**	500	mg/l	4000	2100	38.3	80-120			M-HA
atrix Spike Dup Analyzed: 06/22/00 (P0F2314-MSD1)					**Source: PJF0330-02**					
loride	**1810**	500	mg/l	2000	2300	-24.5	80-120	3.79	20	M-HA
oride	**962**	100	mg/l	1000	ND	95.3	80-120	1.24	20	
rate-N	**885**	100	mg/l	903	ND	87.0	80-120	2.90	20	
rite-N	**288**	100	mg/l	304	ND	94.7	80-120	7.68	20	
fate	**3610**	500	mg/l	4000	2100	37.8	80-120	0.552	20	M-HA

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METHOD BLANK/QC DATA

INORGANICS

alyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
:ch: P0F2329 Extracted: 06/23/00										
nk Analyzed: 06/23/00 (P0F2329-BLK1)										
:l Dissolved Solids	ND	20	mg/l							
S Analyzed: 06/23/00 (P0F2329-BS1)										
ıl Dissolved Solids	402	20	mg/l	405		99.3	80-115			
›licate Analyzed: 06/23/00 (P0F2329-DUP1)					**Source: PJF0418-01**					
ıl Dissolved Solids	1310	20	mg/l		1300			0.766	10	
›licate Analyzed: 06/23/00 (P0F2329-DUP2)					**Source: PJF0389-01**					
ıl Dissolved Solids	1140	20	mg/l		1200			5.13	10	
.'0F2727 Extracted: 06/27/00										
›licate Analyzed: 06/28/00 (P0F2727-DUP1)					**Source: PJF0418-01**					
ılinity as CaCO3	300	5.0	mg/l		300			0	20	
›licate Analyzed: 06/28/00 (P0F2727-DUP2)					**Source: PJF0390-01**					
ılinity as CaCO3	89.0	5.0	mg/l		90			1.12	20	
›licate Analyzed: 06/28/00 (P0F2727-DUP3)					**Source: PJF0447-04**					
ılinity as CaCO3	113	5.0	mg/l		110			2.69	20	
erence Analyzed: 06/28/00 (P0F2727-SRM1)										
ılinity as CaCO3	204	5.0	mg/l	203		100	89.162-11 1			

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METHOD BLANK/QC DATA

DATA QUALIFIERS AND DEFINITIONS

HT-I	The holding time for this test is immediate. The laboratory measurement, therefore, cannot be used for compliance.
M	The MS and/or MSD were outside of the acceptance limits due to sample matrix interference. See LCS.
M-HA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information See LCS.
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not reported.
RPD	Relative Percent Difference

Beth Price
Project Manager

HARGIS + ASSOCIATES, INC. CHAIN OF CUSTODY RECORD / ANALYSIS REQUEST FORM

DATE 06/20/00 PAGE 1 OF 1

PROJECT NAME: GBPP

PROJECT No./TASK No.: 886

PROJECT MANAGER / QA MANAGER: M.R. Long

Phone No. (480) 345-0888

FAX No. (480) 730-0508

SAMPLER (SIGNATURE):

SAMPLER (PRINTED): MICHAEL F. WIESE

LABORATORY INFORMATION: Delmar PHX

Normal TAT

LAB ID	SAMPLE ID	Sample Collection Date	Sample Collection Time	Soil	Ground-water	Surface water	HCl	HNO3	NaOH	H2SO4	Ice	Sample Containers: 1l Poly	Sample Containers: 500ml Poly	Analyses Requested: Common Ions & Nitrate	Analyses Requested: Dissolved Metals	Analyses Requested: Total Metals	Estimated Concentration Range (ppb) for VOAs	Special Handling: Field Filtered	Remarks
NSF0386-01	C(5-5)20CG	06/20/00	1339		X						X	1		X					W77-11
-02	↓	↓	↓		X			X			X		1		X			X	↓
-01	↓	↓	↓		X			X			X		1			X			↓
-03	C(5-5)20CBB	↓	1410		X						X	1		X					W70-9
-04	↓	↓	↓		X			X			X		1		X			X	↓
-03	↓	↓	↓		X			X			X		1			X			↓

See Attached Analyte List

Total number of Containers per analysis: 2 | 4

Total No. of Containers: 6

Relinquished by:	Date	Received by:	Date
[signature]	06/20/00	[signature] 6-21-00	
Company: H+A	Time: 1616	Company:	Time:

Relinquished by	Date	Received by:	Date
[signature]		Jaime Wood	6/21/00
Company:	Time:	Laboratory: DMAP	Time: 1616

INSTRUCTIONS

1. Fill out form completely except for shaded areas (lab use only); sign only after verified for completeness.
2. Complete in ballpoint pen. Draw one line through errors, initial and date correction.
3. Indicate number of sample containers in analysis request space; indicate choice with √ or x.
4. Note applicable preservatives, special instructions, and deviations from typical environmental samples.
5. Consult project QA documents for specific instructions.

Sample Receipt:

- [x] No. of containers correct
- [x] received good condition/cold
- [ ] custody seals secure
- [ ] conforms to COC document

Shipment Method: HAND Delivered

Send Results to: M. R. Long

- [ ] 2223 AVENIDA DE LA PLAYA, SUITE 300 LA JOLLA, CA 92037 (858) 454-0165
- [x] 1400 EAST SOUTHERN AVENUE, SUITE 620 TEMPE, AZ 85282 (480) 345-0888
- [ ] 1820 EAST RIVER ROAD, SUITE 100 TUCSON, AZ 85718 (520) 881-7300

Send invoice to La Jolla, CA
Attn: Accounts Payable

APPENDIX C

MANUFACTURER LINER SPECIFICATIONS

POLY-FLEX POLYETHYLENE GEOMEMBRANES

POLY-FLEX LINER SPECIFICATIONS

INHERENT PROPERTIES OF POLYETHYLENE LINERS

The properties listed in the table below are primarily inherent in the resin type used to produce the liner or are directly proportional to the thickness of the liner and less dependent on the manufacturing method. Therefore, these properties will not change from roll to roll or even lot to lot. Hence, they should not be included as part of routine quality control testing. The exception to this is Oxidative Induction Time. This test is a measurement of the amount of anti-oxidant added to the resin to produce the finished sheet. This test can function both as a performance test and a quality control test. As a quality control test it is desirable to run the test at high temperatures to keep the test duration short. This test is routinely run at the time of manufacture. As a performance test it is desirable to run the test at lower temperatures. Testing at lower temperatures cannot be done for quality control purposes.

The information given below is based on nominal values. Individual test results may vary from these values depending upon the reproducibility of the test.

NOMINAL PROPERTIES

TEST DESCRIPTION	TEST METHOD	UNITS	HDPE	LLDPE
Modulus of Elasticity	ASTM D 638	lb/ in²	110,000	45,000
Secant Modulus	ASTM D 5323	lb/ in²	60,000	45,000
Volatile Loss	ASTM D 1203	%	0.1	0.1
Dimensional Stability	ASTM D 1204	%	+/- 0.5	+/- 1.0
Water Absorption (24 hr @ 23°C)	ASTM D 570	% change	0.1	0.1
Coefficient of LInear (Thermal Expansion)	ASTM D 696	(cm/cm • °c)	1.2×10^{-4}	1.4×10^{-4}
Moisture Vapor Transmission Rate (100°C and 100% relative humidity)	ASTM E 96	g/m²· day 100 mil	0.17	--
		80 mil	0.20	0.25
		60 mil	0.26	0.33
		40 mil	0.39	0.45
		30 mil	0.50	0.57
Low Temperature Brittleness	ASTM D 746	°F	< -112	< -112
Oxidative Induction Time	ASTM D 3895	minutes @ 200°C	100	100
		minutes @ 150°C	2000	2000
Multi-Axial Tension	ASTM D 5617	stress, psi	2200	1500
		strain, lb/ in²	18	40+
Melt Index	ASTM D 1238	g/10 minutes	0.20	0.20

POLY-FLEX
POLYETHYLENE GEOMEMBRANES

SMOOTH HDPE GEOMEMBRANE
ENGLISH UNITS

Property	Test Method	Minimum Average Values 30 Mil	40 Mil	60 Mil	80 Mil	100 Mil
Thickness, mils	ASTM D 5199					
minimum average		30	40	60	80	100
lowest individual reading		27	36	54	72	90
Sheet Density, g/cc	ASTM D 1505/D 792	0.940	0.940	0.940	0.940	0.940
Tensile Properties [1]	ASTM D 638 (Type IV Specimen @ 2 in/ min)					
1. Yield Strength, lb/ in		63	84	126	168	210
2. Break Strength, lb/ in		114	152	228	304	380
3. Yield Elongation, %		12	12	12	12	12
4. Break Elongation, %		700	700	700	700	700
Tear Resistance, lbs	ASTM D 1004	21	28	42	144	180
Puncture Resistance, lbs	ASTM D 4833	54	72	108	144	180
Stress Crack Resistance [2], hrs	ASTM D 5397 (App.)	200	200	200	200	200
Carbon Black Content [3], %	ASTM D 1603	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion [4]	ASTM D 5596	Cat.1 or 2	Cat.1 or 2	Cat.1 or 2	Cat.1 or 2	Cat.1 or 2
Oxidate Induction Time (OIT) Standard OIT, minutes	ASTM D 3895	100	100	100	100	100
Oven Aging at 85°C Standard OIT (% retained after 90 days)	ASTM D 5721 ASTM D 3895	55	55	55	55	55
UV Resistance [5] High Pressure OIT [6] (% retained after 1600 hrs)	GRI GM11 ASTM D 5885	50	50	50	50	50
Seam Properties	ASTM D 4437					
1. Shear Strength, lb/ in		60	80	120	160	200
2. Peel Strength, lb/ in		44 & FTB	59 & FTB	88 & FTB	118 & FTB	147 & FTB
Roll Dimensions						
1. Width (feet):		23	23	23	23	23
2. Length (feet)		1000	750	500	375	300
3. Area (square feet):		23,000	17,250	11,500	8,625	6,900
4. Gross Weight (pounds, approx.)		3,470	3,470	3,470	3,470	3,470

1. Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gauge length of 1.3 inches; Break elongation is calculated using a gauge length of 2.0 inches.
2. The yield stress used to calculate the applied load for the SP-NCTL test should be the mean value via MQC testing.
3. Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.
4. Carbon black dispersion for 10 different views: All 10 in Categories 1 and 2.
5. The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation 60°C.
6. UV resistance is based on percent retained value regardless of the original HP-OIT value.

POLY-FLEX
POLYETHYLENE GEOMEMBRANES

TEXTURED HDPE GEOMEMBRANE ENGLISH UNITS

Property	Test Method	Minimum Average Values 40 Mil	60 Mil	80 Mil	100 Mil
Thickness, mils	ASTM D 5994				
minimum average		38	57	72	90
lowest individual of 8 of 10 readings		36	54	72	90
lowest individual of 10 readings		34	51	68	85
Asperity Height, mils	GRI GM12	10	10	10	10
Sheet Density, g/cc	ASTM D 1505/D 792	0.940	0.940	0.940	0.940
Tensile Properties [1]	ASTM D 638 (Type IV Specimen @ 2 in/ min)				
1. Yield Strength, lb/ in		84	126	168	210
2. Break Strength, lb/ in		60	90	120	150
3. Yield Elongation, %		12	12	12	12
4. Break Elongation, %		100	100	100	100
Tear Resistance, lbs	ASTM D 1004	28	42	56	70
Puncture Resistance, lbs	ASTM D 4833	60	90	120	150
Stress Crack Resistance [2], hrs	ASTM D 5397 (App.)	200	200	200	200
Carbon Black Content [3], %	ASTM D 1603	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion [4]	ASTM D 5596	Cat.1 or 2	Cat.1 or 2	Cat.1 or 2	Cat.1 or 2
Oxidate Induction Time (OIT) Standard OIT, minutes	ASTM D 3895	100	100	100	100
Oven Aging at 85°C Standard OIT (% retained after 90 days)	ASTM D 5721 ASTM D 3895	55	55	55	55
UV Resistance [5] High Pressure OIT [6] (% retained after 1600 hrs)	GRI GM11 ASTM D 5885	50	50	50	50
Seam Properties	ASTM D 4437				
1. Shear Strength, lb/ in		80	120	160	200
2. Peel Strength, lb/ in		59 & FTB	88 & FTB	118 & FTB	147 & FTB
Roll Dimensions					
1. Width (feet):		23	23	23	23
2. Length (feet)		750	500	375	300
3. Area (square feet):		17,250	11,500	8,625	6,900
4. Gross Weight (pounds, approx.)		3,500	3,500	3,470	3,470

1. Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gauge length of 1.3 inches; Break elongation is calculated using a gauge length of 2.0 inches.
2. The yield stress used to calculate the applied load for the SP-NCTL test should be the mean value via MQC testing.
3. Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.
4. Carbon black dispersion for 10 different views: All 10 in Categories 1 and 2.
5. The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation 60°C.
6. UV resistance is based on percent retained value regardless of the original HP-OIT value.

POLY-FLEX
POLYETHYLENE GEOMEMBRANES

HDPE DRAINAGE NET 200

Property	Test Method	Minimum Average Values English Units	Metric Units
Thickness	ASTM D 5199	200 mils	5 mm
Mass Per Unit Area	ASTM D 5261	0.162 lb/ft^2	790 g/m^2
Density, min.	ASTM D 1505	0.940 g/cc	0.940 g/cc
Melt Index, max.	ASTM D 1238	1.0 g/10 minutes	1.0 g/10 minutes
Carbon Black Content, min	ASTM D 1603	2%	2%
Tensile Strength (MD)	ASTM D 1682 or ASTM D 5053	45 lbs/ in	7.9 kN/ m
Transmissivity, (MD)	ASTM D 4716	4.8 gal/ min•ft	1 x 10^{-3} m^2/ sec
metal plate/ net/ metal plate			
hydraulic gradient, i = 1			
normal pressure = 15,000 psf (718 kPa)			
Roll Dimensions			
1. Roll Width		14 ft	4.27 m
2. Roll Length		350 ft	106.7 m
3. Roll Area		4900 ft^2	455.2 m^2
4. Gross Weight (approximate)		840 lbs	381 kg

The above property values, unless otherwise specified, are the minimum acceptable average test results for any roll based on the specified test methods and do not refer to an individual test specimen.
This data is provided for informational purposes only and is not intended as a warranty or guarantee. Poly-Flex, Inc. assumes no responsibility in connection with the use of this data. These values are subject to change without notice. REV. 5/00

POLY-FLEX

CHEMICAL RESISTANCE INFORMATI

CHEMICAL CLASS	CHEMICAL EFFECT	PRIMARY CONTAINMENT (LONG TERM CONTACT) HDPE	LLDPE	SECONDARY CONTAINME (SHORT TERM CONTACT HDPE	LLDPE
CARBOXYLIC ACID	1				
- Unsubstituted (e.g. Acetic acid)		B	C	A	C
- Substituted (e.g. Lactic acid)		A	B	A	A
- Aromatic (e.g. Benzoic acid)		A	B	A	A
ALDEHYDES	3				
- Aliphatic (e.g. Acetaldehyde)		B	C	B	C
- Hetrocyclic (e.g. Furfural)		C	C	B	C
AMINE	3				
- Primary (e.g. Ethylamine)		B	C	B	C
- Secondary (e.g. Diethylamine)		C	C	B	C
- Aromatic (e.g. Aniline)		B	C	B	C
CYANIDES (e.g. Sodium Cyanide)	1	A	A	A	A
ESTER (e.g. Ethyl acetate)	3	B	C	B	C
ETHER (e.g. Ethyl ether)		C	C	B	C
HYDROCARBONS	3				
- Aliphatic (e.g. Hexane)		C	C	B	C
- Aromatic (e.g. Benzene)		C	C	B	C
- Mixed (e.g. Crude oil)		C	C	B	C
HALOGENATED HYDROCARBONS	3				
- Aliphatic (e.g. Dichloroethane) +A4		C	C	B	C
- Aromatic (e.g. Chlorobenzene)		C	C	B	C
ALCOHOLS	1				
- Aliphatic (e.g. Ethyl alcohol)		A	A	A	A
- Aromatic (e.g. Phenol)		A	C	A	B
'NORGANIC ACID					
- Non-Oxidizers (e.g. Hydrocloric acid)	1	A	A	A	A
- Oxidizers (e.g. Nitric Acid)	2	C	C	B	C
INORGANIC BASES (e.g. Sodium hydroxide)	1	A	A	A	A
SALTS (e.g. Calcium chloride)	1	A	A	A	A
METALS (e.g. Cadmium)	1	A	A	A	A
KETONES (e.g. Methyl ethyl ketone)	3	C	C	B	C
OXIDIZERS (e.g. Hydrogen Peroxide)	2	C	C	C	C

Chemical effect (see discussion on Chemical Resistance)

1. No Effect--Most chemicals of this class have no or minor effect.
2. Oxidizer--Chemicals of this class will cause irreversible degradaton.
3. Plasticizer--Chemicals of this class will cause a reversible change in physical properties.

Chart Rating

A. Most chemicals of this class have little or no effect on the liner.
Recommended regardless of concentration or temperature (below 150° F).

B. Chemicals of this class will effect the liner to various degrees.
Recommendations are based on the specific chemical, concentration and temperature.
Consult with Poly-Flex, Inc.

C. Chemicals of this class at high concentrations will have significant effect on the physical properties of the liner.
Generally not recommended but may be acceptable at low concentrations and with special design considerations.
Consult with Poly-Flex, Inc.

POLY-FLEX

FREQUENTLY ASKED QUESTIONS & ANSWERS

1. What is the life expectancy of Poly-Flex HDPE and VFPE liners?

The life expectancy of Poly-Flex liners depends on the environment in which they are installed. Exposure to high temperatures, certain chemicals, constant loads, and adverse site conditions shorten the life of the liners. Under normal conditions, Poly-Flex HDPE and VFPE liners are expected to last for many decades.

2. Are Poly-Flex liners resistant to chemical attack? Which chemicals?

Chemical resistance as applied to geomembranes is a relative term. In its strictest form, chemical compatibility, as the term applies to this industry, implies that a chemical has no effect on the liner. However, from an engineering perspective, chemical compatibility means that a liner will survive exposure to a chemical, even though the chemical could have some effects on the liner, without causing the liner to fail. Poly-Flex liners provide a high degree of chemical resistance to a wide range of chemicals. Please refer to the chemical resistance section under Technical Information.

3. Which liner should be used for secondary containment, Poly-Flex HDPE or VFPE? Why?

Poly-Flex HDPE liners are preferred because most secondary containment projects are for emergency containment of chemicals at high concentrations, such as fuels and acids. The Poly-Flex HDPE liners provide a higher degree of chemical resistance as compared to VFPE liners.

4. What are the typical roll dimensions of Poly-Flex geomembranes?

All Poly-Flex rolls are 23 feet wide. The roll lengths range from 300 feet up to 1,550 feet depending on the material type and thickness. The gross weights are approximately 3,580 lbs. Please refer to the Material Specification Section.

5. How are Poly-Flex geomembranes shipped?

Poly-Flex rolls are shipped by flat-bed trailer trucks. Open- or closed-top containers are used for overseas shipping. Up to 12 full rolls can be shipped per truckload or container.

6. Can Poly-Flex liners be exposed to sunlight for a long period of time? How long?

Yes. Poly-Flex liners are specifically formulated and manufactured to resist ultra-violet rays. Therefore, they are suitable for use in exposed applications. The liners are expected to last many decades in exposed applications without any detrimental effect from sunlight.

7. What is the elongation or deformation limits of Poly-Flex HDPE and VFPE geomembranes before they rupture?

In the multi-axial tension test, ASTM D 5617, the HDPE liners rupture at 15% elongation and the VFPE liners rupture at 35% elongation.

8. Does thickness affect the elongation or deformation limits?

Generally, the elongation property of Poly-Flex liners are independent of the material thickness. Although thinner liners deform with less pressure, the ultimate elongation at rupture is reported the same for all gauges.

9. **Can I purchase the liner and install it myself or do I have to go through a dealer?**

   Installation of Poly-Flex liners requires trained technicians and special equipment. Therefore, we require that Poly-Flex liners be installed either by a Poly-Flex Dealer representative or Poly-Flex Construction, Inc.

10. **Can Poly-Flex liners be used for potable water applications?**

    Poly-Flex HDPE liners are rated by the National Sanitation Foundation, Standard 54, as suitable lining material for potable water applications.

11. **Are Poly-Flex liners available in any other colors than black?**

    Yes. Poly-Flex liners are available in white/black.

12. **What maintenance is required for Poly-Flex liners after installation?**

    None, Poly-Flex liners are maintenance free.

13. **Should Poly-Flex liners be used as reinforcement (structural) membranes?**

    No. The Poly-Flex geomembranes are single layer, unreinforced materials and should not be used as structural membranes to carry loads.

14. **In what type of projects are Poly-Flex liners used?**

    Poly-Flex geomembranes are used in a variety of applications. Most commonly, in municipal solid waste and hazardous waste landfills, landfill closures, raw water reservoirs, wastewater lagoons, industrial ponds, mining leach pads and ponds, canals, aquaculture ponds, secondary containment, etc.

15. **Are there any limits on the project size?**

    No. The project size could vary from a few hundred square feet to millions of square feet of geomembrane.

16. **Can Poly-Flex manufacture customized roll dimensions?**

    Yes. Although the roll width is always 23 feet, Poly-Flex is capable of manufacturing the rolls in custom lengths to accommodate our customers needs.

17. **What are the temperatures for material that can be contained by Poly-Flex liners?**

    Poly-Flex geomembranes are thermoplastic materials, hence their physical properties are temperature dependent. The material becomes softer and more flexible at higher temperatures and stiffer and stronger at lower temperatures. We specify maximum use temperatures of 160° F for HDPE and 140° F for VFPE liners.

18. **Are Poly-Flex liners immune to root penetration?**

    Poly-Flex liners resist root penetration. However, some vegetation, such as nut grass, could penetrate the liners. We recommend that the subgrade soils be prepared to be free of roots and organic material.

19. **Are Poly-Flex liners immune to attack by rodents?**

    Poly-Flex liners are generally immune to rodent and insect attack because they contain no plasticizers or scrim source proteins which are sometimes present in other plastics.

20. Why do Poly-Flex liners have wrinkles?

Because thermal expansion/contraction of approximately 2% over 100° F variance in temperature will cause the liner to grow or shrink.

21. What is the permeability of the Poly-Flex liners?

Poly-Flex liners are the least permeable of all synthetic thin membrane systems. Poly-Flex liners have a permeability of 10^{-13} cm/sec vs. cracked concrete and compacted clay at 10^{-7} cm/sec.

22. What is the moisture vapor transmission rate (MVTR) of the Poly-Flex liners?

The permeability of Poly-Flex liners is expressed as the Moisture Vapor Transmission Rate (MVTR) as measured by the ASTM D E96 test method. The property is expressed in grams/unit area/day. Please refer to inherent properties of polyethylene liners located in Material Specifications.

23. Does material thickness influence puncture resistance?

Yes. Thicker liners have higher puncture resistance than the thinner ones.

24. What is the cold temperature resistance of Poly-Flex liners?

Poly-Flex liners pass the low temperature brittleness test at -70° C (-94° F) according to the ASTM D 746.

25. How is the thickness of a liner determined for a specific application?

In the case of landfills, U.S.E.P.A. mandates that all landfill liners must be 60 mil or thicker. Poly-Flex 40 mil geomembranes are preferred for landfill closures. The liner thickness is determined by the project engineer based on the project site specific conditions.

26. How much cover soil is needed before driving on the liner?

The minimum initial lift of cover soil should be determined based on the type of placement equipment, cover soil, and the liner system under consideration. A minimum of 15 - 30 cm (6 - 12 inches), is usually recommended for equipment with light ground pressure of less than 34.5 kPa ($5\ lb/in^2$). A higher initial lift height should be used for proportionally heavier equipment.

27. How are Poly-Flex liners held in place on side slopes?

The most common method of securing the liners on side slopes is by means of an anchor trench around the perimeter. The batten strip or the PEC embed channel systems are used to attach the liner to structures. Please refer to the Poly-Flex Design Details located in Technical Information.

28. How steep can side slopes be designed for Poly-Flex lining applications?

The side slopes can be designed as steep as 90° or a vertical wall.

29. What are interface friction angles?

Interface friction angles express properties relating to sliding shear resistance between two materials facing each other. This property is used in stability calculations to design a stable liner system.

30. How are interface friction angles determined?

The industry standard test method is the ASTM D 5321 "Determining the coefficient of soil and geosynthetic or geosynthetic and geosynthetic friction by the direct shear method".

31. What are the advantages of Poly-Flex textured liners?

The Poly-Flex textured geomembranes are specifically manufactured with rough surfaces to produce a high interface friction angle when in contact with soils or other geosynthetic materials. This will provide a high factor of safety against sliding failure on side slopes.

32. Can Poly-Flex seams be tested for leaks? How?

Yes. Poly-Flex seams are non-destructively tested over 100% of the seam length for leaks. The most common method is the air pressure test for dual wedge seams. The vacuum box test is used for extrusion welds.

33. What is the minimum degree of roughness (texturing) a textured liner should have?

The minimum industry standard specification GRI GM13, requires a minimum *Asperity Height* of 7 mils for textured HDPE geomembranes. Poly-Flex reports 17 mils as minimum, more than twice the industry standard. The higher degree of texturing of Poly-Flex textured geomembranes provide higher interface friction resistance next to soils and other geosynthetics, which adds to the factor of safety against sliding on slopes

34. Should wind uplift forces be considered for Poly-Flex liners installed in exposed applications?

Yes. The wind suction forces can lift exposed liners off the ground and potentially damage them. A ballast system, such as dead weights, sand tubes, anchor trenches, etc. should be considered for all geomembranes installed in exposed applications. For buried applications, the installed liner should be temporarily secured by means of sand bags until cover soils are placed.

35. How much ballast is needed over exposed liners?

The ballast system should be designed to secure the liner in place under the maximum anticipated wind suction pressures for the specific project site. Wind uplift pressures can be as high as 1.43 kPa ($30\ lb/ft^2$) depending on the project site geometry and wind velocity. Please call your Poly-Flex sales representative for more information.

36. What method is used for joining Poly-Flex liner panels together?

Poly-Flex liner panels are joined by two methods. The primary method of welding geomembrane panels together is fusion welding.

In fusion welding, heat is applied directly to the geomembrane panels by a motorized hot wedge welder. The panels are then routed through a series of rollers that fuse the material together.

The second method of joining Poly-Flex Liner panels is extrusion welding. This method is used primarily for performing repairs on the liner material. This method utilizes the application of molten polyethylene welding rod to the surface of the two geomembrane sheets to be joined. The molten extrudate creates a bond that seals the two pieces of geomembrane together.

37. Can Poly-Flex liners be attached to fixed structures such as concrete, steel, pipes, etc? How?

Yes. Poly-Flex liners can be attached to fixed structures through a number of methods. With concrete structures, two methods are preferred. The first, to be used in new structures, is polyethylene embed channel (PEC). This channel can be inserted into a new concrete structure, providing for a three inch HDPE surface to which Poly-Flex liners may be welded creating a water-tight seal.

Secondly, Poly-Flex liners may be attached to new and existing concrete structures through the use of stainless steel or aluminum batten strips. These strips are attached to the concrete by inserting stainless steel anchor bolts into the concrete, placing the geomembrane liner over the anchor bolts, placing a strip of neoprene gasket between the liner and batten strip, and securing the batten strip with washers and nuts. Poly-Flex liners may also be secured to penetrations through the liner by the fabrication and welding of a polyethylene " boot" around the structure. Please refer to the Design Details Section of Technical Information.

38. How is the Poly-Flex liner deployed at the job site?

Liner is deployed using a lift system that suspends a roll off of the ground. The system is raised by a loader, forklift, crane or other lifting equipment and then spooled off and deployed. An unwind stand can also be used from a modified flatbed trailer. Please refer to Liner Panel Deployment detail under Technical Information.

39. What procedures should be followed for storing Poly-Flex liners at a jobsite?

Poly-Flex liners should be stored on a prepared subbase that is free of rocks, roots, debris, or materials that may damage the liner. The rolls should also be stored away from standing water and should not be stacked more than two rolls high.

40. Can construction equipment be operated directly on the liner?

Equipment that applies less than 2 psi ground pressure can be operated directly on the liner when operated with caution, including no sudden starts, stops or turns. See Question 28.

41. Are there any adhesives, tapes or glues that are suitable for joining Poly-Flex liners?

There are no adhesives, tapes or glues that provide a permanent, watertight bond.

42. How much liner is normally installed and tested in one day?

The amount of liner that can be installed and tested in one day depends upon site conditions, subgrade preparation and the difficulty of the project.

43. Are there any ambient and/or sheet temperature limits when welding?

The industry standard is a maximum of 104°F measured 6 inches above the liner surface and a minimum of 32°F. The liner can be welded above the maximum and below the minimum temperatures if certain precautions are observed.

44. Can Poly-Flex liners be installed directly on top of concrete slabs or asphalt pavement?

Yes. Concrete and asphalt slabs must be smooth and have no sharp edges.

45. Can Poly-Flex liners of different thickness or textures be welded to each other?

Yes. Poly-Flex liners with thickness or texture differences of 20 mils or less can be fusion welded together. Liners with thickness or texture differences of greater than 20 mils should be extrusion welded together.

46. Can Poly-Flex liners of different densities be welded to each other?

Yes. Welding temperature adjustments must be made to achieve a successful weld. When extrusion welding, the lower density welding rod should be used.

47. What are the advantages of LLDPE over PVC geomembrane?

The advantages are as follows:
LLDPE has resistance to a wider range of chemicals as compared to PVC.
LLDPE is immune from biological attack by microorganisms. Microorganisms could attack PVC and use the plasticizer as a source of food.
LLDPE is resistant to burrowing animals, PVC is not.
LLDPE has a lower permeability to methane than PVC.
LLDPE has a lower moisture vapor transmission rate than PVC.
LLDPE retains its physical properties due to long-term soil burial. PVC's physical properties diminish in time due to loss of plasticizer.
LLDPE is resistant to ultra-violet light, PVC is not.
LLDPE remains flexible at temperatures well below freezing at -25°C. PVC loses its flexibility and becomes brittle at -25°C

Disclaimer: These answers are provided for informational purposes only and are not intended as a warranty or guarantee. Poly-Flex, Inc. assumes no responsibilities in connection with the use of this information. Oct. 99.

Colorado Lining
INTERNATIONAL

COLORADO LINING INTERNATIONAL

We have been serving the environmental containment market for over 20 years and continue to grow globally by offering a diverse product line to a variety of market segments including waste management, wastewater, golf course lakes and streams, landscape and agricultural.

Colorado Lining International maintains enough equipment to run five (5) field crews with back up equipment in all major categories.

Colorado Lining International maintains a 25,000 square foot fabrication facility with the ability to pre-fabricate single panels of up to 50,000 square feet.

For further information regarding our products or services, please contact:

Colorado Office: John Heap, President, (303) 841-2022 or (800) 524-8672

Texas Office: Paul Amos, Vice President, Sales, (281) 358-8899 or (888) 546-4641

South Dakota Office: John Brennan, Regional Sales, (605) 748-2201 or (800) 661-2201

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AGRU /AMERICA™ HD
HDPE Geomembrane

Product Data (Minimum Average Roll Values)

Property	Test Method	Values				
Thickness (mils nominal)	ASTM D751	30	40	60	80	100
Melt Flow Index (g/10 minutes)	ASTM D1238-E	.28	.28	.28	.28	.28
Density (g/cm³ min)	ASTM D792 or D1505	.948	.948	.948	.948	.948
Tensile Strength at Yield (lbs/in. width)	ASTM D638 (Modified)	66	88	132	176	220
Tensile Strength at Break (lbs/in. width)	Type IV Specimen	120	160	240	320	400
Elongation at Yield (%)	Gauge length 2in. Break	13	13	13	13	13
Elongation at Break (%)	1.3 in. yield, 2 ipm	500	700	700	700	700
Tear Resistance (lbs)	ASTM D1004-Die C	20	30	45	60	72
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1hr @ 212°F	±2	±2	±2	±2	±2
Environmental Stress Crack (hrs)	ASTM D1693	3000	3000	3000	3000	3000
Puncture Resistance (lbs)	FTMS 101-C, Method 2065	36	52	80	105	130
Carbon Black Content (%)	ASTM D1603	2 – 3	2 – 3	2 – 3	2 – 3	2 – 3
Carbon Black Dispersion	ASTM D3015	A2	A2	A2	A2	A2

Supply Information (Standard Roll Dimensions)

	Thickness		Width		Length		Area		Weight	
	Mil	mm	Ft	m	ft	m	ft²	m²	lbs	kg
Long Rolls	30	.75	22.5	6.86	1,312	400	29,520	2,744	4,970	2,254
Long Rolls	40	1.0	22.5	6.86	984	300	22,140	2,058	4,661	2,114
Long Rolls	60	1.5	22.5	6.86	656	200	14,760	1,372	4,639	2,104
Long Rolls	80	2.0	22.5	6.86	492	150	11,070	1,029	4,662	2,114
Long Rolls	100	2.5	22.5	6.86	328	100	7,380	686	3,898	1,768
Med Rolls	30	.75	22.5	6.86	840	256	18,900	1,756	3,218	1,459
Med Rolls	40	1.0	22.5	6.86	650	198	14,625	1,359	3,113	1,412
Med Rolls	60	1.5	22.5	6.86	420	128	9,450	878	3,006	1,363
Med Rolls	80	2.0	22.5	6.86	320	98	7,200	669	3,067	1,391
Med Rolls	100	2.5	22.5	6.86	250	76	5,625	523	2,995	1,313

agru america

CHEMICAL RESISTANCE INFORMATION

ɛcutive Offices: 500 Garrison Road, Georgetown, S.C. 29440 • 843-546-0600 • 800-321-1379 • Fax 843-546-0516
Sales Office: 700 Rockmead, Suite 150, Kingwood, TX 77339 • 281-358-4741 • 800-373-2478 • Fax 281-358-5297

CHEMICAL RESISTANCE INFORMATION FOR HDPE AND POLYPROPYLENE

General Information:

The following tables give qualitative information as to the resistance of HDPE and Polypropylene sheet materials to specific chemicals at various concentrations. The values given correspond to the most accurate information available from raw material suppliers of the specific resins, based upon testing results and other relevant literature.

It should be emphasized that this data has been compiled for initial consultation purposes only. The information is in no way intended to replace corrosion testing that is based on actual conditions. If the user does not have sufficient experience regarding these materials, the user should contact a competent corrosion expert (certified by the National Association of Corrosion Engineers of Houston, TX), to verify any recommendation or to interpret the tables. Also, for any special or unusual factors, including the duration of contact, or level of stress in the system, the results should be analyzed taking into account these and any other applicable factors. In all circumstances, our engineering department should be consulted to review and verify final recommendations.

The following symbols are used in the tables:

——— **Resistant Symbol**

On the basis of the data, little or no effect on the material has been made evident within the given range of pressure and temperature limits.

– – – **Conditionally Resistant Symbol**

Suitability has to be checked in each individual case of application. Further testing may have to be performed to offer a specific recommendation. Please consult with our engineering department for a specific recommendation.

0 **Non-Resistant (Not Recommended) Symbol**

The material is generally regarded to be unsuitable. Therefore, the application is not recommended.

Note: Information on PVDF available upon request.

The following abbreviations are used for concentrations in some cases, where a specific numeric value is not given.

VL	Aqueous solution, percentage of mass less than 10%
L	Aqueous solution, percentage of mass higher than 10%
GL	Aqueous solution, saturated at 20°C (68°F)
TR	Minimum technically pure concentration
H	Commercially available concentration

The following footnotes are used in the body of the tables:

1) Penetration of HCl possible
2) Oxidizing
3) Penetration of HF possible
4) Medium might cause stress cracking
5) Penetration of HBr possible

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Acetaldehyde	40	PE-HD	
		PP	
	100	PE-HD	
		PP	
Acetaldehyde + Acetic acid	90/10	PE-HD	
		PP	
Acetic acid aqueous	10	PE-HD	
		PP	
Acetic acid aqueous (Glacial acetic acid)	min 96	PE-HD	
		PP	
Acetic acid – ethyl ester (Ethyl acetate)	TR	PE-HD	
		PP	
Acetic acid – methyl ester (Methyl acetate)	TR	PE-HD	
		PP	
Acetic anhydrid	TR	PE-HD	
		PP	
Acetone	GL	PE-HD	
		PP	
	100	PE-HD	
		PP	
Acetophenone	TR	PE-HD	
		PP	
Acrylic acid ethylic ester	100	PE-HD	no values
		PP	no values
Acrylonitrile	TR	PE-HD	
		PP	
Adipic acid aqueous	GL	PE-HD	
		PP	
Air	TR	PE-HD	
		PP	
Allyl alcohol (2-propen-1-ol)	96	PE-HD	
		PP	
Aluminium chloride	GL	PE-HD	
		PP	
Aluminium fluoride	GL	PE-HD	
		PP	
Aluminium sulphate	GL	PE-HD	
		PP	
Alums (metal(I)- and metal(III)-sulphates)	GL	PE-HD	
		PP	

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Ammonia gas	TR	PE-HD	
		PP	
Ammonia liquid	TR	PE-HD	
		PP	
Ammonia solution aqueous (Ammonia water)	33	PE-HD	
		PP	
Ammonia aluminium sulphate (Ammonia alum)	L	PE-HD	
		PP	
Ammonium carbonate and ammonium hydrogen carbonate	GL	PE-HD	
		PP	
Ammonium chloride	GL	PE-HD	
		PP	
Ammonium iron (III)-sulphate (Iron alum)	L	PE-HD	
		PP	
Ammonium fluoride	L	PE-HD	
		PP	
Ammonium nitrate	GL	PE-HD	
		PP	
Ammonium phosphate	GL	PE-HD	
		PP	
Ammonium sulphide	L	PE-HD	
		PP	
Ammonium sulphate	GL	PE-HD	
		PP	
Amyl acetate	TR	PE-HD	
		PP	
Aniline hydrochloride aqueous	GL	PE-HD	
		PP	
Aniline pure	TR	PE-HD	
		PP	
Anone	TR	PE-HD	
		PP	
Anthraquinone sulphone acid	GL	PE-HD	
		PP	
Anti-freezers (motor vehicles)	H	PE-HD	
		PP	
Antimony chloride aqueous	90	PE-HD	
		PP	
Aqua regia (HCl/HNO_3)	75/25	PE-HD	0
		PP	0

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Arsenic acid aqueous	80	PE-HD	
		PP	
Barium carbonate	GL	PE-HD	
		PP	
Barium chloride	GL	PE-HD	
		PP	
Barium hydroxide	GL	PE-HD	
		PP	
Barium salts	GL	PE-HD	
		PP	
Barium sulphate	GL	PE-HD	
		PP	
Beater glue	H	PE-HD	
		PP	
Beer	H	PE-HD	
		PP	
Beer dye (Sugar dye)	VL	PE-HD	
		PP	
Bees-wax	H	PE-HD	
		PP	
Benzaldehyde	GL	PE-HD	
		PP	
Benzine	H	PE-HD	
		PP	
Benzine–benzole mixture	80/20	PE-HD	
		PP	
Benzoic acid	GL	PE-HD	
		PP	
Benzene	TR	PE-HD	
		PP	
Benzoyl chloride	TR	PE-HD	
		PP	
Benzyl alcohol	TR	PE-HD	
		PP	
Bisulphite lye containing SO_2	GL	PE-HD	
		PP	
Bleaching solution (Sodium hypochloride)	20	PE-HD	
		PP	

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Boric acid aqueous	GL	PE-HD	
		PP	
Borax, aqueous (Sodium tetraborate)	GL	PE-HD	
		PP	
Bromine liquid	TR	PE-HD	0
		PP	0
Bromine fumes	TR	PE-HD	0
		PP	0
Bromine* (Bromine water)	GL	PE-HD	
		PP	
Butadiene gas	TR	PE-HD	
		PP	
Butane gas	TR	PE-HD	
		PP	
Butanediol aqueous	L	PE-HD	
		PP	
Butanediol	TR	PE-HD	
		PP	
Butanol (Butyl alcohol)	TR	PE-HD	
		PP	
1,2,4-Butanetriol	TR	PE-HD	
		PP	
2-Butene-1,4-diol	TR	PE-HD	
		PP	
Butindiol	TR	PE-HD	
		PP	
Butyric acid (and isobutyric acid)	TR	PE-HD	
		PP	
Butylacetate	TR	PE-HD	
		PP	
Butylene liquid	TR	PE-HD	0
		PP	no values
Butylene glycol (1,4-Butanediol) aqueous	TR	PE-HD	
		PP	
Butylene glycol (Ethylene glycol monobutyl ether)	TR	PE-HD	
		PP	
Butylphenol	GL	PE-HD	
		PP	
Butylphenone	GL	PE-HD	
		PP	

Note: ***Information of PVDF available upon request.***

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C (20 40 60 80 100)
Butylphthalate (Dibutylphthalate)	TR	PE-HD	
		PP	
Calcium carbonate	GL	PE-HD	
		PP	
Calcium chlorate	GL	PE-HD	
		PP	
Calcium chloride aqueous	GL	PE-HD	
		PP	
Calcium hydroxide	GL	PE-HD	
		PP	
Calcium hypochlorite (Chloride of lime), aqueous	L	PE-HD	
		PP	
Calcium nitrate aqueous	GL	PE-HD	
		PP	
Calcium sulphate	GL	PE-HD	
		PP	
Calcium sulphide	VL	PE-HD	
		PP	
Camphoric oil (Camphor oil)	TR	PE-HD	0
		PP	0
Carbolineum	H	PE-HD	
		PP	
Carbon monoxide gas	TR	PE-HD	
		PP	
Carbonic disulphide	TR	PE-HD	
		PP	0
Carbon dioxide gas	TR	PE-HD	
		PP	
Carbonic acid dry	H	PE-HD	
		PP	
Carbonic acid aqueous	GL	PE-HD	
		PP	
Carbonic acid wet	H	PE-HD	
		PP	
Castor oil	TR	PE-HD	
		PP	
Caustic lye aqueous	50	PE-HD	
		PP	
Caustic lye aqueous	L	PE-HD	
		PP	
Caustic soda	60	PE-HD	
		PP	
Chloracetic acid (mono), aqueous	L	PE-HD	
		PP	
Chloracetic acid (mono), aqueous	85	PE-HD	
		PP	
Chloral (Trichlor acetaldehyde)	TR	PE-HD	
		PP	
Chloral hydrate	TR	PE-HD	
		PP	
Chloramine aqueous	L	PE-HD	
		PP	
Chlordiphenyl	H	PE-HD	
		PP	
Chloroethane (Ethyl chloride)	TR	PE-HD	
		PP	0
2-Chlorethanol (Ethylenechlorohydrin)	TR	PE-HD	
		PP	
Chloric acid aqueous	1	PE-HD	
		PP	
Chloric acid aqueous	10	PE-HD	
		PP	
Chloric acid aqueous	20	PE-HD	no values
		PP	
Chloride of lime (Slurry in water)	any	PE-HD	
		PP	
Chlorine liquid	TR	PE-HD	0
		PP	0
Chlorine gas, wet	0.5	PE-HD	
		PP	
Chlorine gas, wet	1	PE-HD	0
		PP	0
Chlorine gas, dry	TR	PE-HD	
		PP	0
Chlorine water (Chlorine)	GL	PE-HD	
		PP	
Chlormethyl	100	PE-HD	0
		PP	0

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C (20 / 40 / 60 / 80 / 100)
Chlorobenzene	TR	PE-HD	
		PP	
Chloroform (Trichloromethane)	TR	PE-HD	
		PP	
Chloromethane (Methylchloride) gas	TR	PE-HD	
		PP	no values
Chlorosulphonic acid	TR	PE-HD	0
		PP	0
Chrome alum aqueous	GL	PE-HD	
		PP	
Chrome acid** (Chrome(VI)-oxide**) aqueous	20	PE-HD	
		PP	
Chrome acid** (Chrome(VI)-oxide**) aqueous	40	PE-HD	
		PP	
Chromosulphuric acid Chromic acid/ sulphuric acid/water	15/35/50	PE-HD	0
		PP	0
Citric acid	GL	PE-HD	
		PP	
Citric acid aqueous	VL	PE-HD	
		PP	
Coconut butter alcohol	TR	PE-HD	
		PP	
Common salt aqueous	VL	PE-HD	
		PP	
Common salt (Natrium chloride)	GL	PE-HD	
		PP	
Copper(II)-chloride	GL	PE-HD	
		PP	
Copper(I)-cyanide	GL	PE-HD	
		PP	
Copper flouride aqueous	GL	PE-HD	
		PP	
Copper(II)-nitrate aqueous	30	PE-HD	
		PP	
Copper(II)-nitrate	GL	PE-HD	
		PP	
Copper(II)-sulphate	GL	PE-HD	
		PP	
Copper sulphate aqueous	GL	PE-HD	
		PP	

Medium	Concentration %	Material	Temperature °C (20 / 40 / 60 / 80 / 100)
Cotton seed oil	TR	PE-HD	
		PP	
Cresol aqueous	< 90	PE-HD	
		PP	
Cresol aqueous	≥ 90	PE-HD	
		PP	
Crotonaldehyde	TR	PE-HD	
		PP	
Cyanide of potassium (Potassium cyanide)	L	PE-HD	
		PP	
Cyanide of potassium aqueous	GL	PE-HD	
		PP	
Cyclohexanol	TR	PE-HD	
		PP	
Cyclohexanone	TR	PE-HD	
		PP	
Cyclohexane	TR	PE-HD	
		PP	
Decalin® (Decahydro-naphthaline)	TR	PE-HD	
		PP	
Detergents	H	PE-HD	
		PP	
Dextrine aqueous	L	PE-HD	
		PP	
Dextrose (Starch sugar, glucose)	20	PE-HD	
		PP	
1,2-Diaminoethane (Ethylene diamine)	TR	PE-HD	
		PP	
Dibutyl phthalate	TR	PE-HD	
		PP	
Dichloroethane (vinylidene dichloride and vinylene dichloride)	TR	PE-HD	0
		PP	0
Dichloroethylene (1,1 and 1,2)	TR	PE-HD	0
		PP	0
Dichloroacetic acid aqueous	50	PE-HD	
		PP	

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Dichloroacetic acid aqueous	TR	PE-HD	
		PP	
Dichloroacetic acid methyl ester	TR	PE-HD	
		PP	
Dichlorobenzene	TR	PE-HD	
		PP	
Diesel fuel	H	PE-HD	
		PP	
Diethanolamine	TR	PE-HD	
		PP	
Diethyl ether (Ethyl ether)	TR	PE-HD	
		PP	
Diglycolic acid aqueous	GL	PE-HD	
		PP	
Dihexylphthalate	TR	PE-HD	no values
		PP	
Diisobutyl ketone (2,6-Dimethyl-4-heptanone)	TR	PE-HD	
		PP	
Diisooctyl phthalate	TR	PE-HD	
		PP	
Diisopropyl ether	TR	PE-HD	
		PP	
Dimethylamine gas	100	PE-HD	
		PP	
Di-n-Butylether	TR	PE-HD	
		PP	
Dinonylphthalate (DNP)	TR	PE-HD	
		PP	
Dioctylphthalate (DOP)	TR	PE-HD	
		PP	
1,4-Dioxan (Diethylene dioxide)	TR	PE-HD	
		PP	
Emulsions photographic	H	PE-HD	
		PP	
Enzyme mash	H	PE-HD	
		PP	

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Ester	40	PE-HD	
		PP	
Ethanol (Ethyl alcohol)	TR	PE-HD	
		PP	
Ethyl acetate	100	PE-HD	
		PP	
Ethyl alcohol aqueous	96	PE-HD	
		PP	
Ethyl alcohol + acetic acid (Enzyme compound)	H	PE-HD	
		PP	
Ethyl alcohol (Enzyme mash)	H	PE-HD	
		PP	
Ethyl alcohol methylated with Toluol 2 %	96	PE-HD	
		PP	
Ethyl benzene	TR	PE-HD	
		PP	
Ethyl chloride gas (Chloroethane)	TR	PE-HD	0
		PP	0
Ethylenechlorohydrin (Chloroethanol)	TR	PE-HD	
		PP	
Ethylenediamine (1,2-Diaminoethane)	TR	PE-HD	
		PP	
Ethylene glycol (1,2-Ethanediol)	TR	PE-HD	
		PP	
Ethylene oxide gas (Oxiran)	TR	PE-HD	
		PP	0
Ethyl ether	100	PE-HD	
		PP	
Exhaust gases containing SO_2	VL	PE-HD	
		PP	
Exhaust gases containing carbon dioxide	any	PE-HD	
		PP	
Exhaust gases containing hydrochloric acid*	any	PE-HD	
		PP	
Exhaust gases containing hydrogen fluoride	VL	PE-HD	
		PP	
Exhaust gases containing nitrogen	VL	PE-HD	
		PP	
Exhaust gases containing oleum	VL	PE-HD	0
		PP	0

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Exhaust gases sulphuric acid wet	any	PE-HD	
		PP	
Fatty acids	100	PE-HD	
		PP	
Fertilizer salt	H	PE-HD	
		PP	
Fixing solutions photographic	H	PE-HD	
		PP	
Fluor gas, dry	TR	PE-HD	0
		PP	0
Fluorammonium aqueous	20	PE-HD	
		PP	
Fluosilicic acid aqueous	32	PE-HD	
		PP	
Fluosilicic acid aqueous	40	PE-HD	
		PP	
Formaldehyde aqueous	40	PE-HD	
		PP	
Formic acid aqueous	85	PE-HD	
		PP	
Fructose	L	PE-HD	
		PP	
Fruit juices pulp	H	PE-HD	
		PP	
Fruit pulp	H	PE-HD	
		PP	
Fuel oil	H	PE-HD	
		PP	
Furfuryl alcohol	TR	PE-HD	
		PP	
Gaswater	H	PE-HD	
		PP	
Gelatine	L	PE-HD	
		PP	

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Glacial acetic acid	100	PE-HD	
		PP	
Glucose aqueous	20	PE-HD	
		PP	
Glucose aqueous	GL	PE-HD	
		PP	
Glycerine (Glycerol), aqueous	any	PE-HD	
		PP	
Glycol aqueous	H	PE-HD	
		PP	
Glycocoll aqueous	10	PE-HD	
		PP	
Glycolic acid aqueous	30	PE-HD	
		PP	
Glycolic acid aqueous	70	PE-HD	
		PP	
Heptane	TR	PE-HD	
		PP	
Hexane	TR	PE-HD	
		PP	
Hexanetriol (1,2,6)	TR	PE-HD	
		PP	
Hydrazine hydrate	TR	PE-HD	
		PP	
Hydrobromic acid (solution) aqueous*	48	PE-HD	
		PP	
Hydrochloric acid aqueous*+	VL	PE-HD	
		PP	
Hydrochloric acid aqueous*+	> 32	PE-HD	
		PP	
Hydrocyanic acid	L	PE-HD	
		PP	
Hydrocyanic acid aqueous	TR	PE-HD	
		PP	no values
Hydrofluoric acid aqueous*+	4	PE-HD	
		PP	
Hydrofluoric acid aqueous*+	40	PE-HD	
		PP	

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Hydrofluoric acid aqueous	60	PE-HD	
		PP	
Hydrofluoric acid aqueous	70	PE-HD	
		PP	
Hydrofluosilicic acid aqueous	32	PE-HD	
		PP	
Hydrofluosilicic acid aqueous	40	PE-HD	
		PP	
Hydrogen bromide gas	TR	PE-HD	
		PP	no values
Hydrogen chloride gas wet and dry	TR	PE-HD	
		PP	
Hydrogen gas	TR	PE-HD	
		PP	
Hydrogen peroxide aqueous	30	PE-HD	
		PP	
Hydrogen peroxide aqueous	90	PE-HD	
		PP	
Hydrogen sulphide aqueous	GL	PE-HD	
		PP	
Hydrogen sulphide gas, dry	TR	PE-HD	
		PP	
Hydrogenhyposulphite aqueous	VL	PE-HD	
		PP	
Hydroquinone	L	PE-HD	
		PP	
Hydroquinone	GL	PE-HD	
		PP	
Hydroxylamine sulphate aqueous	≤ 12	PE-HD	35°C
		PP	
Iodine, tincture	H	PE-HD	
		PP	
Iron(II)-chloride	GL	PE-HD	
		PP	
Iron(III)-chloride	GL	PE-HD	
		PP	
Iron(III)-nitrate	L	PE-HD	
		PP	

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Iron(II)-sulphate	GL	PE-HD	
		PP	
Iron(III)-sulphate	GL	PE-HD	
		PP	
Isobutanol	TR	PE-HD	
		PP	
Isobutyric acid	TR	PE-HD	
		PP	
Isooctane	TR	PE-HD	
		PP	
Isopropyl alcohol	TR	PE-HD	
		PP	
Lactic acid	TR	PE-HD	
		PP	
Lactic acid aqueous	90	PE-HD	
		PP	
Lanolin (Wool-oil)	H	PE-HD	
		PP	
Lead acetate aqueous	GL	PE-HD	
		PP	
Lead tetraethyl (Tetraethyl lead)	TR	PE-HD	
		PP	
Light liquid paraffin	TR	PE-HD	
		PP	
Lighting gas	H	PE-HD	
		PP	
Linseed oil	H	PE-HD	
		PP	
Liquid ammonia (Ammonia water)	GL	PE-HD	
		PP	
Magnesium carbonate	GL	PE-HD	
		PP	
Magnesium chloride aqueous	GL	PE-HD	
		PP	
Magnesium hydroxide	GL	PE-HD	
		PP	

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C (20 40 60 80 100)
Magnesium hydroxide carbonate	GL	PE-HD	
		PP	
Magnesium nitrate	GL	PE-HD	
		PP	
Magnesium salts	GL	PE-HD	
		PP	
Magnesium sulphate aqueous	GL	PE-HD	
		PP	
Maize seed oil	TR	PE-HD	
		PP	
Maleic acid aqueous	GL	PE-HD	
		PP	
Malic acid aqueous		PE-HD	
		PP	
Menthol	TR	PE-HD	
		PP	
Mercury	TR	PE-HD	
		PP	
Mercury(II)-chloride	GL	PE-HD	
		PP	
Mercury(II)-cyanide	GL	PE-HD	
		PP	
Mercury(I)-nitrate	L	PE-HD	
		PP	
Mercury salts	GL	PE-HD	
		PP	
Methane bromide (Methyl bromide)	TR	PE-HD	0
		PP	0
Methanol (Methyl alcohol)	TR	PE-HD	
		PP	
Methanesulphonic acid (Methylsulphuric acid), aqueous	≤ 50	PE-HD	
		PP	
Methanesulphonic acid (Methylsulphuric acid), aqueous	> 50	PE-HD	
		PP	
Methyl alcohol (Methanol)	5 %	PE-HD	
		PP	
Methylamine aqueous	32	PE-HD	
		PP	
Methoxybutanol	TR	PE-HD	
		PP	
Methoxybutyl alcohol	TR	PE-HD	
		PP	
Methylbenzoin acids (Toluene acids)	GL	PE-HD	
		PP	
Methyl bromide	TR	PE-HD	0
		PP	0
Methyl chloride	TR	PE-HD	
		PP	0
Methylene chloride (Dichloromethane)	TR	PE-HD	
		PP	
Methyl ethyl ketone	TR	PE-HD	
		PP	
Milk	H	PE-HD	
		PP	
Mineral oil	H	PE-HD	
		PP	
Mineral water	H	PE-HD	
		PP	
Molasses	H	PE-HD	
		PP	
Naphtha	H	PE-HD	
		PP	
Natural gas	TR	PE-HD	
		PP	
N,N-Dimethylformamide	TR	PE-HD	
		PP	
Nickel(II)-chloride	GL	PE-HD	
		PP	
Nickel(II)-nitrate	GL	PE-HD	
		PP	
Nickel salts	GL	PE-HD	
		PP	
Nickel(II)-sulphate	GL	PE-HD	
		PP	
Nicotinic acid	VL	PE-HD	
		PP	

***Note:* Information of PVDF available upon request.**

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C (20 40 60 80 100)
Nitric acid aqueous	VL	PE-HD	
		PP	
Nitric acid aqueous	10 – 50	PE-HD	
		PP	
Nitric acid aqueous	> 50	PE-HD	
		PP	0
Nitrobenzene	TR	PE-HD	
		PP	
Nitrous fumes[2]	GL	PE-HD	
		PP	
2-Nitrotoluene	TR	PE-HD	
		PP	
Octylcresole	TR	PE-HD	
		PP	
Oil of turpentine	TR	PE-HD	
		PP	0
Oils essential	TR	PE-HD	
		PP	
Oils, vegetable and animal	TR	PE-HD	
		PP	
Oleic acid	TR	PE-HD	
		PP	
Oleum ($H_2SO_4 + SO_3$)	TR	PE-HD	0
		PP	0
Oleum fumes	VL	PE-HD	0
		PP	0
Oleum fumes	L	PE-HD	0
		PP	0
Oxalic acid aqueous	GL	PE-HD	
		PP	
Oxygen	TR	PE-HD	
		PP	
Ozone gas[4]	0.5 ppm	PE-HD	
		PP	
Paraffin emulsions	TR	PE-HD	
		PP	
Paraffin oil	TR	PE-HD	
		PP	
Peanut oil	TR	PE-HD	
		PP	
1-Pentanol (n-Amylalcohol)	TR	PE-HD	
		PP	
2-Pentanol (sec-n-Amylalcohol)	TR	PE-HD	
		PP	
Peppermint oil	TR	PE-HD	
		PP	
Perchloric acid aqueous	20	PE-HD	
		PP	
Perchloric acid aqueous	50	PE-HD	
		PP	
Perchloric acid aqueous	70	PE-HD	
		PP	
Perchloroethylene (Tetrachloroethane)	TR	PE-HD	
		PP	
Petroleum	TR	PE-HD	
		PP	
Petroleum ether	TR	PE-HD	
		PP	
Phenol aqueous	5	PE-HD	
		PP	
Phenol aqueous	90	PE-HD	
		PP	
Phenylhydrazine	TR	PE-HD	
		PP	
Phenylhydrochloride	TR	PE-HD	
		PP	
Phosgene gas	TR	PE-HD	
		PP	
Phosgene liquid	TR	PE-HD	0
		PP	0
Phosphates inorganic	GL	PE-HD	
		PP	
Phosphoric acid aqueous	95	PE-HD	
		PP	
Phosphoric acid aqueous	50	PE-HD	
		PP	

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concen-tration %	Material	Temperature °C 20 40 60 80 100
Phosphoric acid (Ortho-)	85	PE-HD	
		PP	
Phosphorus(III)-chloride	TR	PE-HD	
		PP	
Phosphorus oxychloride	TR	PE-HD	
		PP	
Phosphorus pentoxide	TR	PE-HD	
		PP	
Phosphorus trichloride	TR	PE-HD	
		PP	
Photographic developing agents	H	PE-HD	
		PP	
Phthalic acid	GL	PE-HD	
		PP	
Picric acid (2,4,6-Trinitro-phenole)	GL	PE-HD	
		PP	
Pine needle oil	H	PE-HD	
		PP	
Potable water (chlorous)	TR	PE-HD	
		PP	
Potassium aluminium sulphate (Potassium alum)	L	PE-HD	
		PP	
Potassium bicarbonate	GL	PE-HD	
		PP	
Potassium bisulphate	GL	PE-HD	
		PP	
Potassium hydrogen sulphite (Potassium bisulphite)	L	PE-HD	
		PP	
Potassium borate aqueous	1	PE-HD	
		PP	
Potassium bromate aqueous	10	PE-HD	
		PP	
Potassium bromate	GL	PE-HD	
		PP	
Potassium bromide aqueous	GL	PE-HD	
		PP	
Potassium carbonate (Potash)	GL	PE-HD	
		PP	
Potassium chlorate	GL	PE-HD	
		PP	
Potassium chloride aqueous	GL	PE-HD	
		PP	
Potassium chromate aqueous	GL	PE-HD	
		PP	
Potassium chrome (III) sulphate (Chrome alum)	L	PE-HD	
		PP	
Potassium cyanide (Cyanide of potassium)	L	PE-HD	
		PP	
Potassium dichromate aqueous	GL	PE-HD	
		PP	
Potassium ferricyanide and potassium ferro-cyanide, aqueous	GL	PE-HD	
		PP	
Potassium fluoride	GL	PE-HD	
		PP	
Potassium hexacyanoferrate (II) and (III) (yellow and red prussiate of potash)	GL	PE-HD	
		PP	
Potassium hypochlorite	L	PE-HD	
		PP	no value
Potassium iodide	GL	PE-HD	
		PP	
Potassium nitrate aqueous	GL	PE-HD	
		PP	
Potassium perchlorate aqueous	10	PE-HD	
		PP	
Potassium perchlorate aqueous	GL	PE-HD	
		PP	
Potassium permanganate aqueous	6	PE-HD	
		PP	
Potassium permanganate aqueous	20	PE-HD	
		PP	
Potassiumperoxodisulphate (Potassium persulphate)	GL	PE-HD	
		PP	
Potassium phosphate	GL	PE-HD	
		PP	
Potassium sulphate	GL	PE-HD	
		PP	
Potassium sulphide	L	PE-HD	
		PP	
Potatoe-spirit oil	TR	PE-HD	
		PP	

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Propane gas	TR	PE-HD	
		PP	
Propane liquid	TR	PE-HD	
		PP	
Propionic acid aqueous	50	PE-HD	
		PP	
Propionic acid	TR	PE-HD	
		PP	
Propanol-(1) (Propyl alcohol)	TR	PE-HD	
		PP	
Propargylalcohol aqueous	7	PE-HD	
		PP	
Propylene glycol	TR	PE-HD	
		PP	
Pyridine	TR	PE-HD	
		PP	
Roaster dry	any	PE-HD	
		PP	
Salicylic acid	GL	PE-HD	
		PP	
Sea-water (Lake water)	H	PE-HD	
		PP	
Silicic acid aqueous	H	PE-HD	
		PP	
Silicone emulsion	H	PE-HD	
		PP	
Silicone oil	TR	PE-HD	
		PP	
Silver acetate	GL	PE-HD	
		PP	
Silver cyanide	GL	PE-HD	
		PP	
Silver nitrate aqueous	GL	PE-HD	
		PP	
Silver salts	GL	PE-HD	
		PP	
Soaps aqueous	GL	PE-HD	
		PP	
Soda (Sodium bicarbonate)	50	PE-HD	
		PP	
Soda lye (Sodium hydroxide) aqueous	40	PE-HD	
		PP	
Soda lye (Sodium hydroxide) aqueous	60	PE-HD	
		PP	
Sodium acetate	GL	PE-HD	
		PP	
Sodium benzoate	GL	PE-HD	
		PP	
Sodium benzoate aqueous	35	PE-HD	
		PP	
Sodium borate hydrogene peroxide (Sodium perborate)	GL	PE-HD	
		PP	
Sodium bromide	GL	PE-HD	
		PP	
Sodium carbonate	GL	PE-HD	
		PP	
Sodium carbonate aqueous	50	PE-HD	
		PP	
Sodium chlorate aqueous	GL	PE-HD	
		PP	
Sodium chlorite aqueous	2–20	PE-HD	
		PP	
Sodium cyanide	GL	PE-HD	
		PP	
Sodium dichromate	GL	PE-HD	
		PP	
Sodium fluoride	GL	PE-HD	
		PP	
Sodium hexacyanferrat (II) (Sodiumferrocyanide)	GL	PE-HD	
		PP	no value
Sodium hexacyanferrat (III) (Sodiumferricyanide)	GL	PE-HD	
		PP	
Sodium hexametaphosphate	L	PE-HD	
		PP	
Sodium hydrogen sulphite (Sodium bisulphite)	L	PE-HD	
		PP	

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Sodium hydrogene sulphate	GL	PE-HD	
		PP	
Sodium hydrogene carbonate (Sodium bicarbonate)	GL	PE-HD	
		PP	
Sodium hypochlorite aqueous	10	PE-HD	
		PP	
Sodium hypochlorite aqueous	20	PE-HD	
		PP	
Sodium hypochloride (Bleaching lye) 15 % act. Cl_2, aqueous	L	PE-HD	
		PP	
Sodium nitrate	GL	PE-HD	
		PP	
Sodium nitrite	GL	PE-HD	
		PP	
Sodium phosphate (-tri-)	GL	PE-HD	
		PP	
Sodium silicate (Water glass)	L	PE-HD	
		PP	
Sodium sulphide	GL	PE-HD	
		PP	
Sodium sulphate	GL	PE-HD	
		PP	
Sodium sulphite aqueous	40	PE-HD	
		PP	
Sodium tetraborate (Borax)	L	PE-HD	
		PP	
Sodium tetraborate (Borax)	GL	PE-HD	
		PP	
Sodium thiosulphate	GL	PE-HD	
		PP	
Soybean oil	TR	PE-HD	
		PP	
Spindle oil	TR	PE-HD	
		PP	
Spirits of all kinds	H	PE-HD	
		PP	
Starch sirup	any	PE-HD	
		PP	
Starch aqueous	any	PE-HD	
		PP	

Medium	Concentration %	Material	Temperature °C 20 40 60 80 100
Starch sugar (Glucose), aqueous	GL	PE-HD	
		PP	
Stearic acid	TR	PE-HD	
		PP	
Succinic acid	GL	PE-HD	
		PP	
Sulphur dioxide aqueous	any	PE-HD	
		PP	
Sulphur dioxide wet and aqueous	any	PE-HD	
		PP	
Sulphur dioxide gas, dry	any	PE-HD	
		PP	
Sulphur trioxide	TR	PE-HD	0
		PP	0
Sulphurous acid aqueous	any	PE-HD	
		PP	
Sulphuryl chloride (Sulphonyl chloride)	TR	PE-HD	0
		PP	0
Sulphuric acid aqueous	VL	PE-HD	
		PP	
Sulphuric acid aqueous	10 – 50	PE-HD	
		PP	
Sulphuric acid	TR	PE-HD	
		PP	
Tallow	TR	PE-HD	
		PP	
Tannic acid (Tannin) aqueous	10	PE-HD	
		PP	
Tanning extracts of cellulose	H	PE-HD	
		PP	
Tanning extracts vegetable	H	PE-HD	
		PP	
Tartaric acids aqueous	L	PE-HD	
		PP	
Test benzene	TR	PE-HD	
		PP	
Tetrachloroethane	TR	PE-HD	
		PP	

Note: Information of PVDF available upon request.

CHEMICAL RESISTANCE TABLES FOR HDPE (PE-HD) AND POLYPROPYLENE (PP-R)

Medium	Concentration %	Material	Temperature °C 20	40	60	80	100
Tetrachloroethene (Perchloroethylene)	TR	PE-HD					
		PP					
Tetrachloromethane	TR	PE-HD	0				
		PP	0				
Tetrahydrofuran	TR	PE-HD					
		PP					
Tetralin (Tetrahydro-naphthaline)	TR	PE-HD					
		PP	0				
Tin(IV)-chloride	GL	PE-HD					
		PP					
Tin(II)-chloride	GL	PE-HD					
		PP					
Thionyl chloride	TR	PE-HD	0				
		PP	0				
Thiophene	TR	PE-HD					
		PP					
Toluene	TR	PE-HD					
		PP					
Transformer oil (Insulating oil)	TR	PE-HD					
		PP					
Trichloroacetic acid aqueous	50	PE-HD					
		PP					
Trichloroethylene (Trichloroethene)	TR	PE-HD					
		PP					
Tricresyl phosphate	TR	PE-HD					
		PP					
Trietanolamine	L	PE-HD					
		PP					
Trioctyl phosphate		PE-HD					
		PP					
Urea aqueous	L	PE-HD					
		PP					
Urea aqueous	GL	PE-HD					
		PP					
Urine		PE-HD					
		PP					

Medium	Concentration %	Material	Temperature °C 20	40	60	80	100
Vinegar (Wine vinegar)	H	PE-HD					
		PP					
Vinyl acetate	TR	PE-HD					
		PP					
Vinylidene chloride (1,1-Dichloro-ethylene)	TR	PE-HD	0				
		PP	0				
Water pure	H	PE-HD					
		PP					
Wines and spirits	H	PE-HD					
		PP					
Wine vinegar (edible vinegar)	H	PE-HD					
		PP					
Xylene (all isomers)	TR	PE-HD					
		PP	0				
Yeast	GL	PE-HD					
		PP					
Yeast bitter	H	PE-HD					
		PP					
Zinc carbonate	GL	PE-HD					
		PP	no value				
Zinc chloride aqueous	GL	PE-HD					
		PP					
Zinc oxyde	GL	PE-HD					
		PP					
Zinc salts	GL	PE-HD					
		PP					
Zinc sulphate aqueous	GL	PE-HD					
		PP					

Symbols:
[1] penetration of HCl possible
[2] oxidizing
[3] penetration of HF possible
[4] medium might cause stress cracking
[5] penetration of HBr possible

Note: Information of PVDF available upon request.

APPENDIX D

ACTION RESPONSE LEVEL CALCULATIONS

ARL's with average depth → $h_w = 6.7\ ft$ $(7ft + 1.7ft - 2ft)$
$= 2.04\ m$

$\boxed{\text{ARL 1}}$

$$Q = (0.6)(3.1\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)\sqrt{(2)(9.8\,m/s^2)(2.04\,m)}$$

$$= 1.176\times10^{-5}\ m^3/s$$

$$Q = (1.176\times10^{-5}\ m^3/s)(2.642\times10^{2}\ gal/m^3)(86{,}400\ s/day)$$

$$= 268.47\ gal/day\text{ - per acre}$$

$$= (268.47\ gal/day)(20\text{ acres}) = \underline{\underline{5{,}369.48\ gal/day\text{-per impoundment}}}$$

$\boxed{\text{ARL 2}}$

$$Q = (0.6)(11.3\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)\sqrt{(2)(9.8\,m/s^2)(2.04\,m)}$$

$$= 4.29\times10^{-5}\ m^3/s$$

$$Q = (4.29\times10^{-5}\ m^3/s)(2.642\times10^{2}\ gal/m^3)(86{,}400\ s/day)$$

$$= 978.63\ gal/day\text{ - per acre}$$

$$= 978.63\ gal/day)(20\text{ acres}) = \underline{\underline{19{,}572.64\ gal/day\text{-per impoundment}}}$$

Assumptions:

1. All four basins are the same size
   630.5 ft × 1283 ft (worst case)

7 ACRE IMPOUNDMENT

ARLs with average depth → $h_w = 6\ ft$ (7ft + 1.04ft − 2ft)
$= 1.84\,m$

$\boxed{\text{ARL 1}}$

$$Q = (0.6)(31\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)\left(\sqrt{(2)(9.8\,m/s^2)(1.84\,m)}\right) = 1.12\times10^{-5}\,m^3/s$$

$$= (1.12\times10^{-5}\,m^3/s)(2.642\times10^2\,gal/m^3)(86{,}400\,s/day) = 254.97\,gal/day\text{-per acre}$$

$$= (254.97\,gal/day)(7\text{ acres}) = \underline{\underline{1{,}784.8\,gal/day\text{-per impoundment}}}$$

$\boxed{\text{ARL 2}}$

$$Q = (0.6)(11.3\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)\sqrt{(2)(9.8\,m/s^2)(1.84\,m)} = 4.07\times10^{-5}\,m^3/s$$

$$= (4.07\times10^{-5}\,m^3/s)(2.642\times10^2\,gal/m^3)(86{,}400\,s/day) = 929.42\,gal/day\text{-per acre}$$

$$= (929.42\,gal/day)(7\text{ acres}) = \underline{\underline{6{,}506\,gal/day\text{-per impoundment}}}$$

Assumptions:

1. Impoundment is 7acres in size.

The following example, which utilizes the above equation and constraints, is provided for a 5 acre area impoundment containing a maximum liquid depth of 10 feet.

Conversion factors: 1 ft = 0.3048 ft/m
1m³ = 2.642 * 10 ² gal
1 sec = 86,400 sec/day

Action Response Level #1:

$$Q=C_R\ a\ \sqrt{2gh_w}$$

$$Q=(0.6)(3.1mm^2)\left(\frac{1m^2}{1*10^{+6}mm^2}\right)\sqrt{2(9.8\frac{m}{s^2})(3.1m)}$$

$$Q=(0.6)(3.1*10^{-6}m^2)\sqrt{60.76\frac{m^2}{s^2}}$$

$$Q=(1.86*10^{-6}m^2)(7.80\frac{m}{s})$$

$$Q=1.45*10^{-5}\frac{m^3}{s}$$

$$Q=(1.45*10^{-5}\frac{m^3}{s})(2.642*10^2\frac{gal}{m^3})(86,400\frac{s}{day})$$

$$Q=331\frac{gal}{day}$$

For a five acre impoundment:

$$Q=5*331\frac{gal}{day}=1,655\frac{gal}{day}$$

Action Response Level #2:

$$Q=C_R\,a\ \sqrt{2gh_w}$$

$$Q=(0.6)(11.3mm^2)\left(\frac{1m^2}{1*10^{+6}mm^2}\right)\sqrt{2(9.8\frac{m}{s^2})(3.1m)}$$

$$Q=(0.6)(11.3*10^{-6}m^2)\sqrt{60.76\frac{m^2}{s^2}}$$

$$Q=(6.78*10^{-6}m^2)(7.80\frac{m}{s})$$

$$Q=5.29*10^{-5}\frac{m^3}{s}$$

$$Q=(5.29*10^{-5}\frac{m^2}{s})(2.642*10^2\frac{gal}{m^3})(86,400\frac{s}{day})$$

$$Q=1,207\frac{gal}{day}$$

For a 5 acre area impoundment:

$$Q=5*1,207\frac{gal}{day}=6,035\frac{gal}{day}$$

As all impoundments vary in size, and it is necessary to calculate the Action Response Levels for each impoundment. **Please include a copy of all calculations with the completed model permit application.**

APPENDIX E

FACILITY DISCHARGE CALCULATIONS

DISCHARGE TO GW FROM ALL 5 EVAP PONDS:

Assumptions:

1. Area of hole is assumed to be $10\,mm^2$ (recommended hole size from BADCT Guidance Document, 1996; page 53)
2. Assume that one hole per acre ($4{,}000\,m^2$) occurs
3. Assume good contact between liner and low perm. soil.
4. Assume $K_S = 1 \times 10^{-6}$ cm/sec for the low perm. soil.
5. Assume 1 ft of head.

Equation 14: (from A.5.4 Leakage Through Liner System - BADCT, p.52)

$$Q = 0.21\,(0.01\,m^2)^{0.1}\,(0.3048\,m)^{0.9}\left[(1\times10^{-6}\,cm/sec)\left(\frac{1\,m}{100\,cm}\right)\right]^{0.74}$$

$$= (5.47\times10^{-8}\,m^3/s)(2.642\times10^{2}\,gal/m^3)(86{,}400\,s/day)$$

$$= 1.25\,gal/day$$

$$Q = (5\text{ ponds})(1.25\,gal/day) = \underline{\underline{6.25\,gal/day}}$$

punctures or in the initiation of tears. HDPE has a high chemical resistance over a wide pH range.

VLDPE is manufactured through extrusion of molten resin. The material is delivered in rolls and typical liner thickness are 40 mil, 60 mil and 80 mil. Other thickness can be specified and manufactured upon request.

VLDPE is a highly flexible material, generally having the highest interface shear strength and puncture resistance of the comparable geomembranes. No specific yield point is present with break occurring at an elongation of approximately 1000 percent uniaxial, and approximately 300 percent biaxial. The chemical resistance of VLDPE is similar to that of HDPE.

The flexible nature of VLDPE makes it highly resistant to impacts of sharp edges on crushed materials. It's thermal expansion behavior is similar to that of HDPE.

A.5.4 Leakage Through Liner Systems

Seepage losses through clay liners are controlled by slow mass liquid flow through the pores of the clay layer. The lower the hydraulic conductivity of the clay layer, the lower this mass flow, until it is finally primarily controlled by physicochemical considerations, and flow takes place by diffusion. In general, the seepage through a clay liner can be calculated using Darcy's equation:[1,4,5,6,7]

$$Q=kiA$$

where:

Q	=	seepage quantity;
k	=	hydraulic conductivity;
i	=	seepage gradient; and
A	=	surface area through which seepage takes place.

Water vapor transmission can occur through intact geomembrane liners. An equivalent hydraulic conductivity for vapor transmission through geomembrane liners, estimated using Darcy's equation, is in the order of 1×10^{-11} cm/sec.

The calculation of a leakage rate through a geomembrane liner is more difficult because its magnitude depends on the size and shape of the opening in the liner, as well as the material underlying and overlying the liner. Empirical equations have been proposed for calculating leakage rates through holes in geomembrane liners:

Rate of leakage due to defects in geomembranes overlain and underlain by high permeability materials (e.g. impoundment primary liners with geonet, or other high-permeability leak collection system):

$$Q = C_B a(2gh)^{0.5} \quad [2]$$

Rate of leakage though a geomembrane resting on high permeability material and overlain by a medium permeability drainage material (e.g. heap leach pad liner overlain by ore and underlain by a leak collection system):

$$Q = 3a^{0.75}h^{0.75}k_d^{0.5} \quad [3]$$

Rate of leakage through a composite liner with a hole in the geomembrane, good contact between geomembrane and clay (e.g., synthetic liner on clay):

$$Q = 0.21\, a^{0.1}h^{0.9}k_s^{0.74} \quad [4]$$

In equations 2 to 4, the symbols are defined as follows:

Q = steady state rate of leakage through one hole in geomembrane layer (m^3/s)
C_B = dimensionless coefficient, $C_B = 0.6$
g = acceleration of gravity, $g = 9.81\ m/s^2$
a = area of the hole in the geomembrane (m^2)
h = head of liquid on top of the geomembrane (m)
k_s = hydraulic conductivity of the low permeability soil underlying the geomembrane (m/s)
k_d = hydraulic conductivity of the drainage material overlying the geomembrane (m/s)

The leakage rate through a hole in a geomembrane member of a composite liner is considerably lower than that through other boundary conditions. The water vapor transmission through a geomembrane may result in higher losses per acre than the leakage through a composite liner.

As was intuitively illustrated earlier, quantitative evaluations of equations 1 to 4 show that if the synthetic liner is underlain by a low permeability layer, the leakage rate through a hole in the synthetic liner will be much lower than that through a hole in a freely drained single synthetic liner. The same is true for a single (non-composite) clay layer. In a composite liner, the hole restricts the flow into the clay liner to a small area and flow into the clay therefore takes place under unsaturated flow conditions. The behavior of the synthetic and clay liner composite is, therefore, more beneficial than that of any layer by itself.

Leakage through liner systems can be estimated using equations [1] to [4] above. Based on research in the solid waste and hazardous waste industries, as well as experience in the mining industry, it is recommended that a hole size of $10mm^2$ be used in the evaluations with the assumption that one hole per acre occurs.

APPENDIX F

SOIL LOGS AND MONITORING WELL CONSTRUCTION

SOIL LOGS FROM SITE CHARACTERIZATION ACTIVITIES ASSOCIATED WITH THE GILA BEND REGIONAL LANDFILL

MALCOLM PIRNIE, INC.

Boring No. 101

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*southeast corner section 36*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*11-8-95*	DRILLER	*Mark Stroud*
FINISH DATE	*11-8-95*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty sand with gravel, dry (no recovery w/o catcher)	SM	7/8/8	
10	fine sand, moist	SP	8/11/12	
	@ 15' fine sand with silt, moist	SM/ SP	9/11/14	
20	clay with silt,slight to med PI, moist	ML/ CL	10/19/21	static water @ 21.7' bls
	@ 25' silty clay, trace sand, slight to med PI, very moist		10/12/16	ring sample collected @ 21'
30	as above with trace of gravel		12/17/24	
	@ 35' silty clay sand, fine sand, very moist to wet	SM/ SC	9/13/14	
40	fine sand, wet, trace of silt and clay	SP		
	total depth 40 '			
50	Note: Irrigation pond within 300 yds. of boring, may influence groundwater level in area.			
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No 102

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	southwest corner section 23	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	11-8-95	DRILLER	Mark Stroud
FINISH DATE	11-8-95	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty sand trace gravel, fine grain sand, dry	SM	3/4/4	
10	silty gravelly sand, well graded, dry	GM	11/15/18	
	@ 15' silty clay/clayey silt, low to med PI, dry		30/50	
20	as above, increasing moisture	ML/ CL	24/50	
	@ 25' as above		9/13/14	
30	as above, very moist		12/15/18	
	@ 35' silty fine sand, very moist	SM	9/16/23	static water @ 34.6' bls
40	sand with gravel, well graded, wet	SW	16/22/25	
	total depth 40 '			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 103

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*northeast corner of section 23*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*11-8-95*	DRILLER	*M. Stroud*
FINISH DATE	*11-8-95*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty sandy gravel, weak cementation, dry, cobbles present		17/23/31	
10	as above	GM	17/19/17	
	@ 15' as above, increasing cobbles and gravel no recovery		50 for 4"	
20	as above no recovery		50 for 3"	
				auger refusal @ 23'
	total depth 23 '			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 104

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	northwest corner of section 24	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	11-8-95	DRILLER	M. Stroud
FINISH DATE	11-8-95	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silt sand and gravel, dry	GM	28/21/26	
10	silty clay, low to med PI, damp		14/25/25	
	@ 15' as above, increasing moisture	ML/CL	6/8/10	
20	as above		3/5/7	
	@ 25' as above, very moist, trace of sand		3/4/6	
30	silty clay, very moist		3/6/6	
	@ 35' sandy silty clay, low PI, wet	ML	11/12/12	depth to water 32'
40	silty clay trace sand, low PI, wet		5/9/10	
	@45' clay with silt, med PI, wet	CL	9/9/9	
50	clayey sand, fine grained sand, wet	SC		
	total depth 50 '			
60				
70				

MALCOLM PIRNIE, INC.

Boring No. 104A

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	northwest center section 24	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-4-95	DRILLER	Mark & Kit
FINISH DATE	12-4-95	HYDROGEOLOGIST	Bill Kozuh (CWI)

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	augered to 15', no sampling			
10				
	@ 15' brown clay and silt, trace gravel		15/20	1 ring collected
			12/22	
		CL		2 rings collected
20	as above		2/9	
				2 rings collected
	total depth 21 '			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 105

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*northeast corner of section 24*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*11-8-95*	DRILLER	*M. Stroud*
FINISH DATE	*11-8-95*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt with gravel, damp	GM	11/11/13	
10	as above		4/8/9	
	@ 15' sandy silty clay, low PI, moist	ML	8/8/9	
20	fine sand trace silt, saturated	SP	5/6/9	depth to water 19.5'
	total depth 20 '			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 106

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*northeast corner of section 31*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*11-8-95*	DRILLER	*M. Stroud*
FINISH DATE	*11-8-95*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty sand/sandy silt, fine grained sand, trace gravel, dry	SM/ ML	8/7/7	
10	silty fine grain sand, trace gravel, dry	SM	5/5/5	
	@ 15' as above		13/11/8	
20	as above		10/23/24	depth to water 33.5'
	@ 25' as above		20/50=5"	
30	Silty gravelly sand, moist	GM	26/50=3"	
	as above - wet		50 for 3"	
	total depth 35 '			
40				
50				
60				
70				

MALCOLM PIRNIE, INC.

Boring No. 107

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	southeast corner of section 35	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	11-8-95	DRILLER	M. Stroud
FINISH DATE	11-8-95	HYRDOGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty clay/clayey silt trace sand, low PI, damp		4/5/5	
		ML		
10	as above, some cementation, low to med PI		6/10/12	
	@ 15' as above		11/12/14	
20	silty sandy clay, slight PI, moist		10/17/24	
	@ 25' as above, no recovery		14/16/18	
30	Sand trace silt, very moist	SP	6/12/12	
	@ 35' fine to med sand, trace gravel		7/8/9	
40	fine grained sand, very moist		6/8/8	
	@ 45' as above		8/10/15	
50	as above			
				depth to water 52.15'
	@ 55' as above, wet			
	total depth 55 '			
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 201

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*northeast corner of section 26*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*12-1-95*	DRILLER	M. Stroud
FINISH DATE	*12-1-95*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy clayey silt trace qravel, fine grain sand, slight cementation, dry, low PI	ML	9/8/8	
10	fine grain sand, trace silt, damp		5/6/7	
	@ 15' as above, fine and med grained sand		5/8/10	
		SP		
20	as above		13/12/15	
	@ 25' as above, trace gravel and moist		15/50=3"	
	total depth 25 '			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 201a

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	southwest corner of section 24	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-22-96	DRILLER	M. Stroud
FINISH DATE	3-22-96	HYRDOGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
5	@ 5' silty sandy gravel, dry, fine grain sand			
10				
15	trace gravel and damp			
20		GM/ SM		
25	@ 25' sand trace silt, moist			
30		SP		water @ ~29.5'
35	@ 35' same as above, except very moist to wet			
40			24/32/28	
45	@ 45' sand with silt trace gravel and clay	SM		
50			13, 50 for 6"	
	total depth 50'			
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 202

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	north center section 26	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-1-95	DRILLER	M. Stroud
FINISH DATE	12-1-95	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt and clay with gravel, low PI, dry	ML	12/13/13	
10	fine grained sand trace silt, moist	SP	5/7/9	
	@ 15' silty fine and med sand trace gravel, moist, slight cementation	SM	12/12/13	* driller noted silty clay from 12 to 25'
		CL		
20	silty clay, med PI, moist		12/15/15	
	@ 25' as above, moisture increasing		11/12/22	ring collected at 22'
30	fine to med sand, trace of gravel, moist	SP	12/21/20	
	gravelly sand with silt and clay, well graded sand , wet	GM/ GC	15/19/23	capillary fringe @ 35'
	total depth 35 '			
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 203

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*center section 26*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*12-1-95*	DRILLER	*M. Stroud*
FINISH DATE	*12-1-95*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt and clay with qravel, slight cementation, damp	GM	10/14/12	
10	silty sand with gravel, damp to moist	SM	11/10/9	
	@ 15' as above		8/8/9	
20	fine grained sand trace silt, damp		7/11/20	
	@ 25' as above		6/9/8	
		SP		
30	as above, very moist		9/12/13	
	as above, wet		6/8/10	capillary fringe @ 35'
	total depth 35 '			
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 204

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	west center section 26	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-1-95	DRILLER	M. Stroud
FINISH DATE	12-1-95	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt, dry, low to no PI	ML	17/14/18	
10	fine grain sand, trace silt and gravel, damp	SP	5/6/7	
	@ 15' gravelly sand trace silt, well graded, very moist	SW	7/6/6	
20	as above		8/8/12	
	@ 25' fine grained sand trace gravel and silt very moist	SP	13/17/12	water @ 27'
30	Gravelly sand trace silt, wet		8/12/14	
	total depth 30 '			

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 205

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	center section 23	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	1-12-96	DRILLER	M. Stroud
FINISH DATE	1-12-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty sand with gravel, dry, slight to med cementation	GM	6/7/6	
10	fine grained sand trace silt, damp	SP	6/6/5	
	@ 15' as above, wet		4/4/5	water @ 15'
	total depth 15 '			
20				
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 206

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	center section 36	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-4-95	DRILLER	M. Stroud
FINISH DATE	12-4-95	HYDROGEOLOGIST	Bill Kozuh

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@5' brown med sand some silt, some coarse sand, dry	SM	6/8/8	
10	brown fine sand, some silt, dry		5/9/8	
	@ 11' becomes brown silt, trace clay, dry			
	@ 15' brown coarse sand, trace gravel, dry	ML	5/6/5	
		SP		
20	brown med sand trace silt, slightly damp		5/5/10	
	total depth 20 '			* no water noted
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 207

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	west center section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-4-95	DRILLER	Mark & Kit
FINISH DATE	12-4-95	HYDROGEOLOGIST	Bill Kozuh

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' brown silt, some sand, trace clay, dry	ML	8/10/12	
10	buff grey silt, trace sand, trace clay, dry		22/35/42	
	@ 14-15' brown med sand, some silt, dry		8/10/14	
	@ 15-16' mottled red, white,grey and brown silt and clay,	SM		
	some sand, dry	CL		
20	@ 20' red brown silt and sand, dry		10/11/13	
		SM		
	@ 25' brown fine sand, some silt, slightly damp with 2" red clay seam		6/8/9	
	total depth 26.5 '			
30				* no water noted
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 208

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	center section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-4-95	DRILLER	Mark & Kit
FINISH DATE	12-4-95	HYDROGEOLOGIST	Bill Kozuh

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' brown caliche, 3" recovery		11/12/13	
10	brown very fine sand some silt, dry	SM	7/9/12	
	@ 15' brown med to fine sand with red rust (oxidation), some silt ,dry		10/9/11	
20	@ 20' brown med and fine sand, some silt, moist		12/12/13	
	total depth 21.5 '			
30				* no water noted
40				
50				
60				
70				

MALCOLM PIRNIE, INC.

Boring No. 209

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	east center section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-4-95	DRILLER	Mark & Kit
FINISH DATE	12-4-95	HYDROGEOLOGIST	Bill Kozuh

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' red brown fine sand, some silt, dry		4/5/5	
10	as above	SM	4/5/7	
	@ 15' as above		4/7/8	@ 17' a 10" clay seam noted by driller
20	as above		6/10/13	
	total depth 21.5 '			* no water noted
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC. Boring No. 210

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	south center section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-4-95	DRILLER	Mark & Kit
FINISH DATE	12-4-95	HYRDOGEOLOGIST	Bill Kozuh

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' red brown silt and sand with caliche seams, dry	SM	16/17/22	
10	Brown sand and gravel some silt , dry	GM/	6/7/8	
	@ 15' brown med sand trace silt, dry	SM	4/6/8	
20	red brown silt and clay, dry		15/18/50=6"	
	@ 25' brown silt and clay, dry	CL	20/27/32	collect 2 ring samples
30	brown fine sand, some silt, dry	SM	13/18	
	total depth 31 '			* no water encountered
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 211

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	northeast corner section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	12-4-95	DRILLER	Mark & Kit
FINISH DATE	12-4-95	HYDROGEOLOGIST	Bill Kozuh

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' brown silt and sand trace gravel, dry	SM	13/12/11	
10	brown silt, trace coarse and med sand, dry	ML	10/12/14	@ 8'driller noted coarse gravel
	@ 15' brown/grey med and coarse sand and silt, dry	SM	17/36/12	
20	brown sand, slightly damp	SP	31 for 1"	cobble ?, refusal ?
	total depth 21.5 '			
30				* no water encountered
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 301

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*HSA (0-74') Rotary (74'+)*
LOCATION	*southwest corner section 25*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*2-19-96*	DRILLER	*Kevin*
FINISH DATE	*2-19-96*	HYDROGEOLOGIST	*D. Spoelman & D. Sweeten*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	silt trace sand and gravel, dry (0-4')	ML		
	@ 5' sand trace silt and gravel, dry, well graded	SW	3/4/4	
		SM		
10	sand with silt, trace gravel, dry		7/7/8	
	@ 15' sand trace silt, with gravel, dry	SW	14/20/20	Note:
				Soil profile taken from log collected from
20	sand tracesilt, fine sand, dry	SP	3/4/6	MW-4, drilled 10/4/95 (0-74' bls)
	@ 25' as above		2/3/3	
				No sampling until 78'
		SM		
30	sand with silt, damp		3/7/11	
	@ 35' fine to med sand, very damp, some clay noddles		15/10/7	
				<static water
40	fine to med sand, trace silt and gravel, wet		4/9/11	@38.6'
	@ 45' as above		4/8/10	
50	fine to med sand, trace gravel, wet	SP	17/30/27	
	@ 55' as above			
60	gravelly sand, med to coarse, wet		12/19/45	
	@ 65' as above			
70	gravelly sand, well graded. wet	SW		
				HSA refusal @ 74'

MALCOLM PIRNIE, INC.

Boring No. 301 (cont.)

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	HSA (0-74') Rotary (74'+)
LOCATION	southwest corner section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	2-19-96	DRILLER	Kevin
FINISH DATE	2-19-96	HYDROGEOLOGIST	D. Spoelman & D. Sweeten

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
		SW		* drill to 70' without sampling ** switch to mud rotary at 70'
	@ 78' sandy gravel, trace silt and coarse sand	GP	100=3"	
80				
				-> 84' out of gravel layer
	@ 88' fine grain sand, with silt and gravels	GM	10/19/21	
90				
	@ 91' silt with clay and sand, very stiff, no gravel	ML	12/12/16	
100				
	med to fine sand, wet , hard	SP	47/38/38	
	@102' silty clay, dry hard, med PI	CL		start of lower clay unit
110				
	clay, dry, brown-white, hard, med to high PI		12/16/21	
120				
		CL/ CH		111' to 146' no change silty clay or clay
130				
140				
	@ 146' brown clay, damp, med to high PI		62/46/30	

MALCOLM PIRNIE, INC. Boring No. 301(cont.)

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*HSA (0-74') Rotary (74'+)*
LOCATION	*southwest corner section 25*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*2-19-96*	DRILLER	*Kevin*
FINISH DATE	*2-19-96*	HYDROGEOLOGIST	*D. Spoelman & D. Sweeten*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 146' brown clay, damp, med to high PI		62/46/30	
150		CL/ CH		
160				
170				return flow becoming more grittyier (sp?) [sand concentration increasing]
180				
190				
200	sandy clay/clayey sand			
	total depth of boring = 200'			
210				

SHEET 3 OF 3

MALCOLM PIRNIE, INC.

Boring No. 302

BORING LOG

CLIENT Continental Waste Industries of AZ
PROJECT # 2602-002
PROJECT Gila Bend Regional Landfill
DRILLING METHOD Hollow stem auger
LOCATION northeast corner section 25
DRILLING CONTRACTOR Heber Ex. & Mining
START DATE 2-21-96
DRILLER Kevin
FINISH DATE 2-21-96
HYDROGEOLOGIST D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' light brown gravelly sand with silt	GM	32/22/21	
10	fine to med sand, trace gravel and silt	SP	5/7/7	
	@ 15' gravelly sandy silt		50=4"	
20	as above	GM	50=3"	
	@ 25' silty sandy gravel		50=4"	groundwater @ 25'
30	silty gravelly sand		50=4"	
	@ 35' sand with gravel well graded	SW	50=4"	
40	clayey sand, cobbles and large gravel, wet	SC	36/50=2"	
	@ 45' clayey sand (fine grained)		47/50=5"	
50	Clay (fat & containg organic noddles) with sand lenses (~6") , wet		15/24/22	
60	clay, high PI, moist to damp	CH	15/18/18	
70	red clay, trac gravel, high PI, slightly damp		10/16/19	

MALCOLM PIRNIE, INC. Boring No. 302 (cont.)

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	HSA
LOCATION	northeast corner section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	2-21-96	DRILLER	Kevin
FINISH DATE	2-21-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	red clay	CH		
80	sandy clay/clayey sand, med PI clay, wet, sand and clay lenses ~3 to 6"	CL/ SC	32/25/25	varves in sand
90	silty (25%) and fine grained sand, wet		19/20/23	
100	silty fine grain sand, trace clay nodules, trace gravel wet		10/14/19	
		SM		
110				
120	silty (25%) fine grained sand, wet		15/20/22	
				hit clay at 125'
130				clay lenses 125' to 130'
140	silty clay, med to High PI, damp	CL	15/21/25	

MALCOLM PIRNIE, INC.

Boring No. 302 (cont.)

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	HSA
LOCATION	northeast corner section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	2-21-96	DRILLER	Kevin
FINISH DATE	2-21-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
150				
160	clay , med to high PI, damp	CL/ CH	14/16/20	
170				~170' hit low drilling pressure zone (sands and silts)
180	coarse grained sandy clay/clayey sand, trace gravel	CL/ SC	18/24/30	
190				
200	clayey sand (fine grained) , wet	SC	21/26/30	
	total depth 200'			
210				

SHEET 3 OF 3

MALCOLM PIRNIE, INC.

Boring No. 303a

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow stem auger*
LOCATION	*northwest corner section 25*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*2-26-96*	DRILLER	*M. Stroud*
FINISH DATE	*2-26-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silty gravel, light brown, moist	GM	11/8/6	
10	gravelly silt with sand, light brown, moist		8/6/6	
	@ 15' silt, sand and gravel, dry		6/6/7	
20	silty fine grained sand, trace gravel, dry	SM	8/11/12	
	@ 25' as above		10/14/15	
30	as above, except trace clay and moist		12/14/12	
	@ 35' silty clayey sand, trace gravel, very moist	SM/ SC	11/11/14	
40	fine to med grained sand with silt, wet	SM	19/31/25	groundwater @ 37'
	@ 45' as above		50=6"	
50	as above		3/13/21	
60	as above with trace of clay		50=6"	
70	No Return		10/16/19	Lost Hole ! tring to sample at at 80' bls, flowing sands
	*** @ 80' bls CLAY, med to high PI (no sample collected - sample off of lead bit teeth)			

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 304

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	HSA (0-100') Mud Rotary (100+)
LOCATION	@ B-207	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	4-18-96	DRILLER	Randy
FINISH DATE	4-19-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
				logged from cuttings 0-100'
	@ 5' sand silt and gravel, damp			
		GM		
10	as above			
	@ 15' same as above			
20	sand trace silt, fine sand, moist			
	@ 25' as above			No sampling until 100'
		SP		
30	same as above except very moist to wet			
	@ 35' as above			
				<static water @29.6' recorded after boring completed
40	silty sand fine grain sand, wet			
	@ 45' as above			
50	as above	SM		
	@ 55' as above			
60	as above except cemented from 60-65'			
	@ 65' as above			
70	as above			

MALCOLM PIRNIE, INC.

Boring No. 304 (cont.)

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	HSA (0-100') Rotary (100'+)
LOCATION	at B-207	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	4-18-96	DRILLER	Randy
FINISH DATE	4-19-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 75' as above	SM		
80	as above			
	@ 85' clayey silty sand	SM/ SC		
90	@ 90' clay			according to driller hit clay at app. 87'
	@ 95' as above	CL		
100	clay, damp to moist, med to high PI, very stiff, red brn		28,29,30	
	@105' as above except slightly damp to damp	CL/ CH	11,19,21	
110	as above		10,17,25	
			20,42,37	hit hard dry clay @ 114'
	@ 115' clay, brn red, with white cemented nodules, very stiff, some cementation, high PI, slightly damp			
120	as above		35, 50 for3"	
	@125 'as above	CH	29,49,50	
130	as above		25,30,33	
	@ 135 as above		22,24,33	
140	as above		14,15,40	
	@ 145' clay, with interbedded sand lenses, 6"-12" thick fine grain sand lenses		21,25,50	

MALCOLM PIRNIE, INC.

Boring No. 304(cont.)

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	HSA (0-100') Rotary (100'+)
LOCATION	at boring 207	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	4-18-96	DRILLER	Randy
FINISH DATE	4-19-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
150	clay, hard dry, cementation present, only 2"-3" of recovery in sampler	CL/CH	98,47,50	out of clay layer at approximately 152'
	@ 155' silty sand, fine grain sand, moist to very moist	SM	30,32,36	
160	as above			
	sand with silt, fine to med. grain sand very moist to wet		26, 33,34	
	TDB =165'			
170				
180				
190				
210				

SHEET 3 OF 3

MALCOLM PIRNIE, INC.

Boring No. 305

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*HSA (0-125') Mud Rotary (125+)*
LOCATION	*at B-209*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*4-29-96*	DRILLER	*Randy*
FINISH DATE	*5-2-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sand silt and gravel, dry	GM		logged from cuttings 0-100'
10	silty sand, fine grain sand, dry to slightly damp			
	@ 15' same as above			
20	sand with silt, fine sand, moist	SM		
	@ 25' as above			No sampling until 100'
30	same as above except very moist to wet			
	@ 35' as above			
40	gravelly silty sand fine grain sand, wet			
	@ 45' as above			
50	as above	GM		
	@ 55' as above			
60	silty sand, some cementation			
	@ 65' as above			
70	as above	SM		

MALCOLM PIRNIE, INC.

Boring No. 305 (cont.)

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*HSA (0-125') Rotary (125'+)*
LOCATION	*at B-209*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*4-29-96*	DRILLER	*Randy*
FINISH DATE	*5-2-96*	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 75' as above	SM		
80	as above			
	@ 85' as above			
90	cemented silt and sand			according to driller hit cemented layer @90-92'
	@ 95' silty sand			
100	silty clay, very moist, low to med. PI, bm		13,33,42	
	@105' as above	CL/ ML	33,37,45	
110	as above		62	ring sample @ 110' and 115'
			165	
	@ 115' silty sand, fine grain sand, very moist to wet interbedded 3"-6"silty sand and clay lenses			
120	as above		21,28,40	
	@125 'as above	SM/ CL	17,22,33	
130	clayey sand trace gravel, well graded sand, very moist		15,17,23	
	@ 135' silty clayey sand, very moist, gravel lenses fine grain sand	SM/ SC	19,23,29	
140	@140' interbedded silty sand and sandy clay, fine grain sand and stiff clay, some cementation		50 for 3"	
	@ 145' as above	SM/ CL	19,30,42	

MALCOLM PIRNIE, INC.

Boring No. 305(cont.)

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*HSA (0-125') Rotary (125'+)*
LOCATION	*at boring 209*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*4-29-96*	DRILLER	*Randy*
FINISH DATE	*5-2-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
		SM/ SC		
150	clay, slightly damp to damp, high PI, red brn.		19,24,30	
	@ 155' sandy clay/clayey sand interbedded 6" lenses fine grain sand, slight PI clay, moist	SC/ CL	127 for 10"	ring @155'
160	@ 160' silty clay, brn., damp, med. PI	CH/ CL	12,16,24	
	@ 165 clay, med. PI, slightly damp		26, 33,3	sampling every 10-15'
170	as above			
	@ 175' clay, fat hard slightly damp to dry, red brn.		100 for 9"	ring sample @ 175'
180	as above			
	@ 185'silty clay, trace fine grain sand, damp, slight to med. PI		100 for 9"	ring sample @ 185
190	as above			
	@ 195' as above except no sand	CL	32,41,50	
200	as above			
	@ 205' as above			
210	silty clay trace sand, hard dry clay nodules,cemented brn., damp, slight to med. PI		44, 50 for 10"	

CLIENT	Continental waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	^HSA (0-125') Rotary (125'+)
LOCATION	at boring 209	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	4-29-96	DRILLER	Randy
FINISH DATE	5-2-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
		CL		
	@215 ' as above			
220	as above			
	@ 225' as above except with sand lenses			
230	silty clay trace sand, brn, moist to very moist, slight PI		14,19,29	
	@ 235' clayey sand			
240	as above			
		SC		
	@ 245' as above			
250	as above			
	@ 255' sand with gravel and silt			
260	sand with gravel, wet well graded sand		47,75	
	TDB= 260			

SHEET 4 OF 4

MALCOLM PIRNIE, INC.

Boring No. 306

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	HSA (0-135') Mud Rotary (135+)
LOCATION	same as B-208'	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	4-22-96	DRILLER	Randy
FINISH DATE	4-26-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
				logged from cuttings
	@ 5' sand silt and gravel, dry	GM		0-75'
10	silty sand, fine grain sand, dry to slightly damp			
	@ 15' same as above			
20	sand with silt, fine sand, moist	SM		
	@ 25' as above			
				No sampling until 75'
30	same as above except very moist			
	@ 35' as above except trace gravel			
40	gravelly silty sand fine grain sand, wet			
	@ 45' as above			
		GM		
50	sand trace silt, wet, fine grain sand			
	@ 55' as above			
		SP		
60	clayey sand, fine to med. grain sand			
	@ 65' as above			
		SC		
70	as above			

MALCOLM PIRNIE, INC.

Boring No. 306 (cont.)

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*HSA (0-135') Rotary (135'+)*
LOCATION	*at B-208*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*4-22-96*	DRILLER	*Randy*
FINISH DATE	*4-26-96*	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES

	@ 75' sandy clay, brown, very moist, well graded sand,			
	med. PI clay	CL		no recovery at 75'
80	clayey sand, fine grain sand, very moist		21,49,36	
		SC	29,36,50	interbedded sand
	@ 85' as above			and clay lenses
				75'-100' (6-12" thick)
90	clay with sand lenses, interbedded 6" lenses		50 for 3"	
	moist clay, trace gravel, some cementation, med. PI clay			
		CL		
	@ 95' as above		39,29,30	
100	clay with fine grain sand, med. to high PI,		47,37,35	
	damp with dry pockets, some cementation			
	@105' clay, stiff, dry, med. to high PI	CL/	70 for 6"	ring @ 105
		SC		
110	clay and sand, 6" interbedded lenses, fine grain sand		90 for 12	ring sample @ 110'
	med PI damp clay; very moist sand			115', 120', 125'
				and 130'
	@ 115' clayey sand with clay lenses, fine grain sand,		125 for 6"	
	very moist sand			
120	as above, except some silt present		144 for 12"	no recovery
				@ 120'
		SM/		
	@125 'silty sand, wet fine to med. grain sand	SC	165 for 12"	
130	silty clayey sand trace gravel		170 for 12"	
	@ 135' silty clayey sand, wet, fine to med. sand		29,38,40	
140	@140' interbedded clay and gravelly sand, 6" beds	SP/	137 for 12"	
		CL		ring @ 140', 145',
	@ 145' clay, red bm, slightly damp to damp	CL/	120 for 12	150, and 160'
	med. to high PI	CH		

MALCOLM PIRNIE, INC.

Boring No. 306(cont.)

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	HSA (0-135') Rotary (135'+)
LOCATION	at boring 208	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	4-22-96	DRILLER	Randy
FINISH DATE	4-26-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
150	clay, with fine grain sand, damp, med. PI, red brn.	CL/ CH	90 for 12	
	@ 155' clay med. to high PI, dry to slightly damp		15,15,20	
160	clay, brn., damp, med. PI		150 for9"	no recovery @ 160'
	@ 165' clay with silt, med. PI, slightly damp to damp		200 for 6"	no recovery with ring
			40,48,70	collected split spoon
170	silty clay, with fine grain sand, med. PI		200 for 10"	@ 165 also
				ring @ 170'
	@ 175' clay, trace sand and gravel slightly damp high PI		250 for11"	ring sample @ 175'
180	silty clay, stiff, slightly damp to dry, med to high PI		275 for 7"	ring@ 180' and 185'
			50 for 12"	ring sample @ 185
	@ 185' as above			
190	as above except 6"sand and gravel lenses present very moist			boring caving-in losing 40' every sample
	@ 195' silty clayey sand			
200	silty clayey sand, wet fine grain sand	SC/ SM	20,24,32	
	TDB=200'			
210				

SHEET 3 OF 3

MALCOLM PIRNIE, INC.

Boring No. 401

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*west center Section 29*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*3-14-96*	DRILLER	*M. Stroud*
FINISH DATE	*3-14-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty sandy gravel	GM		logged from cuttings 0-20'
10	sandy silt	ML		
	@ 15' silty clay med PI, moist	CL		
20	silty clay, med. PI, moist		6/8/13	
	@ 25' clay with silty sandy lenses, clay med to high PI 6" silty sand lenses, wet, interbedded		8/23/16	water @ 25'
	total depth 26'			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 402

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	north center Section 24	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-15-96	DRILLER	M. Stroud
FINISH DATE	3-15-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt, dry	ML		logged from cuttings 0-15'
10	as above, moist, trace clay			
	@ 15' as above		5,5,6	
20	clay with silt, very moist, low to med PI	CL	6,9,11	
	@ 25' silty clayey sand, wet fine grain sand	SM/ SC	6,8,8,	water @ 22'
30	3-6" lenses of clay interbedded with silty sand layers			
		SM/ CL	6,8,11 8,16,21	
	total depth 35'			
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 403

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*N-NW Section 24*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*3-15-96*	DRILLER	*M. Stroud*
FINISH DATE	*3-15-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt, white brown, dry, fine grain sand	ML		logged cuttings 0-10'
10	sand with silt and clay, moist, fine grain sand	SM/ SC	6,6,9	
	@ 15' clay with silt, moist, med. PI, dark brownish red	CL	5,6,7	water @ 16'
20	as above except wet		4,8,8	
	@ 25' clay with 3-6" sand lenses, med. to high PI		3,6,10	
30	as above with interbedded clay and sandy clay lenses		38, 50=3	
	@ 35' silty clayey sand with 6"sand lenses, fine grain sand		50=3	
40	silty sand	SC/ SM		no sample @ 40' logged cuttings
	@ 45' clay with sand lenses, stiff dry clay high PI	CL	14,32,23	
	total depth 45'			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC. Boring No. 404

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	N-NE Section 23	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-19-96	DRILLER	Mark Stroud
FINISH DATE	3-19-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty sandy gravel, dry	GM		logged cuttings 0-20'
10	as above			
	@ 15' sandy silt trace of gravel, fine grain sand, damp	ML		cemented sand and gravel from 16 to 18'
20	silty clay, moist, dark brn. med. PI		9, 11, 13	
	@ 25' clay, wet,red brn. med to high PI, white CaCo nodules present	CL/ CH		water @ 25.4'
30	silty clay with sand, low PI		4, 9, 9	
	@ 35' clay med to high PI			
40	clay trace silt and sand, med. to high PI, very moist		4,6,8	
	@ 45' silty clay trace sand, wet, fine grain sand, med. PI			
50	sand and clay lenses, interbedded 3-6" thick fine grain sand med. PI clay		14,17,19	
	@ 55" as above except trace gravel present 55-58'			
60	as above except clay is dry to damp, sand is wet	CL/ SP	10,10,14	
	@ 65' as above			
70	silty sand and silty clay lenses 6-12" thick	SM/ CL	12,14,14	fine grain wet sand med. PI damp clay
	@ 75' as above			
80' ->	clay, stiff, dry, high PI, with 3" fine grain sand lense	CH	6,12,20	CaCo nodules present

total depth 80'

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 406

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	N-NW Section 23	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-19-96	DRILLER	Mark Stroud
FINISH DATE	3-19-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy gravelly silt, dry, fine gain sand, white	ML		logged cuttings 0-10'
10	sand with silt, damp, fine grain sand, light brn.	SM	4,5,6	
	@ 15' as above except very moist			
20	as above, except trace gravel			water @ 21.1' cementation 21-26'
	@ 25' silty sandy gravel, strong cementation, wet	GM	50=1	no recovery @ 25' refusal @ 26'
	total depth 26'			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC. Boring No. 405

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*North Center Section 25*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*3-19-96*	DRILLER	*Mark Stroud*
FINISH DATE	*3-19-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt grey, damp, slight PI	ML		logged cuttings 0-15'
10	silty sandy gravel, grey, damp, mod. cementation	GM		
	@ 15' silty sand, highly cemented, white, fine grain sand	SM		hit clay @ 16'
20	clay, red brn., very moist, med to high PI	CL/ CH	8,14,13	water @ 21.9'
	@ 25' clay with silt, red brn., med to high PI, wet		4,5,7	
30	as above		11,8,7	
	@ 35'as above, except damp		4,6,9	
40	as above, except very moist and trace sand		10,11,9	
	@ 45' clayey sand, fine grain sand, very moist	SC	15,16,14	
50	sand with silt, fine grain sand, wet	SM	25,23,20	
	@ 55' sand lenses interbedded with 3-6" clay lenses	SP/ CL	14,12,15	
	total depth 55'			
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 407

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	W-NW Section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-18-96	DRILLER	Mark Stroud
FINISH DATE	3-18-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy clay with silt trace gravel, moist, low PI, brn.	CL		
10	sand with silt, fine grain sand, very moist	SM	5,5,7	
	@ 15' as above, except trace gravel and wet		6,4,4	water @ 12.4'
20	silty sand, mod. cemented, white-grey		50=5	
	@ 25' silty sand, wet, grey, fine grained sand, cemented		20,30,28	
30	total depth 28'			
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 408

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*Northcentral Section 23*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*3-21-96*	DRILLER	*Mark Stroud*
FINISH DATE	*3-21-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt with gravel, dry, grey white			logged from cuttings 0-10'
10	as above, except trace clay and moist	GM	18,22,20	water @ 13.5'
	@ 15' sand with silt, fine grain sand, wet, brn.	SM	4,7,7	
20	as above			
	@ 25' as above			
30				
	clay, med to high PI, damp, white/red brn. muddled	CL/ CH	8,14	
	@ 35' clay with silty clay and sandy clay lenses low to med PI, fine grain sand, 6" lenses		11,12,15	
40	clay, red brn., damp to moist, med to high PI		7,8,12	
	@45' as above			
50	clay interbedded with 6" silty sand lenses	CL/ SM	3,5,12	fine grain moist sand med. PI damp clay
	total depth 50'			
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 409

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	NE Center Section 23	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-21-96	DRILLER	Mark Stroud
FINISH DATE	3-21-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt, dry, white	ML		logged cuttings 0-15'
10	as above except damp			
	@ 15' silty sand trace gravel, fine grain sand, very moist	SM	5,6,8	water @ 17.4'
20	sand fine to med. grain, wet, cemented 23-25'	SP	6,11,13	
	@25' as above			
30	clay, red brn. with white brn hard and drier pockets	CH	16,21	
	@ 35' as above			
40	clay interbedded with silty clay and sandy clay lenses	CL/SM	5,9,12	3-6" lenses
	total depth 40'			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 410

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	E-NE Section 23	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-19-96	DRILLER	Mark S.
FINISH DATE	3-19-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' gravelly sandy silt, grey, damp	GM		logged cuttings 0-15'
10	as above			
	@ 15' silty sand, damp, fine grain sand, grey	SM	9,11,10	
20	as above, except wet		8,12,12	
				water @ 24.6'
	@25' cemented silty sand 25-29'			
30	clay, med. to high PI, red brn., very damp	CL/ CH	11,15,25	
	@ 35' as above			
40	silty clay, med. PI, brn., moist		7,8,10	
	@45' clay, med. PI,			
50	clay, med. to high PI, red brn, damp with dry seams		6,8,10	
	@55' as above			
60	silty sand,fine grain sand, mod. cementation	SM	50 = 3	
	@ 65' as above except no cementation			
70	as above		25,25,25	
	total depth 70'			

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 415

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	East Center Section 23	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-20-96	DRILLER	Mark S.
FINISH DATE	3-20-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silt with sand and gravel, damp, grey	GM		logged cuttings 0-30'
10	as above			
	@ 15' as above, except moist and brn.			water @ 15.92'
20	silty sand, fine grain sand, very moist to wet, grey	SM		
	@ 25' as above except wet			
30	sand with silt, fine to med. grain sand		10,18,20	
	@ 35' as above			
40	clayey sand, fine to med. grain sand	SC		
	total depth 40'			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 416

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	East center Section 23	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-21-96	DRILLER	Mark S.
FINISH DATE	3-21-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy gravelly silt, grey white, dry	GM		logged cuttings 0-30'
10	as above, except moist			
				water @ 13.5'
	@ 15' silty clayey sand, fine grained sand, very moist,bm			
20	sand with silt trace clay, wet, fine grained sand	SM/ SC		
	@ 25' as above, except fine to med. grain sand	SM		
30	silty sand with clay lenses, some cementation white nodules present		13, 50=3	
	@ 35' silty sand with gravel, cemented, slow drilling	GM		refusal in cemented sand & gravel @ 45'
40				
	@ 45'			
50				
	total depth 50'			
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 417

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	1/4 mile north of 104	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-22-96	DRILLER	Mark S.
FINISH DATE	3-22-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt with gravel	GM		logged entire boring from cuttings
10	as above			
	@ 15' cemented sand silt and gravel			refusal
	total depth 15'			
20				
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 418

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	1/2 mile north of boring 104	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-22-96	DRILLER	Mark S.
FINISH DATE	3-22-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt, white brn., dry	ML	10,12,16	
10	silt sand and gravel, grey, dry	GM		
	@ 15' as above except moist			
20	sand with silt trace gravel, fine grain sand wet	SM	50=6	water @ 20'
	total depth 20'			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 501

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	W-NW Section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	2-29-96	DRILLER	Mark S.
FINISH DATE	2-29-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy gravelly silt and clay, dry, white & brown	ML	8/7/7	
10	Silty fine to coarse grained sand with gravel, damp	SM	7/7/6	
	@ 15' No Recovery - rock in sampler		4/4/3	
20	fine grained sand with silt, trace gravel, moist		5/5/7	
	@ 25' silty sandy clay , low to med PI, moist	CL	11/21/25	
30	fine grained sand with silt, moist	SM	9/14/19	
	@ 35 as above, with gravel		14/16/14	
40	fine grained sand trace silt and gravel, very moist	SP	19/21/23	water @ 42.7'
	total depth 45 '			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 502

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*W-SW Section 25*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*2-29-96*	DRILLER	*Mark S.*
FINISH DATE	*2-29-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silt with sand and gravel, very moist	ML	6/7/10	
10	fine grain sand trace silt, moist		9/7/7	
	@ 15' as above, increasing moisture - very moist		6/7/7	
		SP		
20	as above		6/7/9	
	@ 25' as above		7/11/16	
30	as abvoe		7/10/12	
	@ 35 as above			water @ 34.6'
	total depth 35 '			
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 503

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	SW Section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-1-96	DRILLER	Mark Stroud
FINISH DATE	3-1-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silt with gravel and sand, light brown, dry	GM	15/11/8	
10	silty fine grain sand, damp	SM	5/5/5	
	@ 15' as above		4/8/9	
20	clay with sand lenses (3" @ 21.5') trace silt, med PI, moist	CL	5/7/16	
	@ 25' fine grained sand with silt, clay lenses (3" @ 25'), moist	SM	6/6/8	
30	as above, without clay lenses		4/5/7	
	@ 35 as above, wet		2/3/4	water @ 35.3'
40	total depth 40 '			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 504

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	SE Section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-1-96	DRILLER	Mark Stroud
FINISH DATE	3-1-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty clay, damp, light brown, low PI	ML	9/7/7	
10	silt and clay with fine grained sand lenses, grey, damp		6/7/8	
	@ 15' fine grained sand with silt, very damp	SM	4/4/4	
20	silty clay lenses interbedded (~3-6" seams) with fine grained sand with silt, moist	SM/ CL	4/6/5	
	@ 25' fine grain sand with silt, moist		4/6/7	
30	silty sand, trace gravel, well graded, very moist	SM	8/6/6	
	@ 35' sand trace silt and clay, well graded, very moist		4/4/4	
40	Sand with gravel and silt, very moist	GM	7/7/7	
	@ 45' as above		5/9/17	water @ 45.3'
50				
	total depth 50 '			
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 505

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	E-SE Section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-1-96	DRILLER	M. Stroud
FINISH DATE	3-1-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty fine grained sand, trace gravel, slighty damp	SM	6/8/8	
10	interbedded sand with silt and clay lenses (~3-6" thick) clay low to med PI, damp	SM/ CL	6/7/9	
	@ 15' well graded sand and trace silt, moist	SW	3/5/7	
20	silty fine to med grained sand, moist	SM	7/8/8	
	@ 25' silty sandy gravel, moist		17/23/30	
		GM		
30	as above, very moist		10/37/50	
				water @ 32.5'
	@ 35' as above, wet		17/50	
	total depth 35 '			
40				
50				
60				
70				

MALCOLM PIRNIE, INC.

Boring No. 506

BORING LOG

CLIENT Continental Waste Industries of AZ PROJECT # 2602-002
PROJECT Gila Bend Regional Landfill DRILLING METHOD Hollow Stem Auger
LOCATION E-NE Section 25 DRILLING CONTRACTOR Heber Ex. & Mining
START DATE 3-4-96 DRILLER Mark Stroud
FINISH DATE 3-4-96 HYDROGEOLOGIST D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt, white, trace gravel, dry	ML	8/7/6	
10	silty fine grained sand, brown, dry	SM	4/5/6	
	@ 15' gravelly fine grained sandy silt, moist		9/11/11	
		GM		
20	silty gravelly sand, well graded, moist		37/50	
	@ 25' silty sand, well graded, trace gravel, very moist to wet	SM	23/19/16	water @ 26.2'
30	silty sandy gravel, well graded	GM	25/17/14	
	total depth 30 '			
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 507

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	NE Section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-4-96	DRILLER	Mark Stroud
FINISH DATE	3-4-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silt with sand and trace gravel, lt. brown, dry	ML	5/7/8	
10	as above		4/4/5	
	@ 15' fine grained sand with clay lenses, dry	SP/SC	4/4/5	
20	silty fine to med grained sand, dry	SM	14/16/12	
	@ 25' silty fine grained sand with gravel, moist	GM	18/16/15	
30	as above		18/21/20	
	@ 35' silty fine grained sand trace gravel, very moist	SM	15/24/38	
40	silty and gravelly with fine to med sand, very moist to wet	GM	15/50=4"	water @41'
	@45' no recovery	?	50=2"	<- slow drilling, cobbles and gravels present, lost 2 teeth from lead bit
	total depth 45 '			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 508

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	NW Section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-4-96	DRILLER	Mark Stroud
FINISH DATE	3-4-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silt, fine grained sand, trace gravel, brown, dry	ML	5/7/8	
10	fine grained sand with silt, trace gravel, damp to very damp	SM	5/9/11	
	@ 15' silty sand with gravel, well graded very moist	GM	16/23/32	water @ 16.3'
20	sandy gravel with silt, wet		50=3"	
	total depth 20 '			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 509

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	S-SE Section 30	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-5-96	DRILLER	Mark Stroud
FINISH DATE	3-5-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silt with fine grained sand, trace gravel, lt. brown, dry	ML	6/5/9	
10	silty sandy gravel, well graded, damp	GM	21/50=1"	
	@ 15' as above, very moist		15/19/50=4"	
				<- hard drilling @ 17' water @ 17.70'
20	clayey sandy gravel, wet	GC	50=3"	
	total depth 20 '			
30				
40				
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 510

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	E-Center Section 30	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	3-5-96	DRILLER	Mark Stroud
FINISH DATE	3-5-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' clayey silt, trace fine sand, damp, white-light brown	ML	8/11/6	
10	Silty sand, gravel, well graded, damp		20/50=3"	
	@ 15' as above		40/33/35	cobbles and cemented sands and gravel
20	as above	GM	50=3"	
	as above		50=3"	
30	total depth 27 '			refusal @ 26-27'
	*** moved drilling location 7 times and could not drill past 27'			
40	** no water encountered			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 511

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*NE Section 30*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*3-6-96*	DRILLER	*Mark Stroud*
FINISH DATE	*3-8-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silty, sandy gravel, dry√		10/13/13	
10	gravel with silt and sand and cobble		29/50=5"	
	dry	GM		
	@ 15' as above		16/17/12	* hard drilling
				cobbles and cemented
20	* no recovery		50=3"	sands and gravel
	total depth ~20 '			
30				
	* * * moved drilling location 3 times			
40				
	* * no water encountered			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 512

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING CONTRACTOR	heber
LOCATION	NE corner of section 30	DRILLING METHOD	hollow stem
START DATE	3-07-96	DRILLER	Mark Stroud
FINISH DATE	3-07-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	silty sand with gravel			
10				
	silty sand with gravel	GM		
	as above	---		
20	clay			
	clay			
30	clay med. PI	CL	4,10,14	
	TDB=30'	---		
				hit water between 25 and 30 feet static water at 21.5'
##				

SHEET 1 OF

MALCOLM PIRNIE, INC.

Boring No. 513

BORING LOG

CLIENT: Continental Waste Industries of AZ — PROJECT #: 2602-002
PROJECT: Gila Bend Regional Landfill — DRILLING CONTRACTOR: heber
LOCATION: NW corner of section 30 — DRILLING METHOD: hollow stem
START DATE: 3-07-96 — DRILLER: Mark Stroud
FINISH DATE: 3-07-96 — HYDROGEOLOGIST: D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	sandy gravelly silt, dry, brown		7,10,14	
10	sandy gravelly silt, dry, brown	GM	28,38,41	
	as above, except cobbles present		50 for 2"	no recovery @ 15'
20	silty sand, wet well graded sand	SM	7,4,5	static water @ 14.7'
	TDB=20'			
30	as above, except cobbles present		50 for 2"	no recovery @15'
##	silty sand, wet, well graded sand	SM	7,4,5	
30				static water at 14.7'
##				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. 514

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING CONTRACTOR	heber
LOCATION	NW corner of section 30	DRILLING METHOD	hollow stem
START DATE	3-12-96	DRILLER	Mark Stroud
FINISH DATE	3-12-96	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	sandy gravelly silt, dry, brn	GM	23,25,17	
10	gravelly sand with silt		15,15,25	no return @10'
	as above		3,4,3	no recovery @ 15'
20	silty sandy gravel, moist, well graded sand		50 for 4"	cobbles present @20'
	as above except wet		50 for 3"	static water @ 21.00'
	TDB=25'			
30				
40				
50				
60				
70				

SHEET 1 OF

MALCOLM PIRNIE, INC.

Boring No. 515

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING CONTRACTOR	*heber*
LOCATION	*SW corner of section 30*	DRILLING METHOD	hollow stem
START DATE	*3-12-96*	DRILLER	Mark Stroud
FINISH DATE	*3-12-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	silty sandy gravel	GM	4,4,6	
10	as above		35,37,50	
	silty sand with gravel, very moist		14,50	
20	as above, except wet		50 for 4"	cobbles present @20'
				static water @ 17.00'
	TDB=20'			
30				
40				
50				
60				
70				

SHEET 1 OF ___

MALCOLM PIRNIE, INC.

Boring No. MW-1S

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	2602-002
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow stem auger*
LOCATION	*northwest corner section 25*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*2-27-96*	DRILLER	*M. Stroud*
FINISH DATE	*2-27-96*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' sandy silty gravel, light brown, moist	GM	11/8/6	
10	gravelly silt with sand, light brown, moist		8/6/6	
	@ 15' silt, sand and gravel, dry		6/6/7	
20	silty fine grained sand, trace gravel, dry	SM	8/11/12	
	@ 25' as above		10/14/15	
30	as above, except trace clay and moist		12/14/12	
	@ 35' silty clayey sand, trace gravel, very moist	SM/ SC	11/11/14	
40	fine to med grained sand with silt, wet	SM	19/31/25	groundwater @ 37'
	@ 45' as above		50=6"	
50	as above		3/13/21	
60	as above with trace of clay		50=6"	
	clay (starting at approx 62-65' bls)	CL		
	total depth 65'			
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. MW-2

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*N-NE area Section 25*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*10-4-95*	DRILLER	*Kevin*
FINISH DATE	*10-4-95*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silt with sand and gravel, dry	ML	10/8/8	
10	fine to med sand with silt, dry	SM	6/8/8	
	@ 15'sand and gravel with silt, slight cementation	GM	25/30/32	
20	sandy, silty gravel, damp		13/21/50	static water @ 20.55'
	@ 25' gravelly sand, trace silt, wet, coarse sand	SW	42/50	
30	as above		31/25/50	
	@ 35' sand with gravel trace silt, wet,		15/20/21	
	cobbles present at 38'			auger refusal @ 38'
40	total depth 38'			
50				
60				
70				

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. MW-4

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	southwest corner section 25	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	10-2-95	DRILLER	Kevin
FINISH DATE	10-4-95	HYDROGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	silt trace sand and gravel, dry (0-4')	ML		
	@ 5' sand trace silt and gravel, dry, well graded	SW	3/4/4	
		SM		
10	sand with silt, trace gravel, dry		7/7/8	
	@ 15' sand trace silt, with gravel, dry	SW	14/20/20	
20	sand tracesilt, fine sand, dry	SP	3/4/6	
	@ 25' as above		2/3/3	
		SM		
30	sand with silt, damp		3/7/11	
	@ 35' fine to med sand, very damp, some clay noddles		15/10/7	
40	fine to med sand, trace silt and gravel, wet		4/9/11	static water @38.6'
	@ 45' as above		4/8/10	
50	fine to med sand, trace gravel, wet	SP	17/30/27	
	@ 55' as above			
60	gravelly sand, med to coarse, wet		12/19/45	
	@ 65' as above			
70	gravelly sand, well graded. wet	SW		
				auger refusal @ 74'
	total depth 74'			

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. MW-5

BORING LOG

CLIENT	*Continental Waste Industries of AZ*	PROJECT #	*2602-002*
PROJECT	*Gila Bend Regional Landfill*	DRILLING METHOD	*Hollow Stem Auger*
LOCATION	*southwest corner section 30*	DRILLING CONTRACTOR	*Heber Ex. & Mining*
START DATE	*10-5-95*	DRILLER	*Kevin*
FINISH DATE	*10-5-95*	HYDROGEOLOGIST	*D. Spoelman*

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' silt with fine sand, dry	ML	2/3/3	
10	fine sand with silt, trace gravel, dry	SM	20 for 12"	
	@ 15' as above, increase in moisture		8 for 12"	
20	as above with increasing moisture		50 for 11"	
	@ 25' as above, wet		70 for 9"	static water @23.35' bls
30	sandy gravel/gravelly sand trace silt, wet	GP/SP	70 for 8"	
	@ 35' sand with gravel trace silt, well graded, cobbles present at 36-38'	SW	27/40/40	refusal @ 38'
40	total depth 38 '			
50				
60				
70				

Note:
ring samples attempted at 10', 15', 20', 25', and 30' if no recovery from ring sampler split spoon was used to collect and log sample. Blow counts noted at described depths are from ring samplers.

SHEET 1 OF 1

MALCOLM PIRNIE, INC.

Boring No. MW-6S

BORING LOG

CLIENT	Continental Waste Industries of AZ	PROJECT #	2602-002
PROJECT	Gila Bend Regional Landfill	DRILLING METHOD	Hollow Stem Auger
LOCATION	NE, NW, NW Section 30	DRILLING CONTRACTOR	Heber Ex. & Mining
START DATE	2-28-96	DRILLER	
FINISH DATE	2-28-96	HYRDOGEOLOGIST	D. Spoelman

Depth	SAMPLE DESCRIPTION	USCS	Blow Cnts	NOTES
	@ 5' lt brown gravelly silt with sand, moist		7/18/11	
10	as above	GM	13/25/30	
	@ 15' no recovery - hard drilling, gravels& cobbles		50=2"	
	* * * Refusal @ 20' -moved boring 50' north, redrill	?		
		?		
20	silty clayey gravel, damp	GM	50=2"	
	@ 25' gravelly sand, well graded, wet	SW	35/50=4"	groundwater @ 24' bls
30	No Return - gravel and sand in cuttings	SW/ GW	50=6"	
	@ 35' sand and clay (interbedded), graded beds of sand and clay		50=6"	
40	sand with clay	SP	46/26/17	
	@41' med to high PI clay	CL		clay stringers
	@ 45' fine to med sand, wet	SP	50=6"	
50	fine grained sand		15/19/26	
	@ 50.5' med PI clay	CL		
	total depth 50 '			
60				
70				

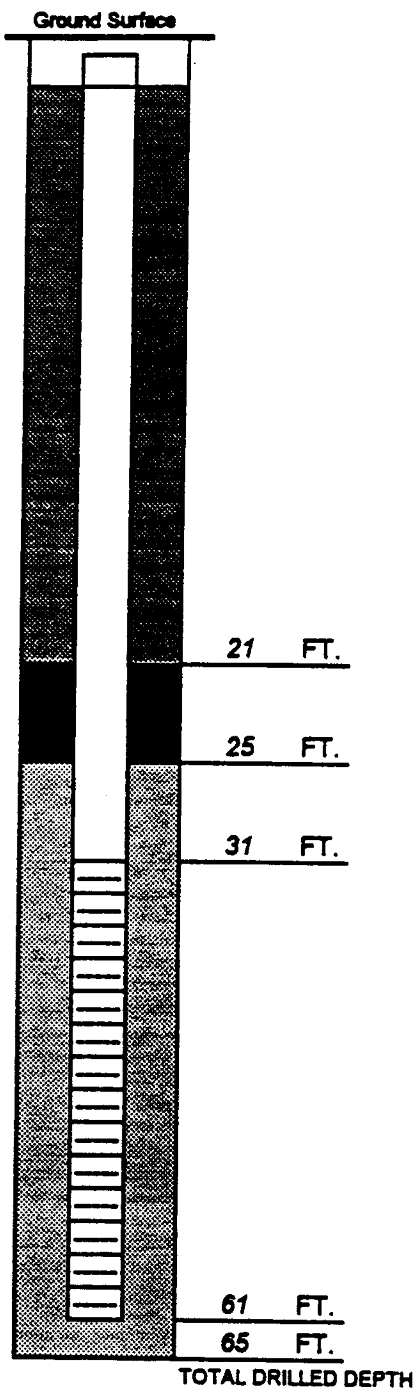
SHEET 1 OF 1

MONITORING WELLS
CONSTRUCTION DIAGRAMS (MW-1S THROUGH MW-6S)

MALCOLM PIRNIE, Inc.

Well ID MW-1S

Monitoring Well Construction Log



All measurements are in feet from ground surface

CLIENT NAME Continental Waste Industries of Az
PROJECT NAME Gila Bend Regional Landfill

PROJECT # 2602-002
PROJECT LOCATION west of Gila Bend, AZ
WELL LOCATION NW corner Section 25

DRILLING DATE 2-27-96
COMPLETION DATE 2-27-96
DRILLING CONTRACTOR Heber Explo. & Mining
DRILLER Mark Stroud
BOREHOLE DIAMETER 8 inches
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT (date/vol.) 3-18-96 300 gallons

WELL MATERIALS:
SURFACE CASING none
RISER PVC SCH 40 4"
LENGTH 31

WELL SEAL bentonite pellets

SCREEN:
MATERIAL PVC SCH 40 4"
LENGTH 30'
DIAMETER 4 inch
SLOT SIZE 0.02

SAND PACK 8-12 colorado silica sand

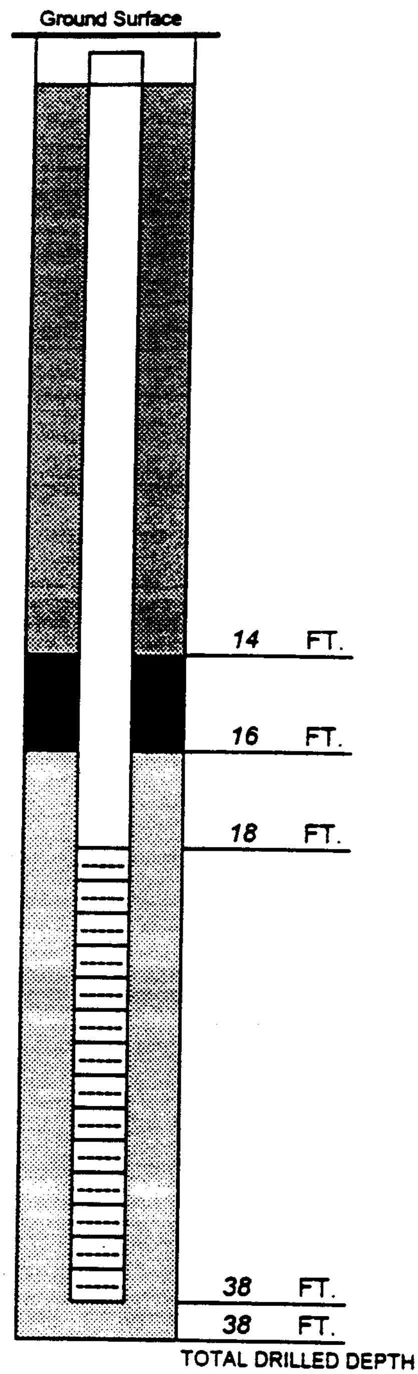
REMARKS native soil from 61-65'
groundwater at 41' bls

HYDROGEOLOGIST D. Spoelman

MALCOLM PIRNIE, Inc.

Well ID MW-2S

Monitoring Well Construction Log



CLIENT NAME Continental Waste Industries of Az
PROJECT NAME Gila Bend Regional Landfill

PROJECT # 2602-002
PROJECT LOCATION west of Gila Bend, AZ
WELL LOCATION north central area

DRILLING DATE 10-4-95
COMPLETION DATE 10-4-95
DRILLING CONTRACTOR Heber Explo. & Mining
DRILLER Kevin
BOREHOLE DIAMETER 8 inches
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT (date/vol.) 10-25-95 300 gallons

WELL MATERIALS:
SURFACE CASING none
RISER PVC SCH 40 4"
LENGTH 18'

WELL SEAL bentonite pellets

SCREEN:
MATERIAL PVC SCH 40 4"
LENGTH 20'
DIAMETER 4 inch
SLOT SIZE 0.02

SAND PACK 8-12 colorado silica sand

REMARKS auger refusal at 38'
static water level at 20.55'

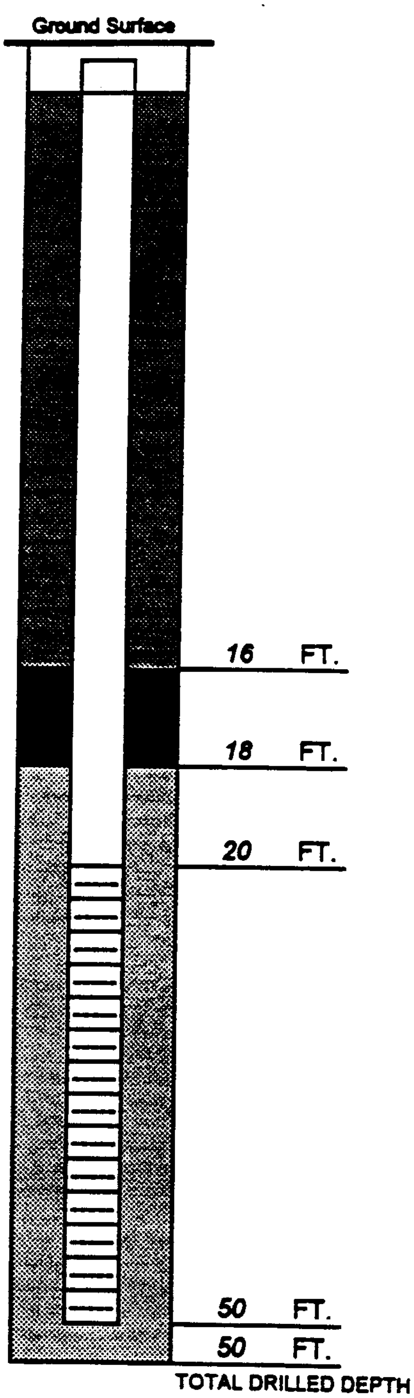
All measurements are in feet from ground surface

HYDROGEOLOGIST D. Spoelman

MALCOLM PIRNIE, Inc.

Well ID MW-3S

Monitoring Well Construction Log



CLIENT NAME Continental Waste Industries of Az
PROJECT NAME Gila Bend Regional Landfill

PROJECT # 2602-002
PROJECT LOCATION west of Gila Bend, AZ
WELL LOCATION NE, NE, NE, Section 25

DRILLING DATE 3-11-96
COMPLETION DATE 3-12-96
DRILLING CONTRACTOR Heber Explo. & Mining
DRILLER Mark Stroud
BOREHOLE DIAMETER 8 inches
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT (date/vol.) 3-19-96 330 gallons

WELL MATERIALS:
SURFACE CASING none
RISER PVC SCH 40 4"
LENGTH 20'

WELL SEAL bentonite pellets

SCREEN:
MATERIAL PVC SCH 40 4"
LENGTH 30'
DIAMETER 4 inch
SLOT SIZE 0.02

SAND PACK 8-12 colorado silica sand

REMARKS
static water level at 26'

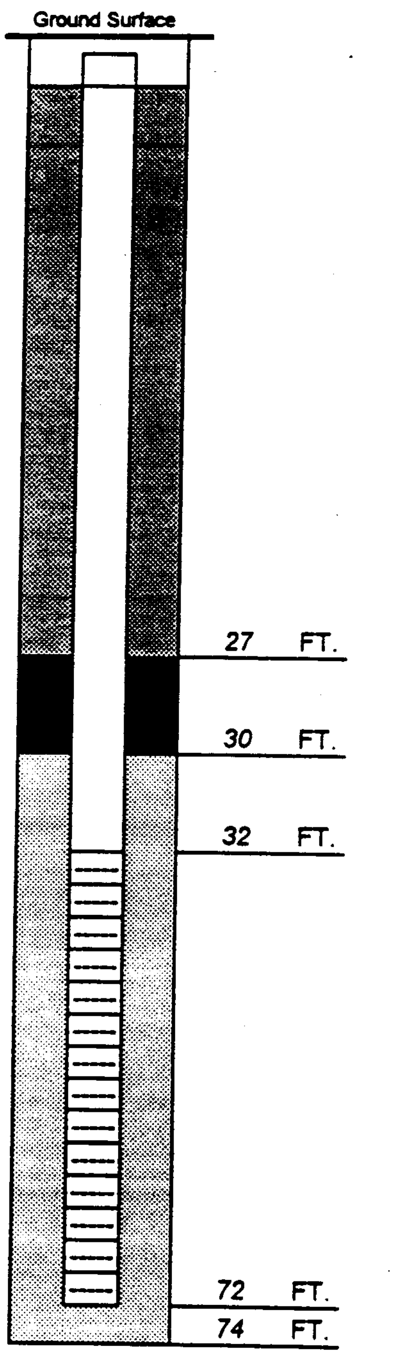
All measurements are in feet from ground surface

HYDROGEOLOGIST D. Spoelman

MALCOLM PIRNIE, Inc.

Well ID MW-4S

Monitoring Well Construction Log



All measurements are in feet from ground surface

CLIENT NAME *Continental Waste Industries of Az*
PROJECT NAME *Gila Bend Regional Landfill*

PROJECT # *2602-002*
PROJECT LOCATION *west of Gila Bend, AZ*
WELL LOCATION *southwest corner section 25*

DRILLING DATE *10-2,3,4-95*
COMPLETION DATE *10-4-95*
DRILLING CONTRACTOR *Heber Explo. & Mining*
DRILLER *Kevin*
BOREHOLE DIAMETER *8 inches*
DRILLING METHOD *Hollow Stem Auger*
DEVELOPMENT (date/vol.) *10-25-95 300 gallons*

WELL MATERIALS:
SURFACE CASING *none*
RISER *PVC SCH 40 4"*
LENGTH *32'*

WELL SEAL *bentonite pellets*

SCREEN:
MATERIAL *PVC SCH 40 4"*
LENGTH *40'*
DIAMETER *4 inch*
SLOT SIZE *0.02*

SAND PACK *8-12 colorado silica sand*

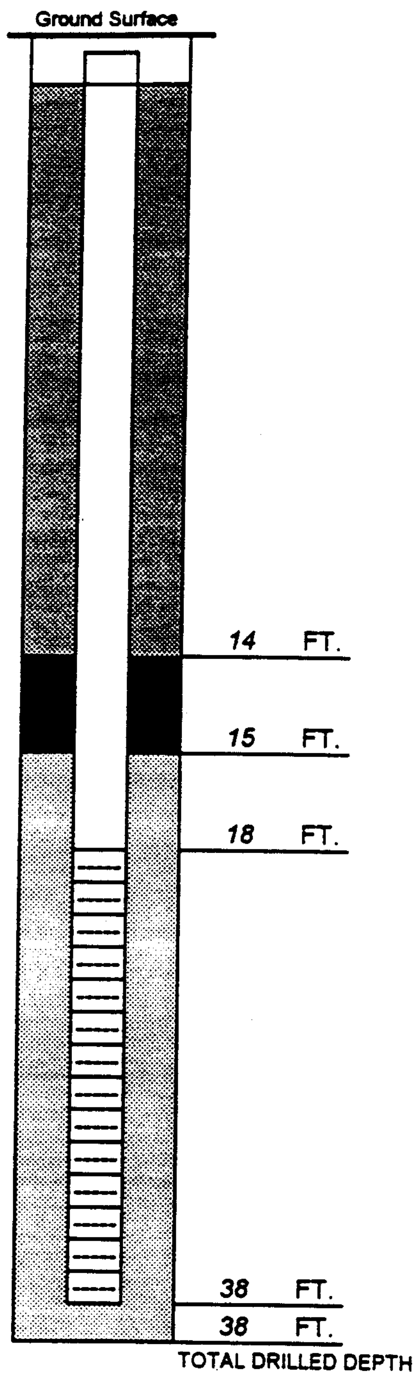
REMARKS *auger refusal at 74'*
static water level at 38.6'

HYDROGEOLOGIST *D. Spoelman*

MALCOLM PIRNIE, Inc.

Well ID MW-5S

Monitoring Well Construction Log



CLIENT NAME Continental Waste Industries of Az
PROJECT NAME Gila Bend Regional Landfill

PROJECT # 2602-002
PROJECT LOCATION west of Gila Bend, AZ
WELL LOCATION southeast corner section 30

DRILLING DATE 10-5-95
COMPLETION DATE 10-5-95
DRILLING CONTRACTOR Heber Explo. & Mining
DRILLER Kevin
BOREHOLE DIAMETER 8 inches
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT (date/vol.) 10-25-95 300 gallons

WELL MATERIALS:
SURFACE CASING none
RISER PVC SCH 40 4"
LENGTH 18'

WELL SEAL bentonite pellets

SCREEN:
MATERIAL PVC SCH 40 4"
LENGTH 20'
DIAMETER 4 inch
SLOT SIZE 0.02

SAND PACK 8-12 colorado silica sand

REMARKS auger refusal at 38'
static water level at 23.35'

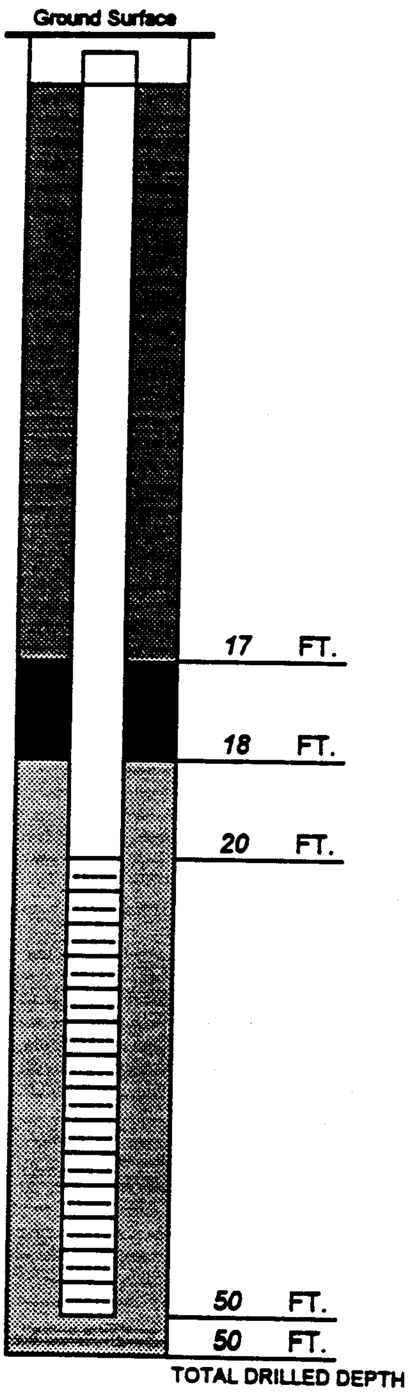
All measurements are in feet from ground surface

HYDROGEOLOGIST D. Spoelman

MALCOLM PIRNIE, Inc.

Well ID MW-6S

Monitoring Well Construction Log



CLIENT NAME Continental Waste Industries of Az
PROJECT NAME Gila Bend Regional Landfill
PROJECT # 2602-002
PROJECT LOCATION west of Gila Bend, AZ
WELL LOCATION NE, NW, NW, Section 30

DRILLING DATE 2-28-96
COMPLETION DATE 2-28-96
DRILLING CONTRACTOR Heber Explo. & Mining
DRILLER Mark Stroud
BOREHOLE DIAMETER 8 inches
DRILLING METHOD Hollow Stem Auger
DEVELOPMENT (date/vol.) 3-18-96 300 gallons

WELL MATERIALS:
SURFACE CASING none
RISER PVC SCH 40 4"
LENGTH 20'

WELL SEAL bentonite pellets

SCREEN:
MATERIAL PVC SCH 40 4"
LENGTH 30'
DIAMETER 4 inch
SLOT SIZE 0.02

SAND PACK 8-12 colorado silica sand

REMARKS
static water level at 24'

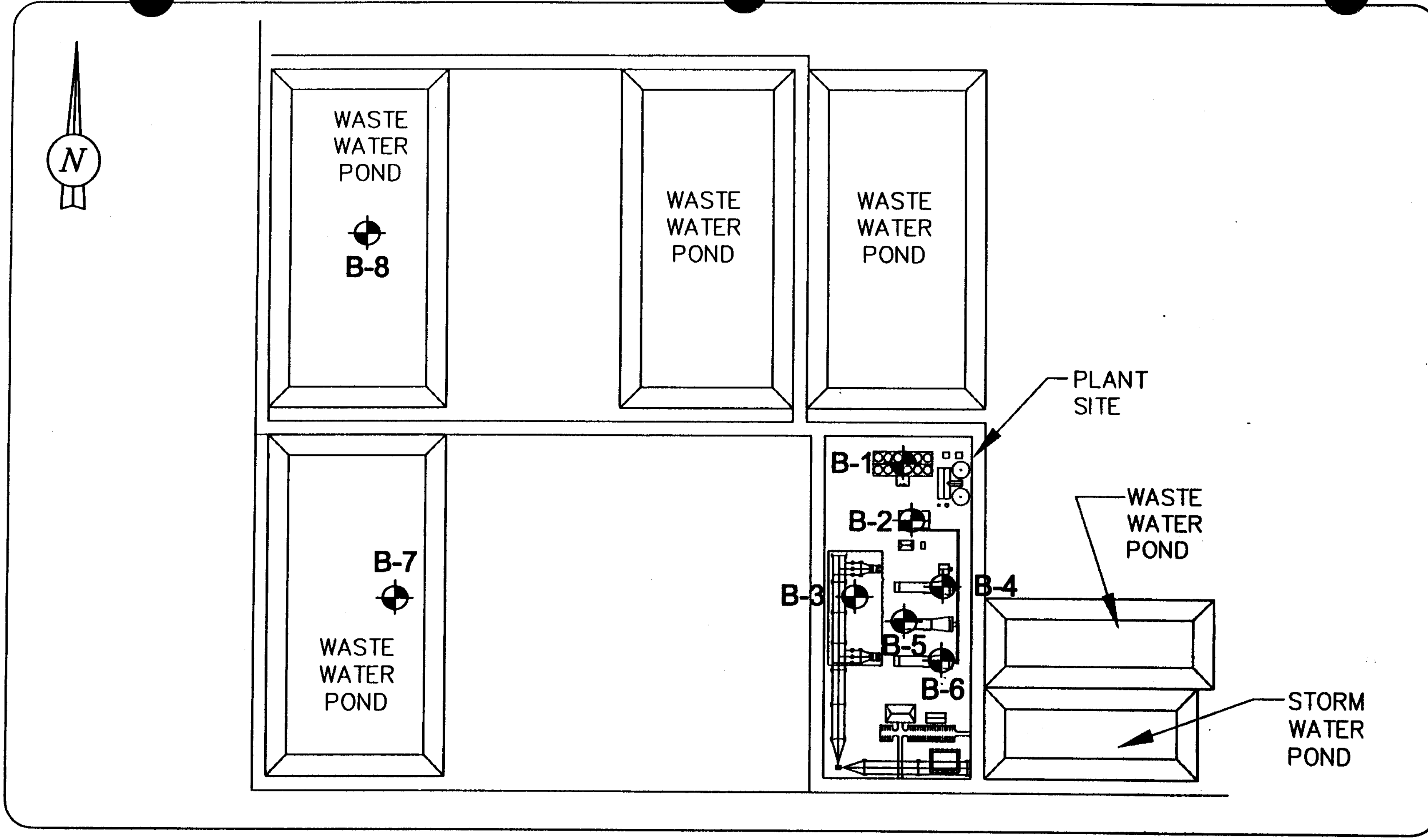
All measurements are in feet from ground surface

HYDROGEOLOGIST D. Spoelman

APPENDIX G

GEOTECHNICAL RESULTS

NINYO & MOORE
GEOTECHNICAL INVESTIGATION



Ninyo & Moore

LEGEND

B-8 BORING LOCATIONS

0 500 1000

APPROX. SCALE FEET

BORING LOCATION MAP

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	2

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

The Standard Penetration Test Spoon (Borings)

Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test spoon sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The spoon was driven up to 18 inches into the ground with a 140-pound or a 280-pound hammer free falling from a height of 30 inches in general accordance with ASTM D 1586-84. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the spoon, bagged, sealed and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following methods.

The Modified Split-Barrel Drive Sampler (Borings)

The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound or a 280-pound hammer free falling from a height of 30 inches in general accordance with ASTM D 3550-84. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer or bar, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED ______ BORING NO. PATTERNS GROUND ELEVATION ______ SHEET 1 OF 1 METHOD OF DRILLING ______ DRIVE WEIGHT ______ DROP ______ SAMPLED BY ______ LOGGED BY ______ REVIEWED BY ______ DESCRIPTION/INTERPRETATION
0								SOILS
							GW	(GW:G3N) = well graded GRAVEL
							GP	(GP:G) = poorly graded GRAVEL, sandy gravel, aggregate base
							GM	(GM:GZ) = silty GRAVEL
							GC	(GC:OG) = clayey GRAVEL
							SW	(SW:D) = well graded SAND
							SP	(SP:S) = poorly graded SAND
							SM	(NZ) = silty SAND
6							SC	(NO) = clayey SAND
							CL	(O) = low plasticity CLAY or just CLAY
							ML	(Z) = silt
							OL	(4) = low plasticity organic SILT
							CH	(C) = high plasticity CLAY
							MH	(M) = plastic SILT
							OH	(5) = high plasticity organic CLAY
							PT	(Q) = peat
								ROCKS AND CONCRETE
12								(I) = SILTSTONE (clayey SILTSTONE, sandy SILTSTONE, etc.)
								(1) = SANDSTONE (silty SANDSTONE, clayey SANDSTONE, etc.)
								(H) = CLAYSTONE (sandy CLAYSTONE, silty CLAYSTONE, etc.)
								(O12) = BRECCIA rock with angular and/or gravel- or cobble-sized clasts
								(B) + (1) = CONGLOMERATE
								(>) = SHALE or SLATE
								(/) = GRANITIC ROCK or BONSALL TONALITE
								(2) = METAVOLCANIC (or VOLCANIC) ROCK
18								(2+I) = VOLCANIC TUFF
								(V) = GABBROIC ROCK or other intrusive igneous rock
								(P) = ASPHALT CONCRETE
								(9) = CONCRETE
								(WATER) Water table during drilling. (FWATER) Water table at boring completion.
								(%) = CALICHE
								(.) = GYPSUM
								($) = SCHIST
24								

Ninyo & Moore

BORING LOG

LEGEND FOR BORING LOGS

PROJECT NO.	DATE	FIGURE
PATTERNS	REV. 5/99	A-i

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								Solid line denotes unit change.
								Dashed line denotes material change.
								Modified split-barrel drive sampler.
								No recovery with modified split-barrel drive sampler.
5				♀				Seepage.
								Groundwater encountered during drilling.
								Groundwater measured after drilling.
								Standard Penetration Test (SPT).
10								No recovery with a SPT.
			XX/ XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
								No recovery with Shelby tube sampler.
15								Bulk sample.
20								The total depth line is a solid line that is drawn at the bottom of the boring.

DATE DRILLED ______ BORING NO. SYMBOL SAMPLES
GROUND ELEVATION ______ SHEET 1 OF 1
METHOD OF DRILLING ______
DRIVE WEIGHT ______ DROP ______
SAMPLED BY ______ LOGGED BY ______ REVIEWED BY ______

Ninyo & Moore

BORING LOG

EXPLANATION OF BORING LOG SYMBOLS

PROJECT NO.	DATE	FIGURE
SYMSAMP	Rev. 5/99	A-ii

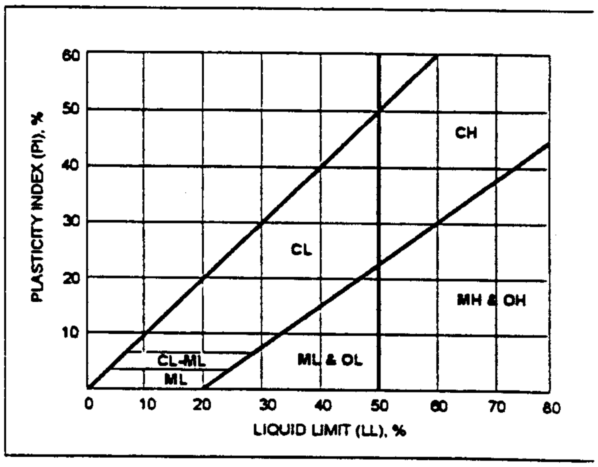
U.S.C.S. METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (More than 1/2 of soil >No. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction <No. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than 1/2 of soil <No. 200 sieve size)	SILTS & CLAYS Liquid Limit <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS Liquid Limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

CLASSIFICATION CHART (Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL Coarse Fine	3" to No.4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND Coarse Medium Fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

GRAIN SIZE CHART



PLASTICITY CHART

DATE DRILLED 10/12/00 BORING NO. B-1

GROUND ELEVATION ________ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ________

DEPTH (feet)	SAMPLES Bulk / Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SP-SC	ALLUVIUM: Light brown, damp, very dense, fine to coarse SAND; little gravel; few clay.
		39					
5		28	2.1	101.0			Medium dense.
		70/7"				SM	Light brown, dry to damp, very dense, silty SAND; little gravel.
10		86/11"					
15		71/11"	1.6	124.0		SP	Light brown, dry to damp, very dense, fine to coarse SAND; little gravel.

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-1

DEPTH	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
								DATE DRILLED 10/12/00 BORING NO. B-1
								GROUND ELEVATION ______ SHEET 2 OF 2
								METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger
								DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"
								SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______
20			50/1"				SP	ALLUVIUM: (Continued) Light brown, damp, very dense, fine to coarse SAND.
								Total Depth = 20.1 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-2

DATE DRILLED 10/12/00 BORING NO. B-2

GROUND ELEVATION ____________ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ____________

DEPTH	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SM	ALLUVIUM: Light brown, damp, very dense, silty SAND; some gravel.
			45					
5			40					Less fines.
			34					
10			80					
15			48					
								Very difficult drilling between 18' and 20'; large cobbles.

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-3

DEPTH (FEET)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 10/12/00 BORING NO. B-2 GROUND ELEVATION ______ SHEET 2 OF 2 METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30" SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______ DESCRIPTION/INTERPRETATION
20			50/1"				SM	ALLUVIUM: (Continued) Light brown, damp, very dense, silty SAND; large cobbles. Very difficult drilling between 20' and 23'; large cobbles. Moist.
				⏚				
25			77/11"				SP	Brown, saturated, very dense, fine to coarse SAND; little gravel.
								Total Depth = 26.4 feet. Groundwater encountered at approximately 24 feet. Backfilled on 10/12/00.
30								
35								

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-4

DATE DRILLED 10/12/00 BORING NO. B-3

GROUND ELEVATION ______ SHEET 1 OF 1

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							GC	ALLUVIUM: Brown, dry to damp, very dense, clayey GRAVEL; some sand.
		X	64					
5							SP-SM	Brown, damp, medium dense, fine to coarse SAND; little gravel; few silt.
		X	33					
		X	35					
10			50/5"					Very dense.
15			50/6"					
								Difficulty drilling between 17' to 19'.
			50/1"					
								Total Depth = 19.1 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-5

DATE DRILLED 10/12/00 BORING NO. B-4

GROUND ELEVATION ______ SHEET 1 OF 1

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (feet)	SAMPLES Bulk / Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Light brown, dry to damp, very dense, silty SAND; few gravel; trace clay.
		71/11"	2.3	135.6			
5		70/11"					
		62	1.4				Less fines with depth.
10		59					
15		75/9"					Very difficult drilling between 16' to 18'.
		50/1"					
							Total Depth = 18 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.

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BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-6

DATE DRILLED 10/12/00 BORING NO. B-5

GROUND ELEVATION ____ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ____

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Light brown, dry to damp, very dense, silty fine to medium SAND; little gravel.
		80/9"	2.8	116.1			
						GP	Light brown, dry to moist, medium dense, fine to coarse, sandy GRAVEL; few silt.
5		24	1.2				
		50					
10		50/5"					Very dense.
15							Medium dense.
		50/5"					
							Difficult drilling between 16' and 20'.

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-7

DEPTH (feet)	SAMPLES Bulk / Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 10/12/00 BORING NO. B-5 GROUND ELEVATION ____ SHEET 2 OF 2 METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30" SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ____ **DESCRIPTION/INTERPRETATION**
20	X	50/5"				GP	ALLUVIUM: (Continued) Light brown, dry to damp, very dense, fine to medium sandy GRAVEL; few silt.
							Total Depth = 20.4 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25							
30							
35							

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-8

DATE DRILLED 10/12/00 BORING NO. B-6

GROUND ELEVATION ______ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (FEET)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SP-SC	ALLUVIUM: Light brown, dry to damp, very dense, fine to coarse SAND; little gravel; few clay.
			79					
5			41	2.5	114.9			Medium dense.
							SM	Brown, dry to damp, very dense, silty fine to coarse SAND; some gravely small weakly cemented zones.
			63/10"					
10			61	1.1			SP	Brown, damp, dense, fine to coarse SAND; some gravel; trace silt and clay.
15			50/6"					Very dense; rock stuck in sampler; weakly cemented chunk in sampler.
								Difficulty drilling between 16' and 18'.

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-9

DATE DRILLED 10/12/00	BORING NO. B-6
GROUND ELEVATION	SHEET 2 OF 2
METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger	
DRIVE WEIGHT 140 lb. (Auto Trip Hammer)	DROP 30"
SAMPLED BY CRP LOGGED BY CRP	REVIEWED BY

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		X	50/6"				SP	ALLUVIUM: (Continued) Brown, dry to damp, very dense, fine to coarse SAND; some gravel.
								Total Depth = 20.5 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-10

DATE DRILLED 10/12/00 BORING NO. B-7

GROUND ELEVATION ______ SHEET 1 OF 2

METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger

DRIVE WEIGHT 140 lb. (Auto Trip Hammer) DROP 30"

SAMPLED BY CRP LOGGED BY CRP REVIEWED BY ______

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SM	ALLUVIUM: Light brown, dry to damp, very dense, silty SAND; some gravel; little clay.
		82					
5		65					Dense.
		29					Medium dense.
10		21					Dense; decrease in fines.
15		17	1.8	120.2		SP	Brown, damp, medium dense, fine to coarse SAND; some gravel; trace silt.

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-11

DATE DRILLED	10/12/00	BORING NO.	B-7
GROUND ELEVATION		SHEET	2 OF 2
METHOD OF DRILLING	CME 75, 8" Diameter Hollow-Stem Auger		
DRIVE WEIGHT	140 lb. (Auto Trip Hammer)	DROP	30"
SAMPLED BY	CRP	LOGGED BY	CRP
REVIEWED BY			

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		X	50/4"				SP	ALLUVIUM: (Continued) Brown, moist, very dense, fine to coarse SAND; some gravel.
								Total Depth = 20.4 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-12

DATE DRILLED	10/12/00
BORING NO.	B-8
GROUND ELEVATION	
SHEET	1 OF 2
METHOD OF DRILLING	CME 75, 8" Diameter Hollow-Stem Auger
DRIVE WEIGHT	140 lb. (Auto Trip Hammer)
DROP	30"
SAMPLED BY	CRP
LOGGED BY	CRP
REVIEWED BY	

DEPTH	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						SP	ALLUVIUM: Light brown, damp, loose, fine to medium SAND; some gravel; trace silt.
		6					
5		23	2.2	113.4			Medium dense.
		48	1.4	121.3			Dense.
10		25					Medium dense.
15		30					

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-13

DATE DRILLED	10/12/00	BORING NO.	B-8
GROUND ELEVATION		SHEET 2	OF 2
METHOD OF DRILLING	CME 75, 8" Diameter Hollow-Stem Auger		
DRIVE WEIGHT	140 lb. (Auto Trip Hammer)	DROP	30"
SAMPLED BY CRP	LOGGED BY CRP	REVIEWED BY	

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20		/	50/5"				SP	ALLUVIUM: (Continued) Brown, damp, very dense, fine to coarse SAND; some gravel; trace silt.
								Total Depth = 20.4 feet. Groundwater not encountered during drilling. Backfilled on 10/12/00.
25								
30								
35								

Ninyo & Moore

BORING LOG

GILA BEND POWER PLANT
GILA BEND, ARIZONA

PROJECT NO.	DATE	FIGURE
600150-01	11/00	A-14

GEOTECHNICAL INVESTIGATION AT PROPOSED GILA BEND REGIONAL LANDFILL

TABLE 7-2

SIEVE ANALYSES SUMMARY

Boring No.	Sample Depth (ft)	Soil Description	Mean Diameter, d_{50} (cm)
MW-2S	5	Fine to medium SAND, some silt, some gravel	0.060
MW-2S	10	Fine to medium SAND, trace silt	0.027
MW-2S	15	Gravelly fine to coarse SAND, trace silt	0.280
MW-2S	25	Gravelly fine to coarse SAND, trace silt	0.280
MW-2S	35	Fine to medium SAND	0.053
MW-5S	5	Silty fine to medium SAND	0.020
MW-5S	10	Fine to medium SAND, some gravel	0.045
MW-5S	15	Fine to medium SAND, trace gravel, trace silt	0.055
MW-5S	20	Fine to medium SAND, some gravel, some silt	0.047
MW-5S	25	Fine to coarse SAND, some gravel	0.081
MW-5S	30	Sandy GRAVEL	0.580
MW-5S	35	Fine to medium SAND, some gravel, trace silt	0.050

TABLE 7-1

GEOTECHNICAL DATA SUMMARY

Boring No.	Sample Depth (ft)	Hydraulic Conduc-tivity (cm/s)	Plas-ticity Index	Dry Density (lbs/cu ft)	Unconfined Compression		Moisture Content (%)	Consoli-dation
					Maximum Stress (psi)	Strain (%)		
B-305	105	--[1]	--	--	--	--	16.9	--
B-305	110	--	--	--	--	--	15.1	--
B-305	115	--	--	--	--	--	21.0	--
B-305	125	--	--	--	--	--	20.1	--
B-305	135	--	--	--	--	--	22.8	--
B-305	160	--	--	--	--	--	34.1	--
B-305	175	--	--	--	--	--	19.4	--
B-305	195	--	--	--	--	--	28.3	--
B-305	230	--	--	--	--	--	30.6	--
B-305	260	--	--	--	--	--	10.3	--
B-104	10-11	5.40E-08	43	--	--	--	--	--
B-104A	14-15	6.30E-09	45	--	--	--	--	--
B-104A	15-16	--	29	--	--	--	--	--
B-202	22	--	24	--	--	--	--	--
B-210	26-27	--	50	--	--	--	--	--
B-306	110	--	--	--	--	--	--	[2]
B-306	145	--	--	105.4	78	7.12	--	--
B-306	150	--	--	--	--	--	--	[2]
B-306	175	2.70E-08	--	--	--	--	--	--
B-306	185	--	--	101.3	49	10.47	--	[2]

1. "--" denotes data not obtained for this boring.
2. See Attachment 7C for consolidation testing results.

Boring 306 Consolidation, Unconfined Compression and Permeability

AGRA Earth & Environmental

AGRA Earth &
Environmental, Inc.
3232 West Virginia Avenue
Phoenix, Arizona 85009-1502
Tel (602) 272-6848
Fax (602) 272-7239

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MALCOLM PIRNIE, INC.
PHOENIX

JUN 6 1996

TRANSMITTAL

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TO: CONTINENTAL WASTE INDUSTRIES
67 WALNUT AVE #103
CLARK NJ 07066

ATTN: Michael Drury

Date: 6-4-96
Project: MATERIALS TESTING
Job/Proposal #: AEE Job 6-119-0023LT
Transmittal #: 4
Reference: Gila Bend Reg. Landfill

We are:	For your:	The following:
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[ ] returning	[x] information/files	[ ] calculations
[ ] separately	[ ] approval	[ ] design charts
	[ ] signature	[ ] progress reports
	[ ] as requested	[x] laboratory results
		[ ] plans
		[ ] specifications
		[ ] other:

Copies	Date	Description
		Consols, Unconfined Compression, Perm

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Remarks:

Copy to: Addressee (1)
William Kozuh (1)
Malcolm Pirnie (1)

By: Cliff Metz CM
Laboratory Supervisor

AGRA Earth & Environmental

PROJECT:	GILA CANAL REGIONAL LANDFILL	JOB NO:	6-119-0023L
LOCATION:	GILA BEND, ARIZONA	WORKORDER NO:	3
MATERIAL:	----	LAB NO:	32
SAMPLE SOURCE:	175'@306	DATE SAMPLED:	04-26-96
SAMPLE PREPARATION:	INSITU		

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS USING A FLEXIBLE WALL PERMEAMETER (ASTM 5084-90) "CV" METHOD C

AVERAGE PERMEABILITY		2.7E-08 cm/sec	
INITIAL LENGTH OF SPECIMEN		8.55 cm	
INITIAL DIAMETER OF SPECIMEN		6.13 cm	
INITAL WATER CONTENT		16.7%	
INITIAL DRY UNIT WEIGHT		115.2 pcf	
INITIAL VOLUME		252.3 cu.cm	
PERMEANT LIQUID		BOTTLED WATER	
MAGNITUDE OF TOTAL BACK PRESSURE		56 psi	
EFFECTIVE CONSOLIDATION STRESS		5 psi	
RANGE OF HYDRAULIC GRADIENT USED	16.2	to	14.9
FINAL LENGTH OF SPECIMEN		8.55 cm	
FINAL DIAMETER OF SPECIMEN		6.15 cm	
FINAL WATER CONTENT		18.3%	
FINAL DRY UNIT WEIGHT		114.5 pcf	
FINAL VOLUME		254.0 cu.cm	
DEGREE OF SATURATION (BEFORE AND AFTER TEST)	97%	and	105%
SPECIFIC GRAVITY USED IN CALCULATIONS OF SATURATION		2.7	

TIME INTERVAL sec	K cm/sec	K ft/yr
1015	2.9E-08	0.030
1328	2.3E-08	0.024
1824	2.9E-08	0.030
2489	2.8E-08	0.029

AGRA Earth & Environmental

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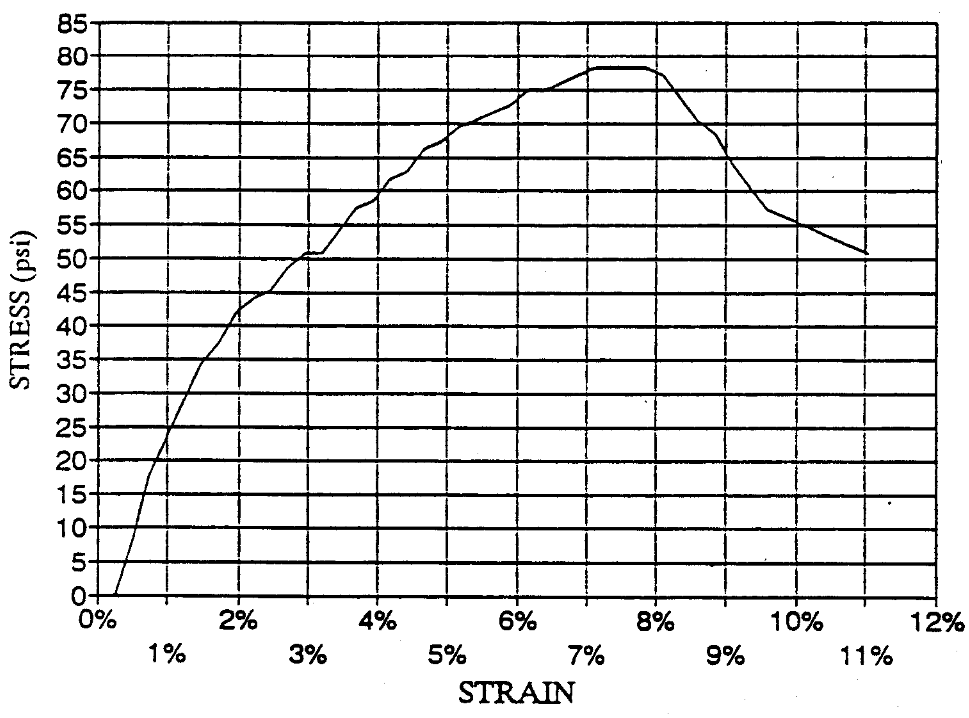
PROJECT:	GILA BEND REGIONAL LANDFILL	JOB NO:	6-119-0023LT
LOCATION:	GILA BEND, ARIZONA	WORK ORDER NO:	3
MATERIAL:	CLAY	LAB NO:	30
SAMPLE SOURCE:	145' @ 306	DATE SAMPLED:	04-26-96
SAMPLE PREP:	INSITU		

UNCONFINED COMPRESSION TEST
APPLICABLE PORTIONS OF ASTM D2166

HEIGHT:	12.93 cm	MAXIMUM STRESS:	78 psi
DIAMETER:	6.10 cm	AT STRAIN:	7.12%
STRAIN RATE:	5.0% inches/min.		
DRY DENSITY:	105.4 lb/cu.ft		



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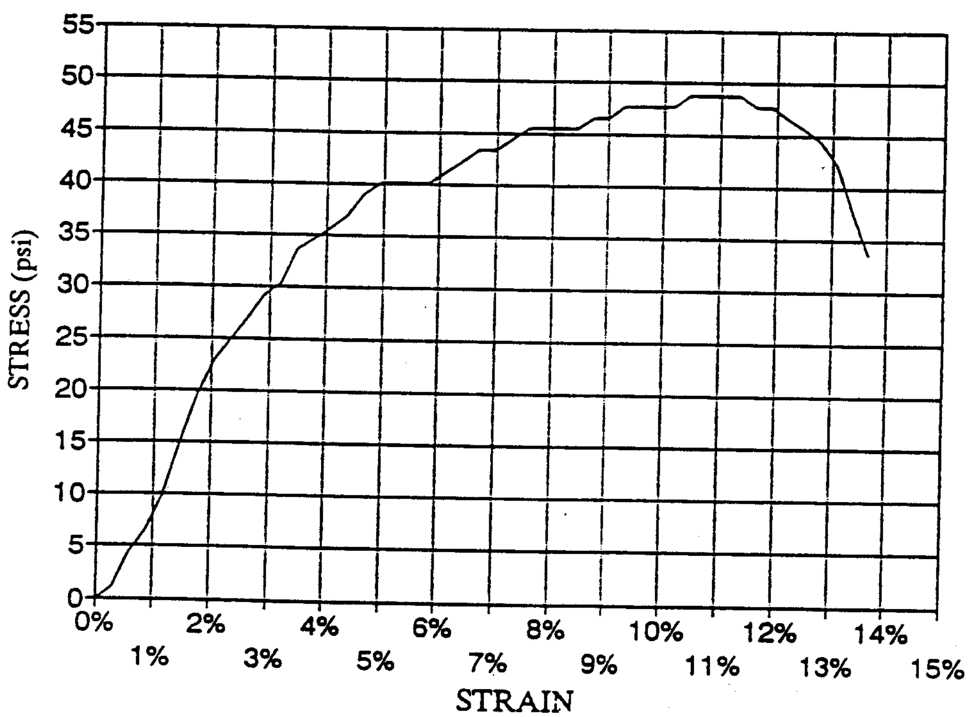
PROJECT:	GILA BEND REGIONAL LANDFILL	JOB NO:	6-119-0023LT
LOCATION:	GILA BEND, ARIZONA	WORK ORDER NO:	3
MATERIAL:	CLAY	LAB NO:	31
SAMPLE SOURCE:	185' @ 306	DATE SAMPLED:	04-26-96
SAMPLE PREP:	INSITU		

UNCONFINED COMPRESSION TEST
APPLICABLE PORTIONS OF ASTM D2166

HEIGHT:	10.92 cm	MAXIMUM STRESS:	49 psi
DIAMETER:	6.16 cm	AT STRAIN:	10.47%
STRAIN RATE:	5.0% inches/min.		
DRY DENSITY:	101.3 lb/cu.ft		



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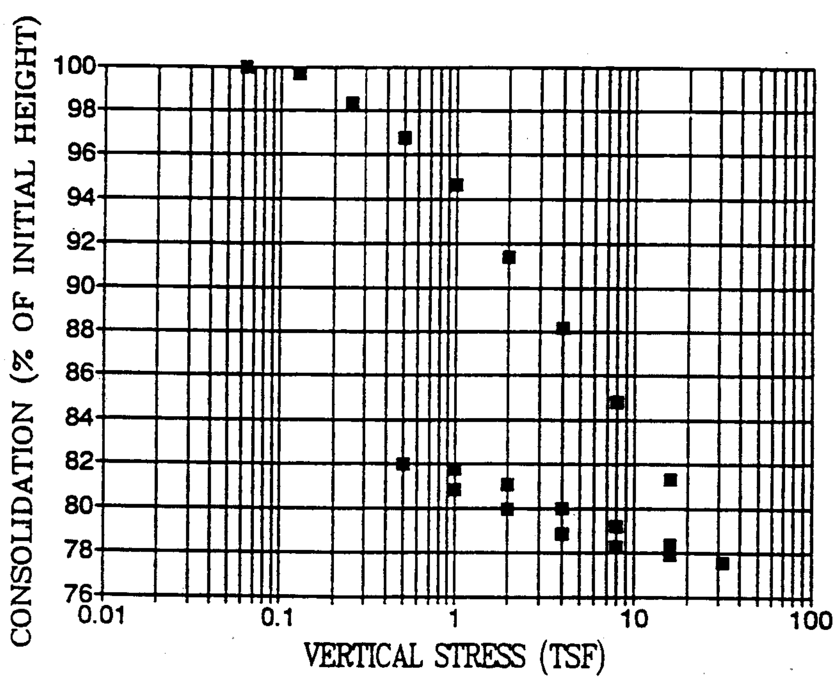
PROJECT:	GILA BEND REGIONAL LANDFILL	**JOB NO:**	6-119-0023LT
LOCATION:	GILA BEND, ARIZONA	**WORK ORDER NO:**	3
MATERIAL:	CLAY	**LAB NO:**	27
SAMPLE SOURCE:	110' @306	**DATE SAMPLED:**	04-26-96
SAMPLE PREPARATION:	INSITU / INUNDATED @ .0625 TSF		

CONSOLIDATION TEST (ASTM D 2435)

INITIAL MOISTURE CONTENT	19.3%	FINAL MOISTURE CONTENT	10.7%
INITIAL DRY DENSITY (PCF)	102.0	FINAL DRY DENSITY (PCF)	131.0
INITIAL DEGREE OF SATURATION	81%	FINAL DEGREE OF SATURATION	104%
INITIAL VOID RATIO	0.64	FINAL VOID RATIO	0.28
ESTIMATED SPECIFIC GRAVITY	2.68		



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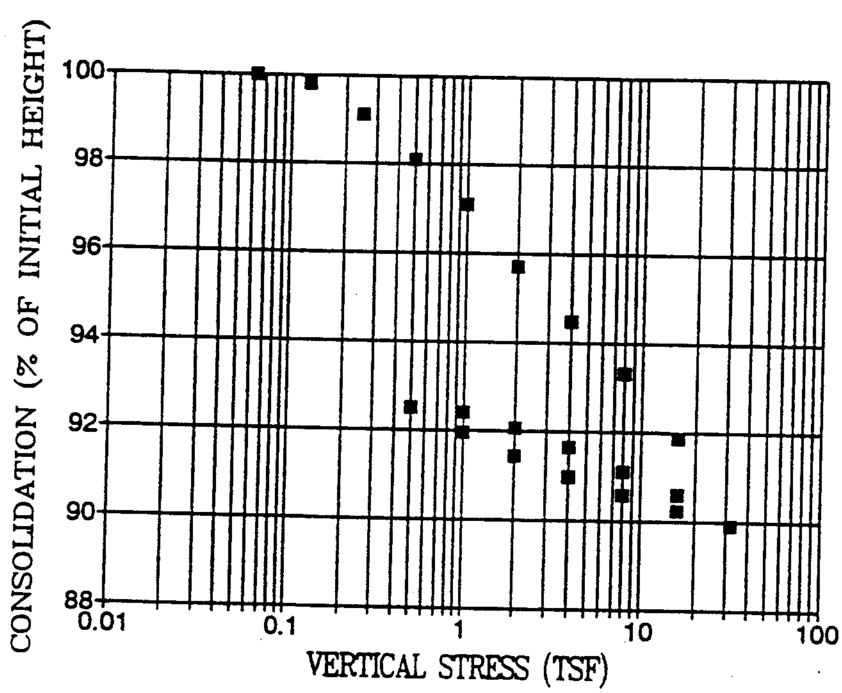
PROJECT:	GILA BEND REGIONAL LANDFILL	**JOB NO:**	6-119-0023LT
LOCATION:	GILA BEND, ARIZONA	**WORK ORDER NO:**	3
MATERIAL:	CLAY	**LAB NO:**	28
SAMPLE SOURCE:	150' @ 306	**DATE SAMPLED:**	04-26-96
SAMPLE PREPARATION:	INSITU / INUNDATED @ .0625 TSF		

CONSOLIDATION TEST (ASTM D 2435)

INITIAL MOISTURE CONTENT	19.4%	FINAL MOISTURE CONTENT	14.8%
INITIAL DRY DENSITY (PCF)	109.3	FINAL DRY DENSITY (PCF)	120.9
INITIAL DEGREE OF SATURATION	98%	FINAL DEGREE OF SATURATION	104%
INITIAL VOID RATIO	0.53	FINAL VOID RATIO	0.38
ESTIMATED SPECIFIC GRAVITY	2.68		



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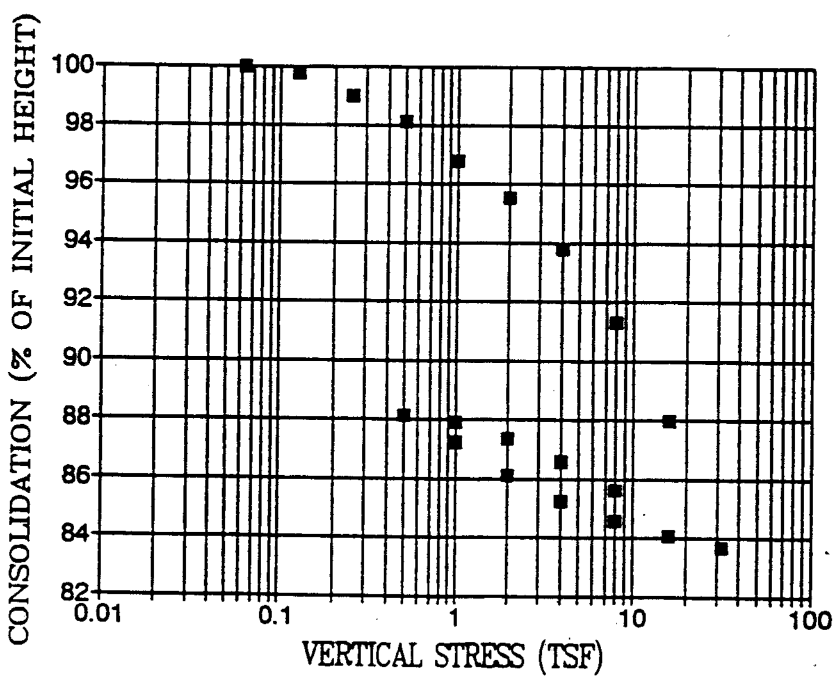
PROJECT:	GILA BEND REGIONAL LANDFILL	JOB NO:	6-119-0023LT
LOCATION:	GILA BEND, ARIZONA	WORK ORDER NO:	3
MATERIAL:	CLAY	LAB NO:	29
SAMPLE SOURCE:	185' (2 RINGS) @ 306	DATE SAMPLED:	04-26-96
SAMPLE PREPARATION:	INSITU / INUNDATED @ .0625 TSF		

CONSOLIDATION TEST (ASTM D 2435)

INITIAL MOISTURE CONTENT	26.7%	FINAL MOISTURE CONTENT	21.8%
INITIAL DRY DENSITY (PCF)	90.2	FINAL DRY DENSITY (PCF)	107.3
INITIAL DEGREE OF SATURATION	84%	FINAL DEGREE OF SATURATION	104%
INITIAL VOID RATIO	0.85	FINAL VOID RATIO	0.56
ESTIMATED SPECIFIC GRAVITY	2.68		



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Borings 304 and 305 Moisture Contents

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AGRA Earth &
Environmental, Inc.
3232 West Virginia Avenue
Phoenix, Arizona 85009-1502
Tel (602) 272-6848
Fax (602) 272-7239

TRANSMITTAL

TO: CONTINENTAL WASTE INDUSTRIES
67 WALNUT AVE #103
CLARK NJ 07066

ATTN: Michael Drury

Date: 5-14-96
Project: Materials Testing
Job/Proposal #: AEE Job 6-119-0023LT
Transmittal #: 3
Reference: Gila Bend Regional Land:

We are:	For your:	The following:
[x] transmitting	[ ] review & comment	[ ] boring logs
[ ] returning	[x] information/files	[ ] calculations
[ ] separately	[ ] approval	[ ] design charts
	[ ] signature	[ ] progress reports
	[ ] as requested	[x] laboratory results
		[ ] plans
		[ ] specifications
		[ ] other:

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		2602-002 (Contractor Originals)

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Malcolm Pirnie (1)

By: Cliff Metz
Laboratory Supervisor

Engineering & Environmental Services

AGRA Earth & Environmental

PROJECT:	GILA BEND REGIONAL LANDFILL	JOB NO:	6-119-0023LT
LOCATION:	GILA BEND, AZ	WORK ORDER NO:	4
MATERIAL:	---	LAB NO:	SEE BELOW
SAMPLE SOURCE:	SEE BELOW	DATE SAMPLED:	5/1 & 5/2/96

MOISTURE CONTENT OF SOIL (ASTM D2216)

LAB #	SOURCE	WET WT. (gram)	DRY WT. (gram)	MOISTURE CONTENT
33	B305 @ 105'	166.0	142.0	16.9%
34	B305 @ 110' R62	191.0	166.0	15.1%
35	B305 @ 125' GBL	371.0	309.0	20.1%
36	B305 @ 135' GBL	307.0	250.0	22.8%
37	B305 @ 115' GBL	294.0	243.0	21.0%
38	B305 @ 160' GBL	413.0	308.0	34.1%
39	B305 @ 175' GBL	222.0	186.0	19.4%
40	B305 @ 195' GBL	331.0	258.0	28.3%
41	B305 @ 260' GBL	352.0	319.0	10.3%
42	B305 @ 230' GBL	303.0	232.0	30.6%

AGRA Earth & Environmental

AGRA Earth &
Environmental, Inc.
3232 West Virginia Avenue
Phoenix, Arizona 85009-1502
Tel (602) 272-6848
Fax (602) 272-7239

TRANSMITTAL

TO: CONTINENTAL WASTE INDUSTRIES
67 WALNUT AVE #103
CLARK NJ 07066

ATTN: MICHAEL DRURY

Date: 4-29-96
Project: Materials Testing
Job/Proposal #: AEE Job 6-119-0023LT
Transmittal #: 2
Reference: Laboratory Testing
Gila Bend Regional Landfill

We are:	For your:	The following:
[x] transmitting	[ ] review & comment	[ ] boring logs
[ ] returning	[x] information/files	[ ] calculations
[ ] separately	[ ] approval	[ ] design charts
	[ ] signature	[ ] progress reports
	[ ] as requested	[x] laboratory results
		[ ] plans
		[ ] specifications
		[ ] other:

Copies	Date	Description
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Remarks:

Copy to: Addressee (1)
William J. Kozuh (1)
Malcolm Pirnie (1)

By: Cliff Metz
Laboratory Supervisor

Engineering & Environmental Services

AGRA Earth & Environmental

PROJECT:	GILA BEND REGIONAL LANDFILL	**JOB NO:**	6-119-0023LT
LOCATION:	GILA BEND, AZ	**WORK ORDER NO:**	2
MATERIAL:	CLAY	**LAB NO:**	SEE BELOW
SAMPLE SOURCE:	SPLIT SPOON SAMPLES (SEE BELOW)	**DATE SAMPLED:**	04-19-96

MOISTURE CONTENT OF SOIL (ASTM D2216)

LAB #	SOURCE	WET WT. (gram)	DRY WT. (gram)	MOISTURE CONTENT
14	B304 @ 100'	353.0	273.0	29.3%
15	B304 @ 105'	374.0	287.0	30.3%
17	B304 @ 115'	212.0	177.1	19.7%
18	B304 @ 120'	251.0	205.0	22.4%
20	B304 @ 130'	498.0	396.0	25.8%
21	B304 @ 135'	304.0	244.0	24.6%
22	B304 @ 140'	253.0	204.0	24.0%
23	B304 @ 145'	334.0	279.0	19.7%
25	B304 @ 155'	349.0	295.0	18.3%
26	B304 @ 165'	561.0	463.0	21.2%

Borings 104 and 104A Gradation, Plasticity Index and Permeability

Coronado Engineering & Consulting
127 South Weber Drive, Suite B-1, Chandler, AZ 85226 Phone: 602-940-0276 Fax: 602-940-0263

January 19, 1996

Mr. Don Cornelison, P.E.
Speedie and Associates
11029 North 24th Avenue, Suite 805
Phoenix, Arizona 85029

RE: Hydraulic Conductivity Testing
Project No. KL-1079

Dear Mr. Cornelison:

In accordance with your request, we have tested two soil samples for hydraulic conductivity (i.e. permeability).. The results of those tests were transmitted in our letter dated January 18, 1996. As part of that testing, we also performed minus #200 and plasticity index tests on other samples not included in the previously transmitted information. This additional data is tabulated below.

Sample ID	Minus #200 %	Plasticity Index
B104 @ 10'-11'	99	43
B104A @ 14'-15'	98	45
B104A @ 15'-16'	98	29
B202 @ 22'	82	24
B210 @ 26'-27'	80	50

Samples 210 @ 30'-30.5' and 210 @ 30.5'-31.0' were sand and could not be tested.

If there are any questions or if we may be of further assistance, please call at 940-0276.

Respectfully submitted,
CORONADO ENGINEERING AND CONSULTING

Registered Professional
CERTIFICATE
14724
STEVEN A
GRIESS
Date Signed 1/19/96
ARIZONA, U.S.A.

Steven A. Griess, P.E.

Copies (3) Client

Coronado Engineering & Consulting

127 South Weber Drive, Suite B-1, Chandler, AZ 85226 Phone: 602-940-0276 Fax: 602-940-0263

January 18, 1996

Mr. Don Cornelison P.E.
Speedie and Associates
11029 N. 24th Ave. #805
Phoenix, Arizona 85029

Re: Hydraulic Conductivity Testing Project No. KL-1079

Dear Mr. Cornelison:

In accordance with your request, we have tested two soil samples for hydraulic conductivity (i.e. permeability). The testing was done following the guidelines of test method ASTM D 5084 using a flexible wall permeameter. The following permeability values were determined.

Sample	Permeability (centimeters/second)	Passing #200 Sieve (%)	Plasticity Index
B 104 @ 10'-11'	$5.4\ E^{-8}$	99	43
B 104A @ 14'15'	$6.3\ E^{-9}$	98	45

Three samples submitted with the above samples could not be tested due to sample disturbance. They were B 104A at 15' to 16', B 202 at 22' and B 210 7C at 26' to 27'. The sample from B104 A at 15' to 16' lost it's soil structure duri saturation. All that held the sample together in the test cell was the rubber membrane. When we removed this sample fr the cell, the soil just flowed out of the membrane. The sample from B 202 7C at 26' to 27' had too many cracks and vo for testing. The sample from B 202 at 22' would not hold a seal between the rubber membrane and the sample and could not be tested.

During saturation of the samples, some swelling was noticed.

The correlation between results obtained with this test method and the hydraulic conductivity of in-place field materials has not been fully investigated. Experience has sometimes shown that flow patterns in small test specimens do not necessarily follow the same patterns on large field scales and that hydraulic conductivities measured on small test specimens are not necessarily the same as larger scale values. Therefore, the above results should be applied to field situations with caution and by qualified personnel.

If there are any questions or if we may be of further assistance, please call at 940-0276.

Respectfully submitted,

Coronado Engineering and Consulting

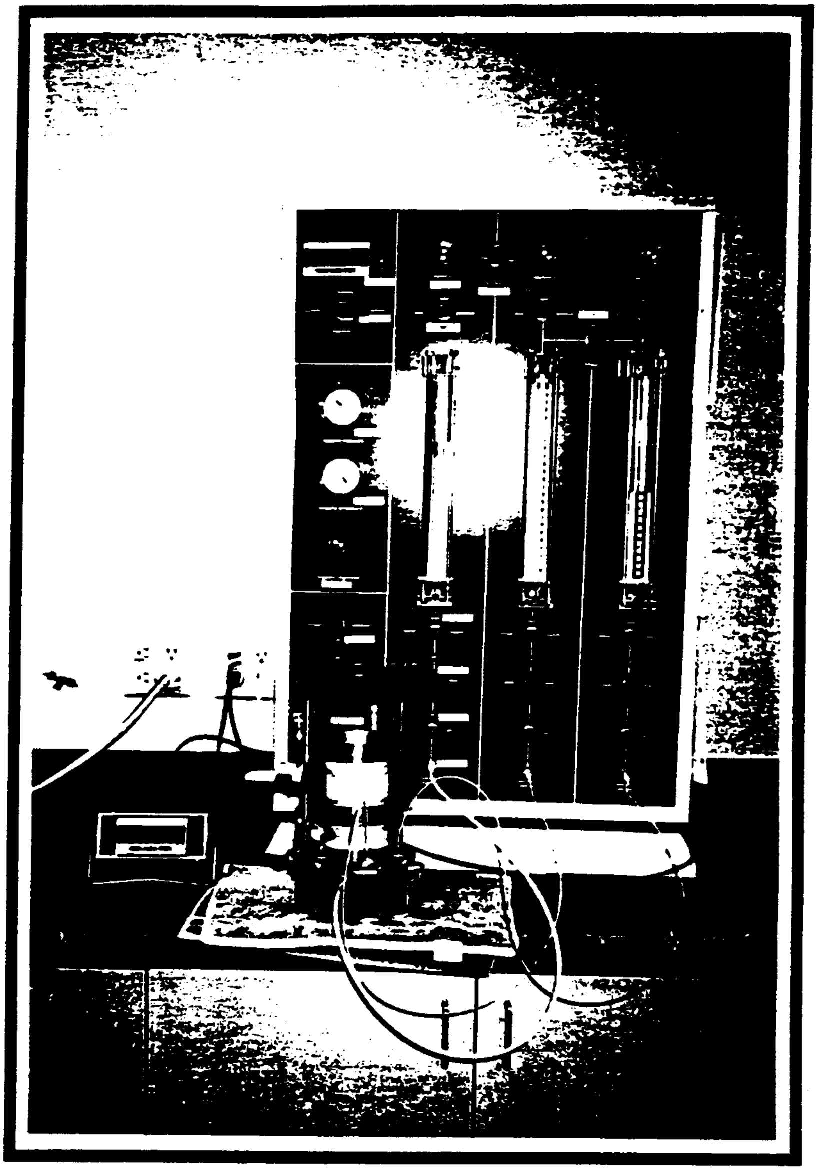
Clyde L. Pretti

Registered Professional Engineer (Civil)
CERTIFICATE NO.
12561
CLYDE L.
PRETTI
1/19/96
Date Signed
ARIZONA, U.S.A.

Clyde L. Pretti P.E.
Geotechnical Engineer

Copies (3) client

projects/KL-1079/960118.prm



Permeability Test Apparatus

Gradation Analyses

SPEEDIE AND ASSOCIATES
GEOTECHNICAL/ENVIRONMENTAL/MATERIALS ENGINEERS
9 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029
(602) 997-6391 • FAX (602) 943-5508

LETTER OF TRANSMITTAL

DATE: October 20, 1995
PROJECT NO: 95577LA

RE:
Gila Bend Landfill
Gila Bend, Arizona

CLIENT'S PROJECT NO.

TO
Mr. William J. Kozuh
Continental Waste Industries
67 Walnut Avenue, Suite 1
Clark, NJ 07066

GENTLEMEN:

WE ARE SENDING YOU X Attached | Under separate cover via | the following
Reports | Prints | Samples | Specifications
Copy of letter | Plans

COPIES	NO.	DATE	DESCRIPTION
1	23 Sheets	10-04-95	Report of Laboratory Tests
1	23 Sheets	10-04-95	Gradation Curves

THESE ARE TRANSMITTED as checked below:

For approval	Approved as submitted	Resubmit copies for approval
For your use X	Approved as noted	Submit copies for distribution
As requested	Returned for corrections	Return corrected prints.
For review and comment	Disapproved	For release to Bidders

REMARKS

Donald L. Cornelision, P.E.

BY:

If enclosures are not as noted, kindly notify us at once.

10.20-A/1

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GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-155
BORING NO.: FIELD SAMPLE NO.: B-1 SAMPLE DEPTH: 5'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		100	
1/2 INCH		96.8	
3/8 INCH		95.9	
1/4 INCH		93.1	
NO. 4		91.9	
NO. 8		86.7	
NO. 10		84.1	
NO. 16		70.9	
NO. 30		41.0	
NO. 40		26.4	
NO. 50		17.8	
NO. 100		11.3	
NO. 200		7.6	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 2.1
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-156
BORING NO.: FIELD SAMPLE NO.: B-2 SAMPLE DEPTH: 10'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		100	
1/2 INCH		96.8	
3/8 INCH		93.4	
1/4 INCH		88.5	
NO. 4		85.3	
NO. 8		76.0	
NO. 10		74.0	
NO. 16		65.4	
NO. 30		41.0	
NO. 40		25.7	
NO. 50		17.1	
NO. 100		8.9	
NO. 200		6.0	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 1.8
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill — PROJECT NO. 95577LA — DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. — LAB SAMPLE NO.: 958-157
BORING NO.: — FIELD SAMPLE NO.: B-3 — SAMPLE DEPTH: 15'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client — DATE: 10-04-95 — TESTED BY: MW — DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		100	
1/2 INCH		96.8	
3/8 INCH		93.4	
1/4 INCH		88.6	
NO. 4		85.6	
NO. 8		76.9	
NO. 10		74.4	
NO. 16		66.8	
NO. 30		50.7	
NO. 40		38.2	
NO. 50		27.6	
NO. 100		18.2	
NO. 200		16.2	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 10.7
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-158
BORING NO.: FIELD SAMPLE NO.: B-4 SAMPLE DEPTH: 20'
MATERIAL DESCRIPTION: Poorly Graded Sand
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		100	
1/2 INCH		100	
3/8 INCH		99.7	
1/4 INCH		99.1	
NO. 4		98.8	
NO. 8		98.2	
NO. 10		98.0	
NO. 16		97.0	
NO. 30		93.0	
NO. 40		87.4	
NO. 50		69.9	
NO. 100		7.9	
NO. 200		3.3	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 2.6
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-159
BORING NO.: FIELD SAMPLE NO.: B-5 SAMPLE DEPTH: 25'
MATERIAL DESCRIPTION: Poorly Graded Sand
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH			
3/8 INCH			
1/4 INCH			
NO. 4			
NO. 8		99.7	
NO. 10		99.6	
NO. 16		98.1	
NO. 30		70.5	
NO. 40		43.4	
NO. 50		29.4	
NO. 100		6.9	
NO. 200		1.8	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 2.9
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-160
BORING NO.: FIELD SAMPLE NO.: B-6 SAMPLE DEPTH: 30'
MATERIAL DESCRIPTION: Poorly Graded Sand
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH			
3/8 INCH			
1/4 INCH			
NO. 4			
NO. 8		99.5	
NO. 10		99.3	
NO. 16		98.5	
NO. 30		87.2	
NO. 40		60.0	
NO. 50		29.0	
NO. 100		6.8	
NO. 200		3.6	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 3.1
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-161
BORING NO.: FIELD SAMPLE NO.: B-7 SAMPLE DEPTH: 35'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		100	
1/2 INCH		97.8	
3/8 INCH		97.3	
1/4 INCH		96.4	
NO. 4		96.3	
NO. 8		95.8	
NO. 10		95.5	
NO. 16		94.3	
NO. 30		85.6	
NO. 40		63.7	
NO. 50		32.6	
NO. 100		9.0	
NO. 200		4.8	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 3.7
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-162
BORING NO.: FIELD SAMPLE NO.: B-8 SAMPLE DEPTH: 40'
MATERIAL DESCRIPTION: Poorly Graded Sand
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		97.1	
1/2 INCH		93.1	
3/8 INCH		91.4	
1/4 INCH		89.5	
NO. 4		87.5	
NO. 8		81.9	
NO. 10		80.1	
NO. 16		72.3	
NO. 30		47.9	
NO. 40		31.1	
NO. 50		19.1	
NO. 100		7.1	
NO. 200		4.3	

LIQUID LIMIT: NATURAL MOISTURE: 16.1 ASPHALT CONTENT
PLASTIC LIMIT: UNIT DENSITY: % OF TOTAL SAMPLE:
PLASTICITY INDEX: % OF DRY WEIGHT:
RESISTIVITY: MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill **PROJECT NO.** 95577LA **DATE:** 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. **LAB SAMPLE NO.:** 958-163
BORING NO.: **FIELD SAMPLE NO.:** B-9 **SAMPLE DEPTH:** 45'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client **DATE:** 10-04-95 **TESTED BY:** MW **DATE:** 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH			
3/8 INCH			
1/4 INCH			
NO. 4			
NO. 8		99.2	
NO. 10		99.1	
NO. 16		98.3	
NO. 30		91.0	
NO. 40		81.0	
NO. 50		67.6	
NO. 100		24.8	
NO. 200		6.8	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 23.3
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

SPEEDIE AND ASSOCIATES
GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill **PROJECT NO.** 95577LA **DATE:** 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. **LAB SAMPLE NO.:** 958-164
BORING NO.: **FIELD SAMPLE NO.:** B-10 **SAMPLE DEPTH:** 50'
MATERIAL DESCRIPTION: Poorly Graded Sand
SAMPLED BY: Client **DATE:** 10-04-95 **TESTED BY:** MW **DATE:** 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH			
3/8 INCH		99.6	
1/4 INCH		99.6	
NO. 4		99.6	
NO. 8		99.4	
NO. 10		99.3	
NO. 16		99.1	
NO. 30		97.7	
NO. 40		94.0	
NO. 50		82.1	
NO. 100		8.7	
NO. 200		3.2	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 27.0
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

SPEEDIE AND ASSOCIATES
GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-165
BORING NO.: FIELD SAMPLE NO.: B-11 SAMPLE DEPTH: 60'
MATERIAL DESCRIPTION: Poorly Graded Sand with Gravel
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-4

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH		94.8	
3/4 INCH		94.8	
1/2 INCH		88.0	
3/8 INCH		81.3	
1/4 INCH		72.2	
NO. 4		65.5	
NO. 8		54.0	
NO. 10		52.0	
NO. 16		44.8	
NO. 30		29.9	
NO. 40		19.3	
NO. 50		11.3	
NO. 100		4.5	
NO. 200		3.0	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE:
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

SPEEDIE AND ASSOCIATES
GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-166
BORING NO.: FIELD SAMPLE NO.: B-12 SAMPLE DEPTH: 5'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-2

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		96.9	
1/2 INCH		93.0	
3/8 INCH		90.6	
1/4 INCH		82.9	
NO. 4		78.5	
NO. 8		68.4	
NO. 10		65.8	
NO. 16		59.9	
NO. 30		50.2	
NO. 40		43.2	
NO. 50		37.1	
NO. 100		28.7	
NO. 200		21.2	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 2.5
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-167
BORING NO.: FIELD SAMPLE NO.: B-12 SAMPLE DEPTH: 10'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-2

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH			
3/8 INCH		98.9	
1/4 INCH		98.5	
NO. 4		98.5	
NO. 8		95.2	
NO. 10		94.4	
NO. 16		91.4	
NO. 30		79.6	
NO. 40		67.7	
NO. 50		54.7	
NO. 100		18.7	
NO. 200		8.5	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 1.6
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-168
BORING NO.: FIELD SAMPLE NO.: B-14 SAMPLE DEPTH: 15'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-2

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH		93.9	
3/4 INCH		86.2	
1/2 INCH		79.1	
3/8 INCH		74.3	
1/4 INCH		66.2	
NO. 4		59.9	
NO. 8		46.5	
NO. 10		42.7	
NO. 16		34.7	
NO. 30		24.0	
NO. 40		19.0	
NO. 50		15.8	
NO. 100		11.1	
NO. 200		8.6	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 2.1
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-169
BORING NO.: FIELD SAMPLE NO.: B-15 SAMPLE DEPTH: 25'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-2

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		95.7	
1/2 INCH		84.9	
3/8 INCH		79.6	
1/4 INCH		69.8	
NO. 4		62.6	
NO. 8		46.1	
NO. 10		41.9	
NO. 16		31.3	
NO. 30		18.8	
NO. 40		14.3	
NO. 50		11.5	
NO. 100		7.7	
NO. 200		5.4	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 11.1
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-170
BORING NO.: FIELD SAMPLE NO.: B-16 SAMPLE DEPTH: 35'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-2

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH			
3/8 INCH		96.9	
1/4 INCH		94.0	
NO. 4		91.9	
NO. 8		88.2	
NO. 10		86.1	
NO. 16		78.1	
NO. 30		54.6	
NO. 40		36.4	
NO. 50		23.1	
NO. 100		9.6	
NO. 200		4.9	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 20.8
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-171
BORING NO.: FIELD SAMPLE NO.: B-17 SAMPLE DEPTH: 5'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-5

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH			
3/8 INCH			
1/4 INCH			
NO. 4			
NO. 8		90.3	
NO. 10		89.1	
NO. 16		86.9	
NO. 30		79.2	
NO. 40		69.2	
NO. 50		58.2	
NO. 100		43.2	
NO. 200		31.0	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 0.9
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-172
BORING NO.: FIELD SAMPLE NO.: B-18 SAMPLE DEPTH: 10'
MATERIAL DESCRIPTION: Poorly Graded Sand
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-5

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		94.6	
1/2 INCH		91.8	
3/8 INCH		90.0	
1/4 INCH		88.4	
NO. 4		87.2	
NO. 8		83.9	
NO. 10		82.6	
NO. 16		77.6	
NO. 30		62.4	
NO. 40		45.9	
NO. 50		25.9	
NO. 100		6.7	
NO. 200		4.1	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 0.9
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-173
BORING NO.: FIELD SAMPLE NO.: B-19 SAMPLE DEPTH: 15'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-5

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH		99.0	
3/8 INCH		98.2	
1/4 INCH		96.5	
NO. 4		94.9	
NO. 8		90.8	
NO. 10		89.2	
NO. 16		81.0	
NO. 30		54.5	
NO. 40		36.1	
NO. 50		22.9	
NO. 100		9.8	
NO. 200		7.3	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 1.9
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-174
BORING NO.: FIELD SAMPLE NO.: B-20 SAMPLE DEPTH: 20'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-5

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH		95.3	
1/2 INCH		91.6	
3/8 INCH		89.1	
1/4 INCH		85.3	
NO. 4		83.6	
NO. 8		80.5	
NO. 10		79.3	
NO. 16		76.0	
NO. 30		61.2	
NO. 40		44.7	
NO. 50		27.5	
NO. 100		11.1	
NO. 200		6.9	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 1.5
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill **PROJECT NO.** 95577LA **DATE:** 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. **LAB SAMPLE NO.:** 958-175
BORING NO.: **FIELD SAMPLE NO.:** B-21 **SAMPLE DEPTH:** 25'
MATERIAL DESCRIPTION: Poorly Graded Sand with Gravel
SAMPLED BY: Client **DATE:** 10-04-95 **TESTED BY:** MW **DATE:** 10-05-95
REMARKS:
SAMPLE LOCATION: MW-5

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH			
3/4 INCH			
1/2 INCH		92.3	
3/8 INCH		88.5	
1/4 INCH		83.2	
NO. 4		78.2	
NO. 8		68.4	
NO. 10		65.4	
NO. 16		58.8	
NO. 30		36.6	
NO. 40		18.9	
NO. 50		10.5	
NO. 100		4.2	
NO. 200		2.4	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 12.5
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-176
BORING NO.: FIELD SAMPLE NO.: B-22 SAMPLE DEPTH: 30'
MATERIAL DESCRIPTION: Well Graded Gravel with Sand
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-5

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH		94.0	
3/4 INCH		86.9	
1/2 INCH		77.6	
3/8 INCH		65.8	
1/4 INCH		54.2	
NO. 4		46.6	
NO. 8		34.5	
NO. 10		31.4	
NO. 16		26.3	
NO. 30		20.5	
NO. 40		16.6	
NO. 50		13.6	
NO. 100		6.7	
NO. 200		3.5	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 9.8
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

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REPORT OF LABORATORY TESTS

PROJECT: Gila Bend Landfill PROJECT NO. 95577LA DATE: 10-20-95
LOCATION: Gila Bend
CLIENT: Continental Waste Industries Inc. LAB SAMPLE NO.: 958-177
BORING NO.: FIELD SAMPLE NO.: B-23 SAMPLE DEPTH: 35'
MATERIAL DESCRIPTION: N/A
SAMPLED BY: Client DATE: 10-04-95 TESTED BY: MW DATE: 10-05-95
REMARKS:
SAMPLE LOCATION: MW-5

MECHANICAL ANALYSIS:

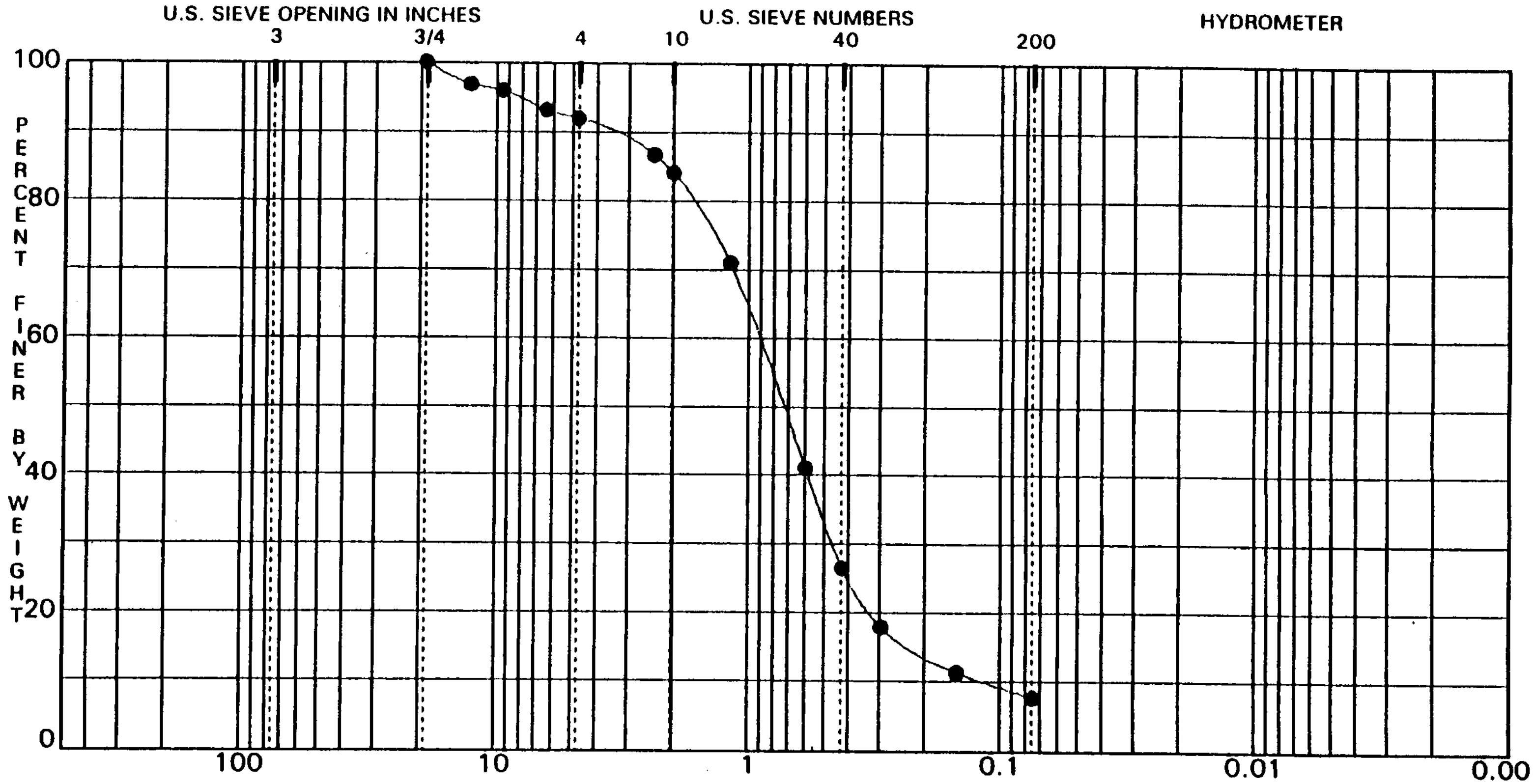
SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	PROJECT SPECIFICATION
1 1/2 INCH			
1 1/8 INCH			
1 INCH		91.8	
3/4 INCH		89.6	
1/2 INCH		89.6	
3/8 INCH		85.6	
1/4 INCH		81.7	
NO. 4		78.3	
NO. 8		72.8	
NO. 10		71.4	
NO. 16		67.1	
NO. 30		56.5	
NO. 40		43.8	
NO. 50		31.3	
NO. 100		16.3	
NO. 200		11.1	

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:
RESISTIVITY:

NATURAL MOISTURE: 12.0
UNIT DENSITY:

ASPHALT CONTENT
% OF TOTAL SAMPLE:
% OF DRY WEIGHT:
MARSHALL DENSITY:

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-4	5.0					8.1	84.2	7.7

Sheet 1 of 1

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

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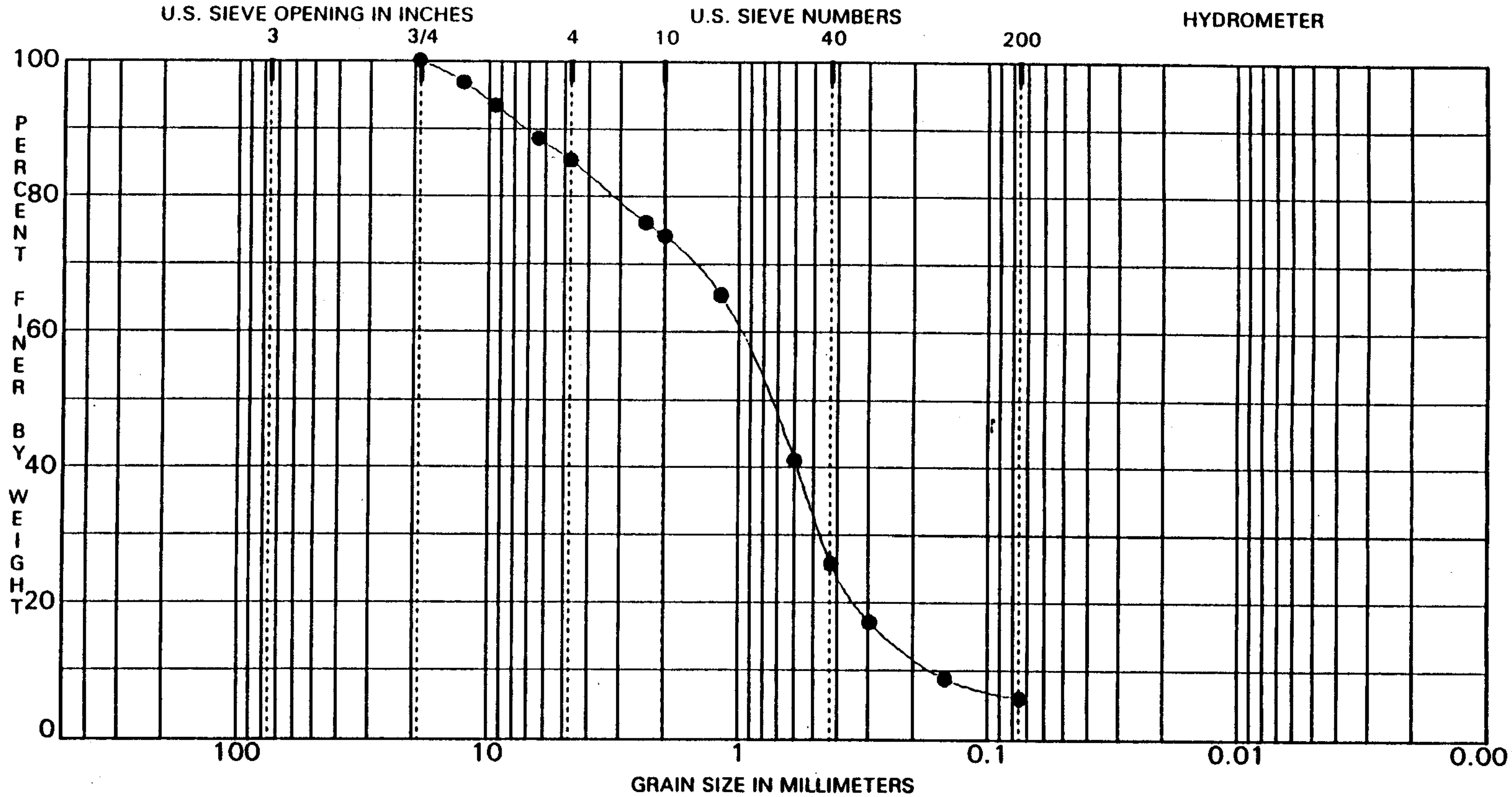
GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
● MW-4 ,	10.0					14.7	79.3	6.0

Sheet 1 of 2

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

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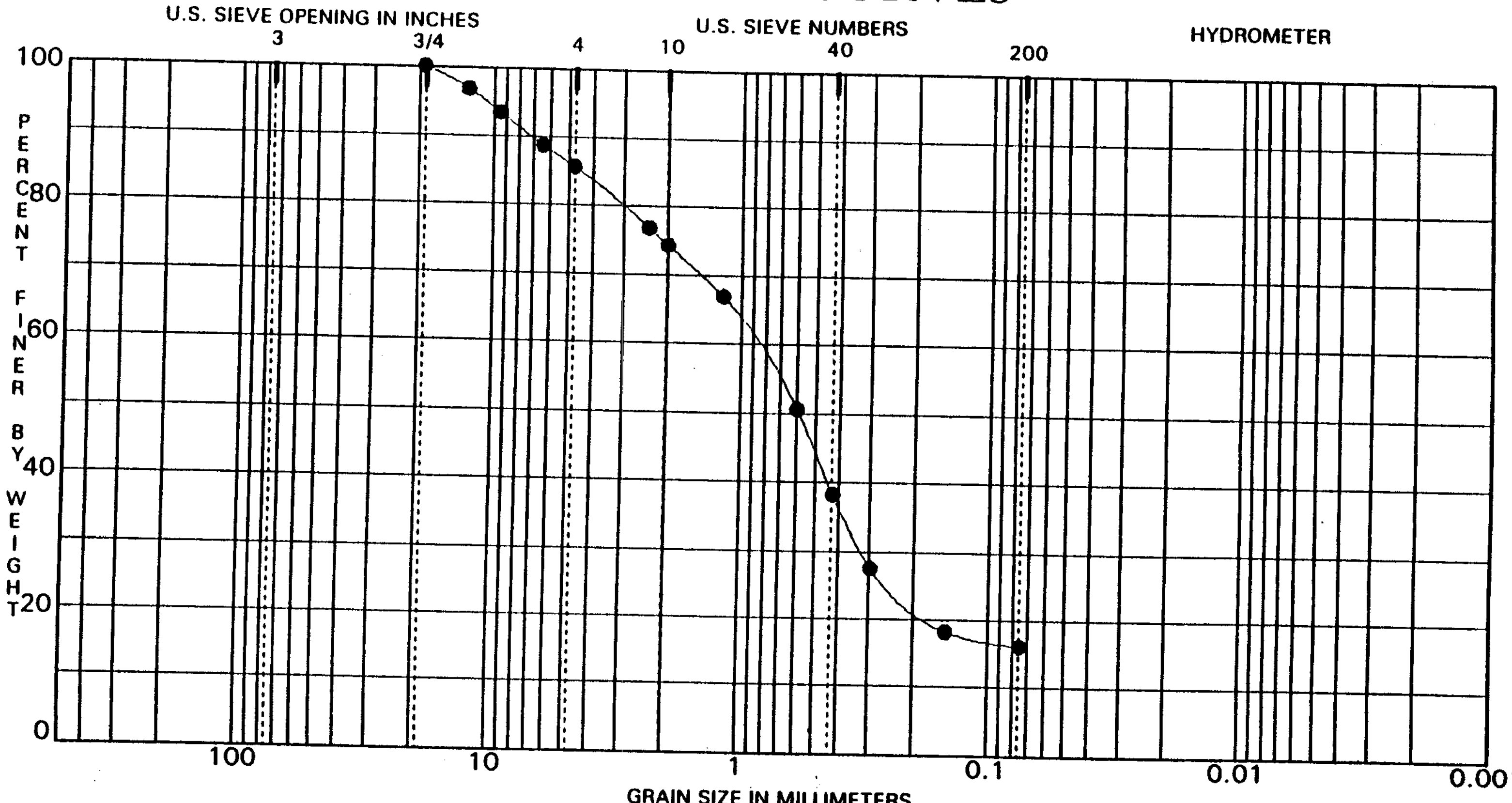
GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-4	15.0					14.4	69.5	16.1

Gila Bend Landfill

Gila Bend, Arizona
...ct No. 95577LA

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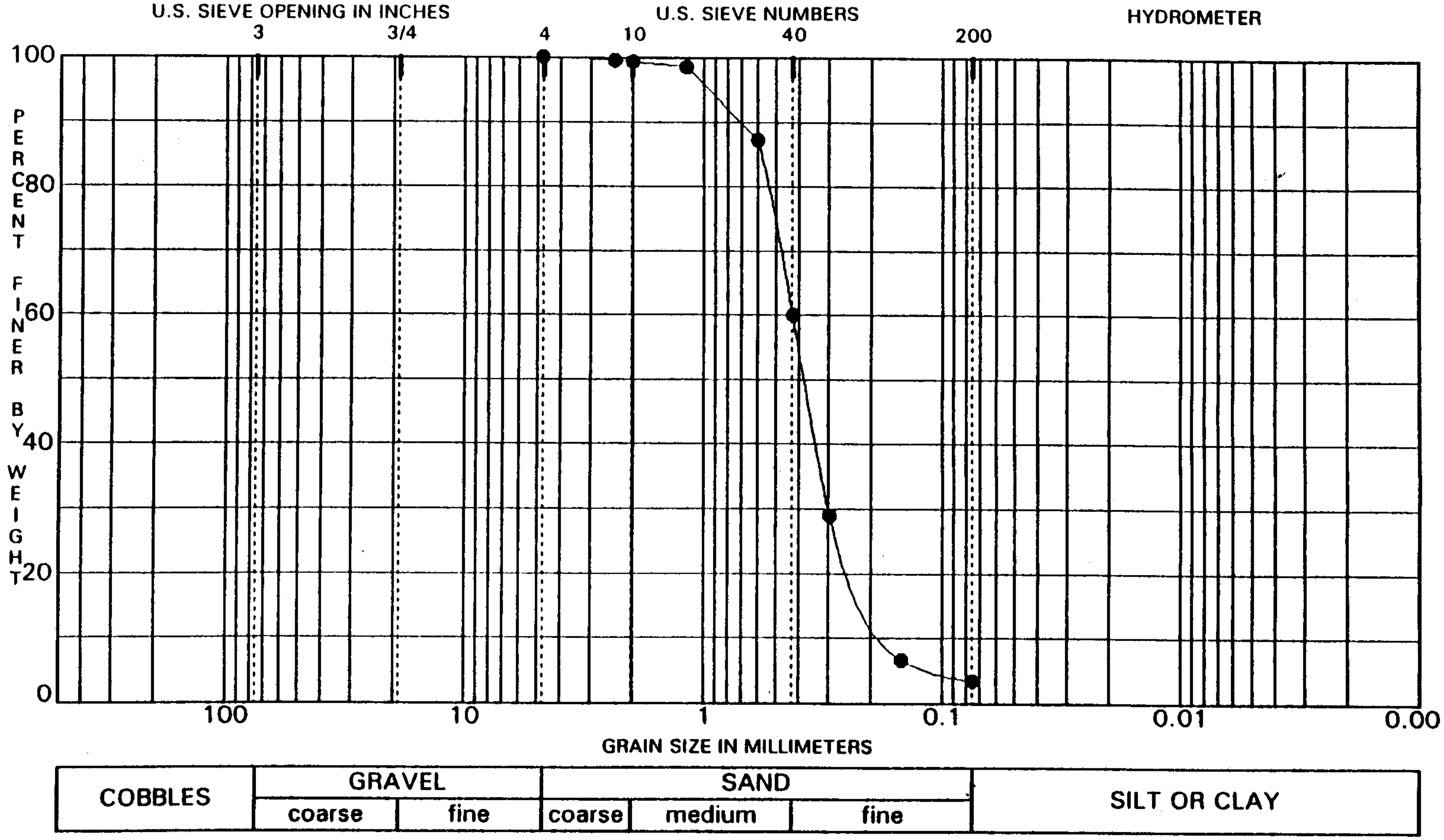
Sheet 2

GRADATION CURVES



	Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-4	30.0	POORLY GRADED SAND	SP				0.0	96.5	3.5

Sheet 1 of 2

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

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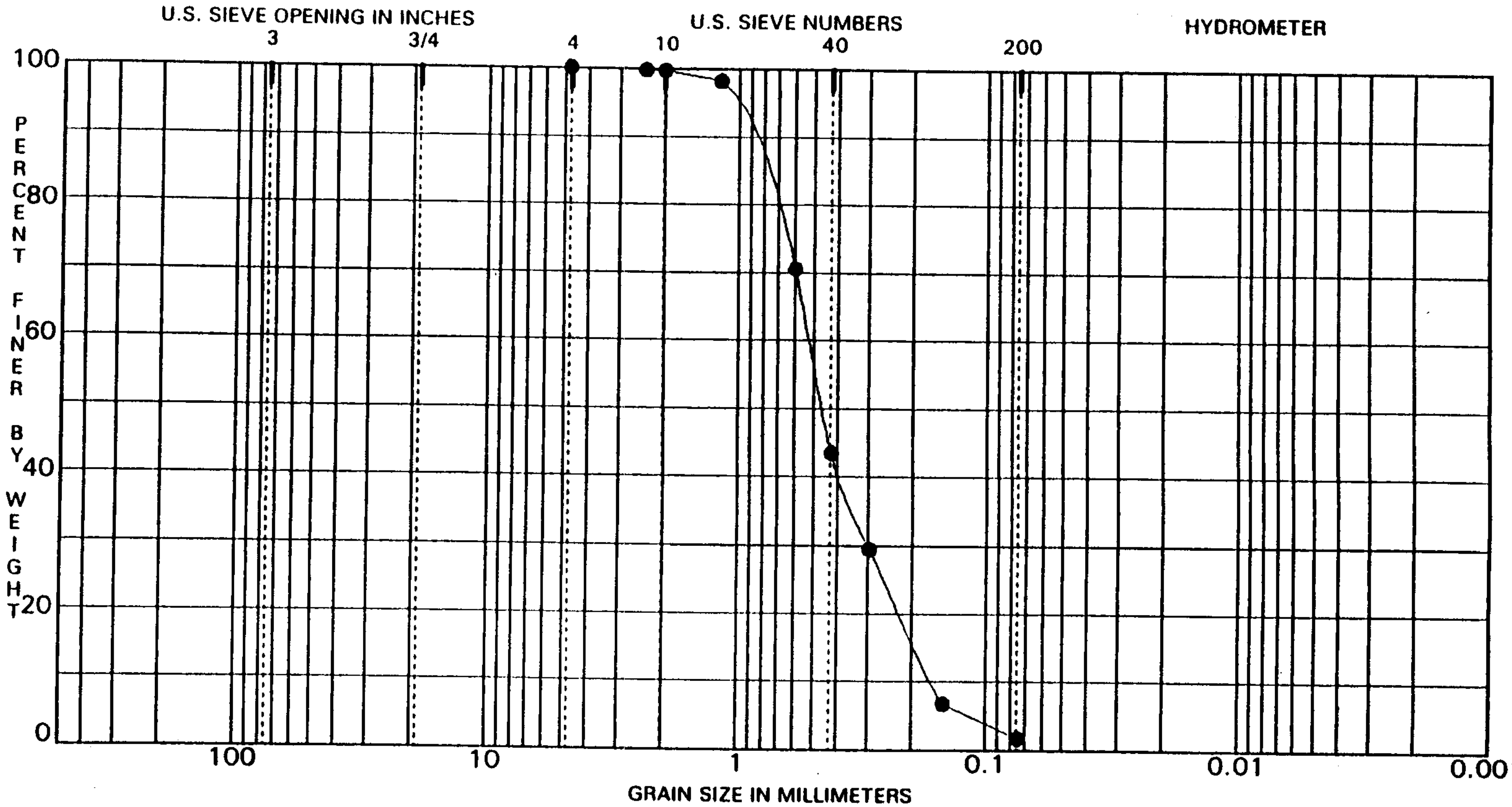
GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-4	25.0	POORLY GRADED SAND	SP				0.0	98.3	1.7

Sheet 2 of

Gila Bend Landfill

Gila Bend, Arizona

Project No. 95577LA

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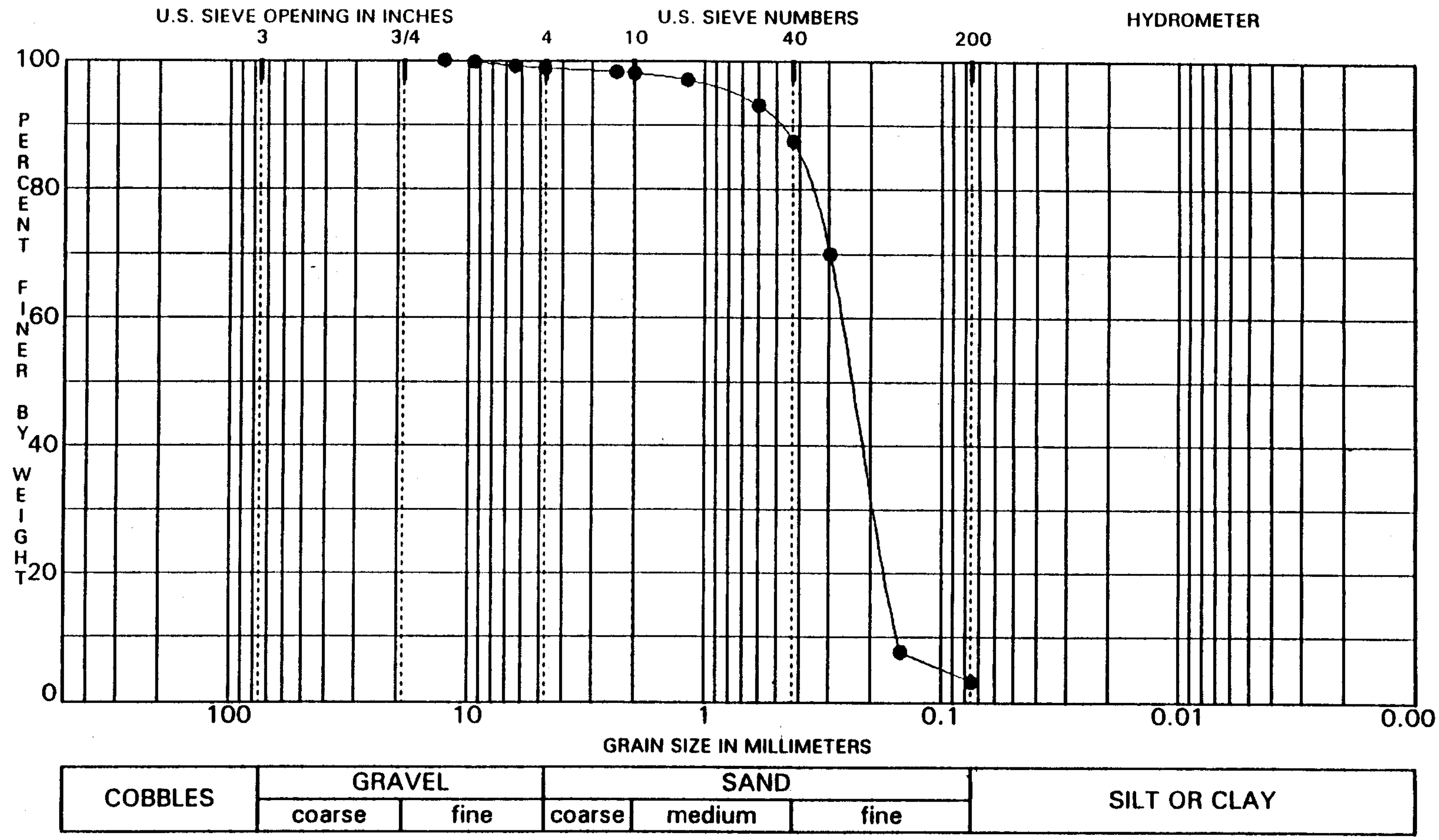
GRADATION CURVES



Specimen Identification			ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-4	20.0	POORLY GRADED SAND	SP				1.2	95.6	3.2

Sheet 1 of 2

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

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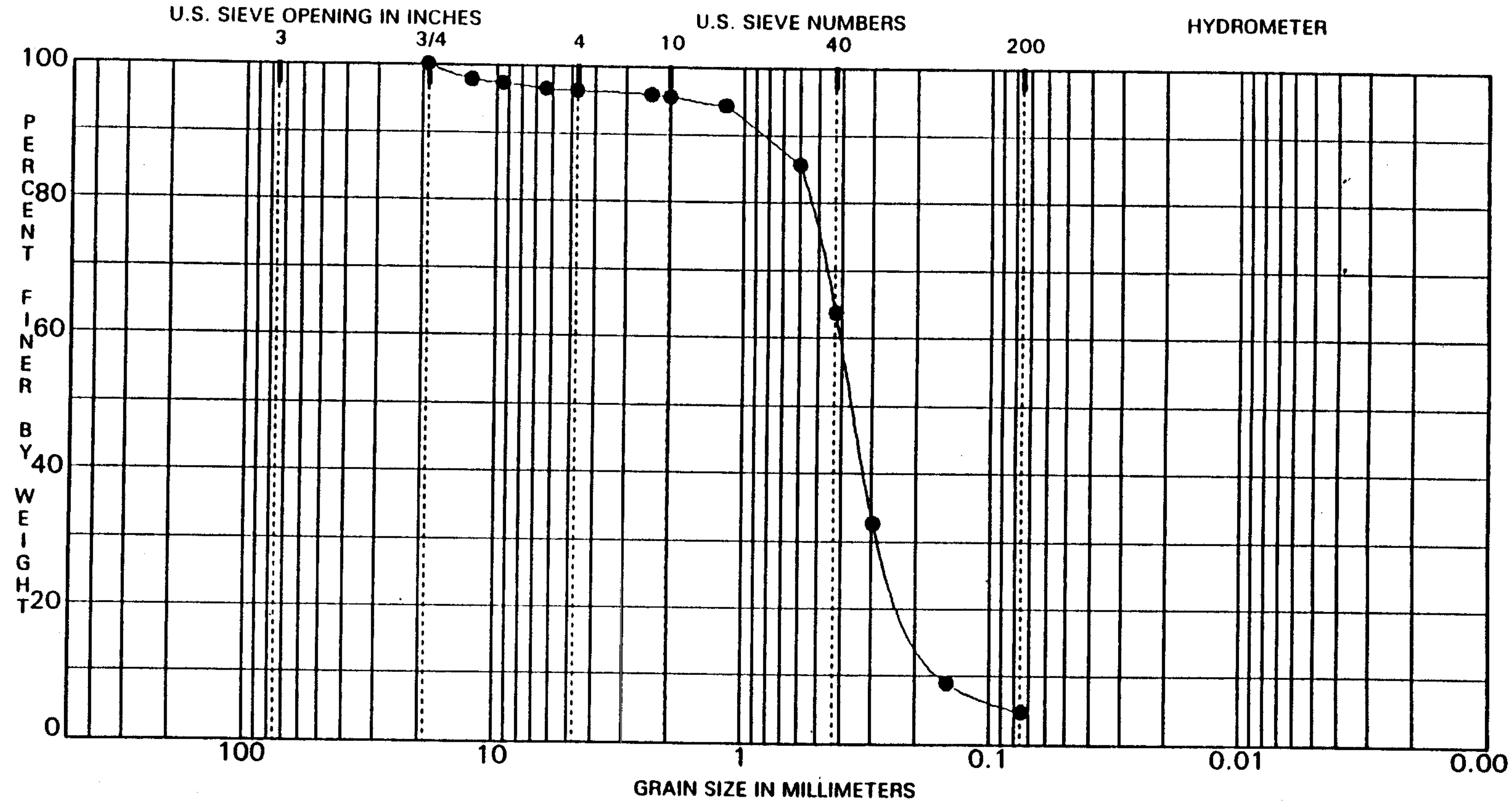
GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
● MW-4	35.0					3.7	91.5	4.8

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

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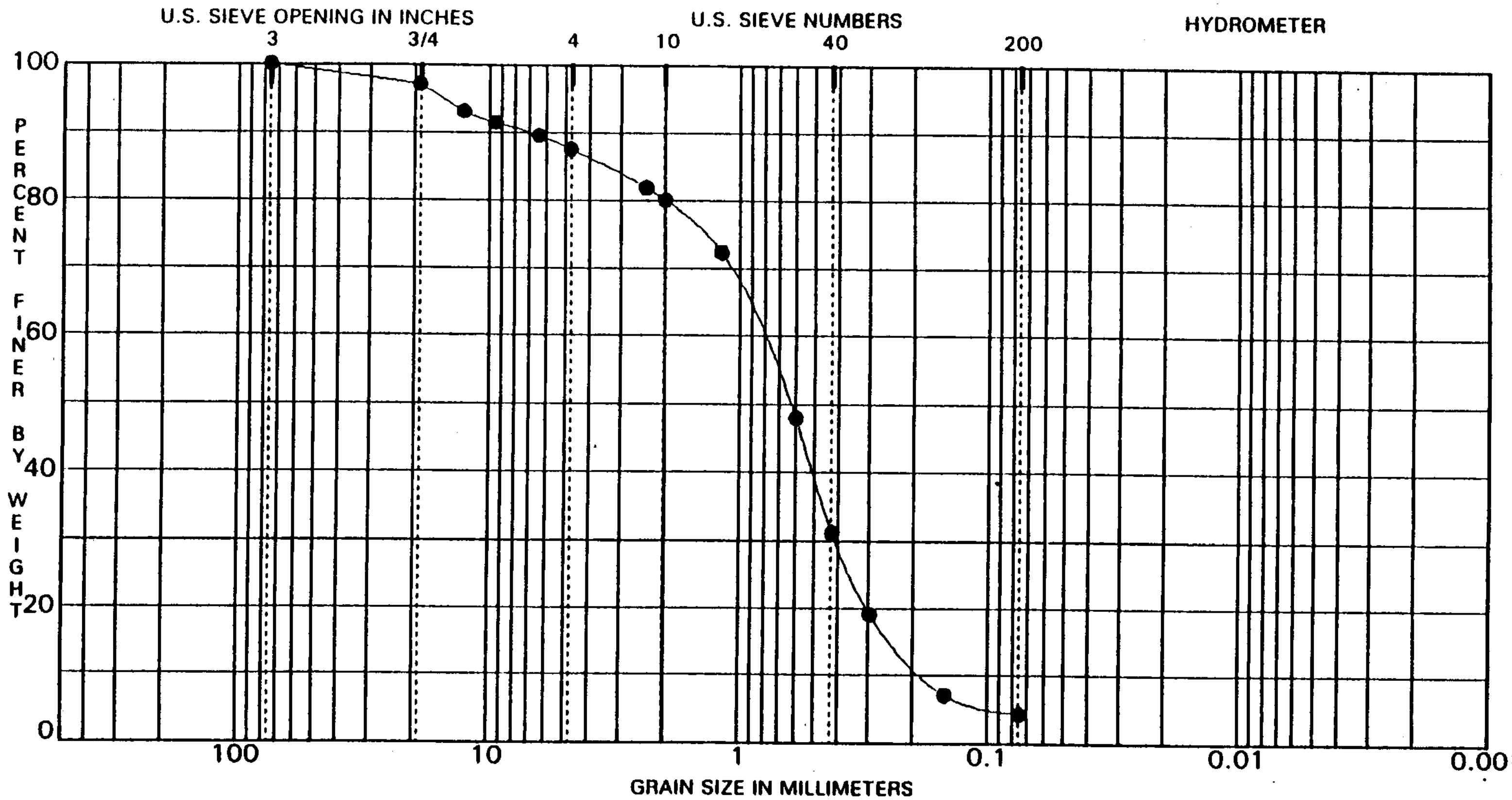
Sheet [illegible] of 2

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-4 ,	40.0	POORLY GRADED SAND	SP				12.5	83.2	4.3

Sheet 1 of 1

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

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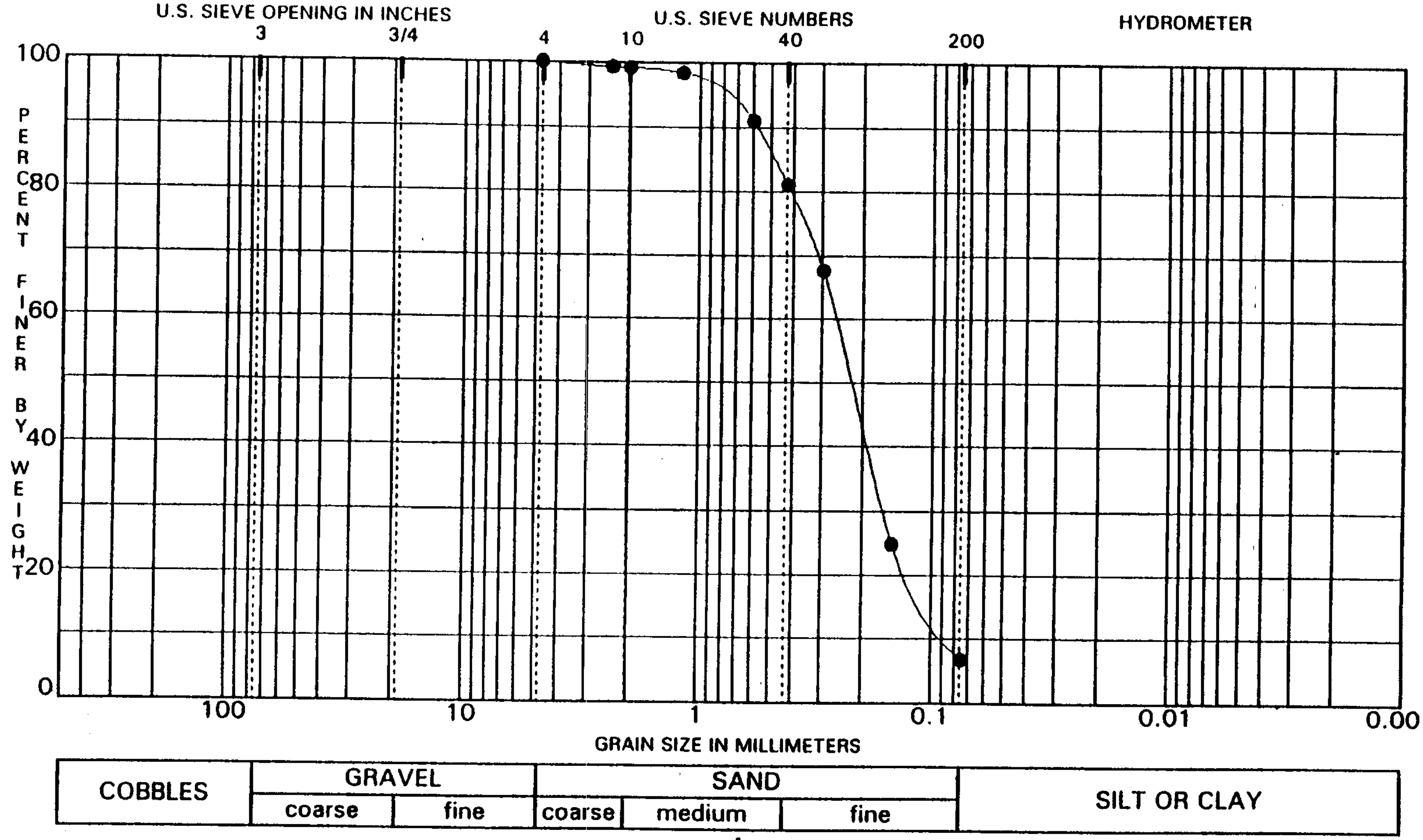

Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
● MW-4	45.0					0.0	93.2	6.8

Sheet [illegible]

Gila Bend Landfill

Gila Bend, Arizona

Project No. 95577LA

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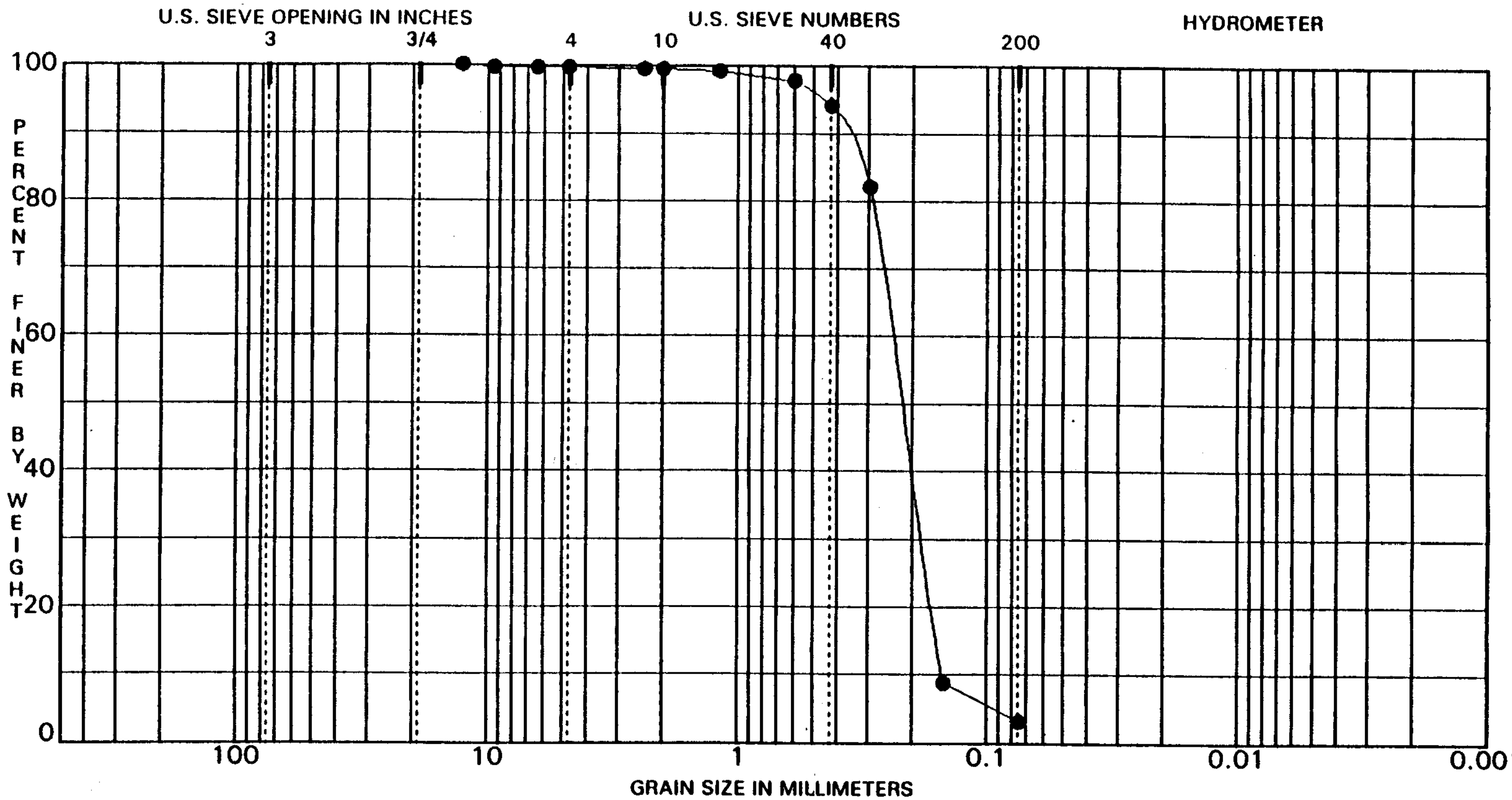
GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
● MW-4	50.0	POORLY GRADED SAND	SP				0.4	96.4	3.2

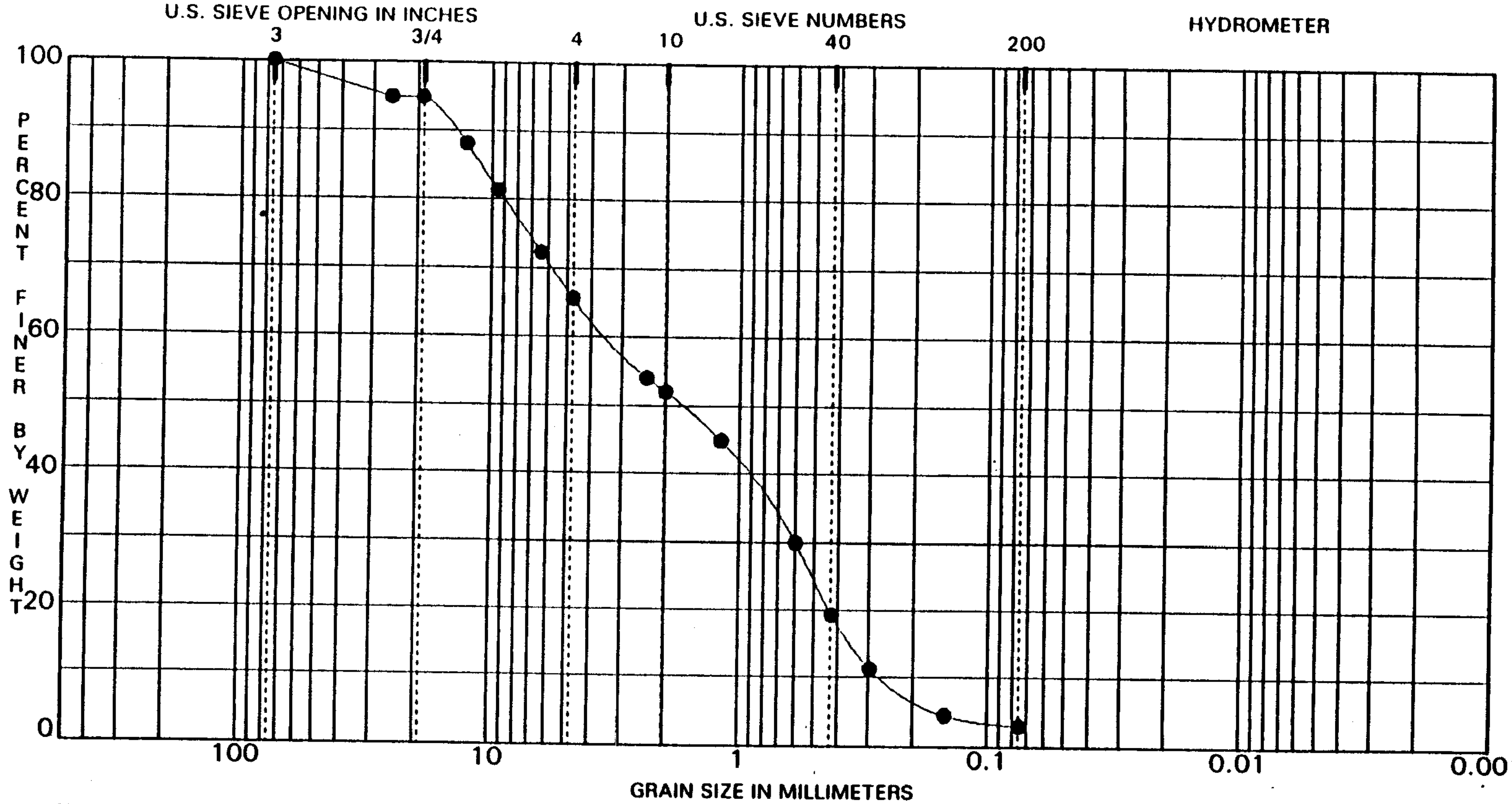
Sheet 1 of 1

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-4	60.0	POORLY GRADED SAND with GRAVEL	SP				34.5	62.5	3.0

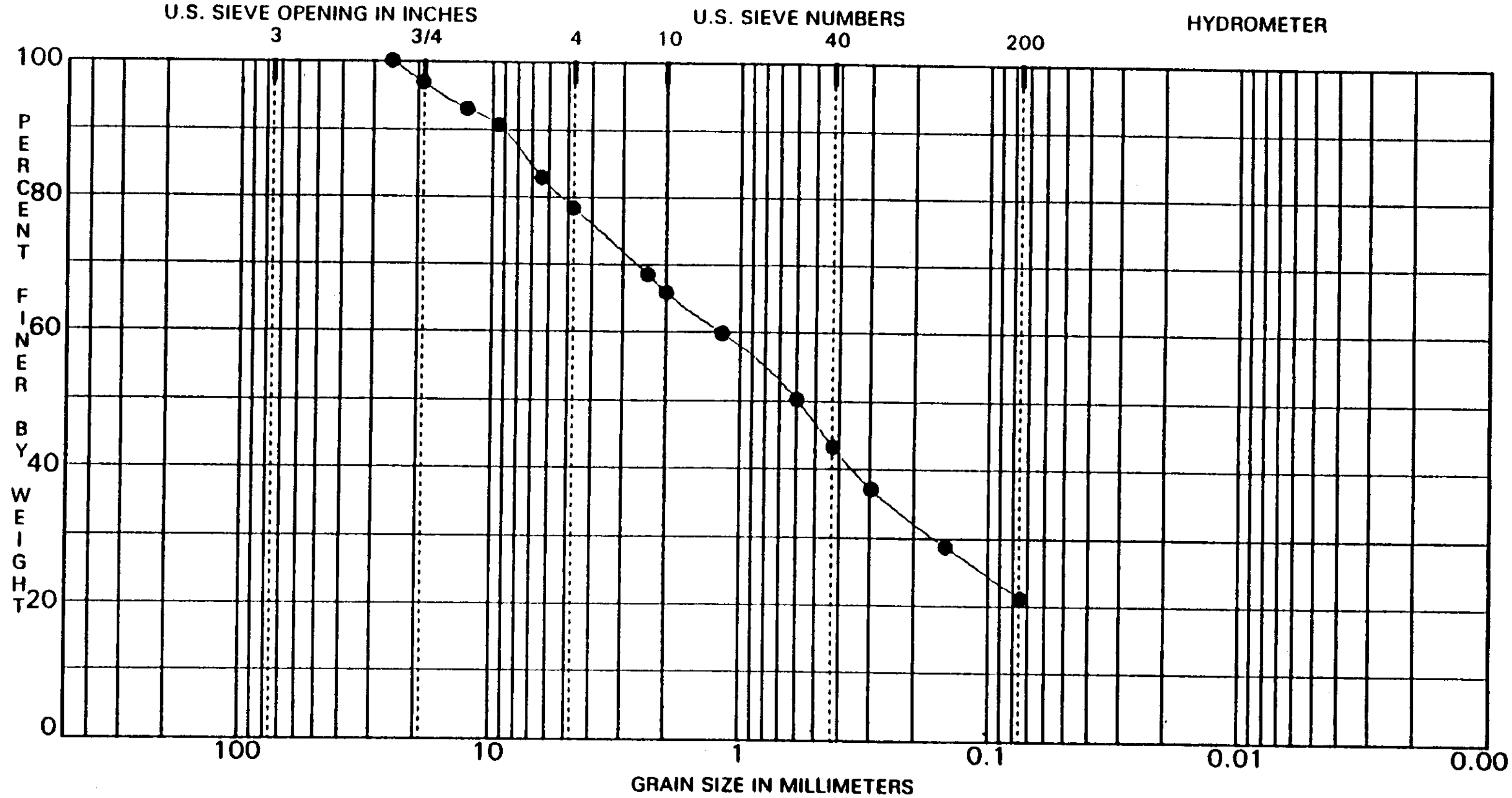
Sheet 1 of

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-2	5.0					21.6	57.2	21.2

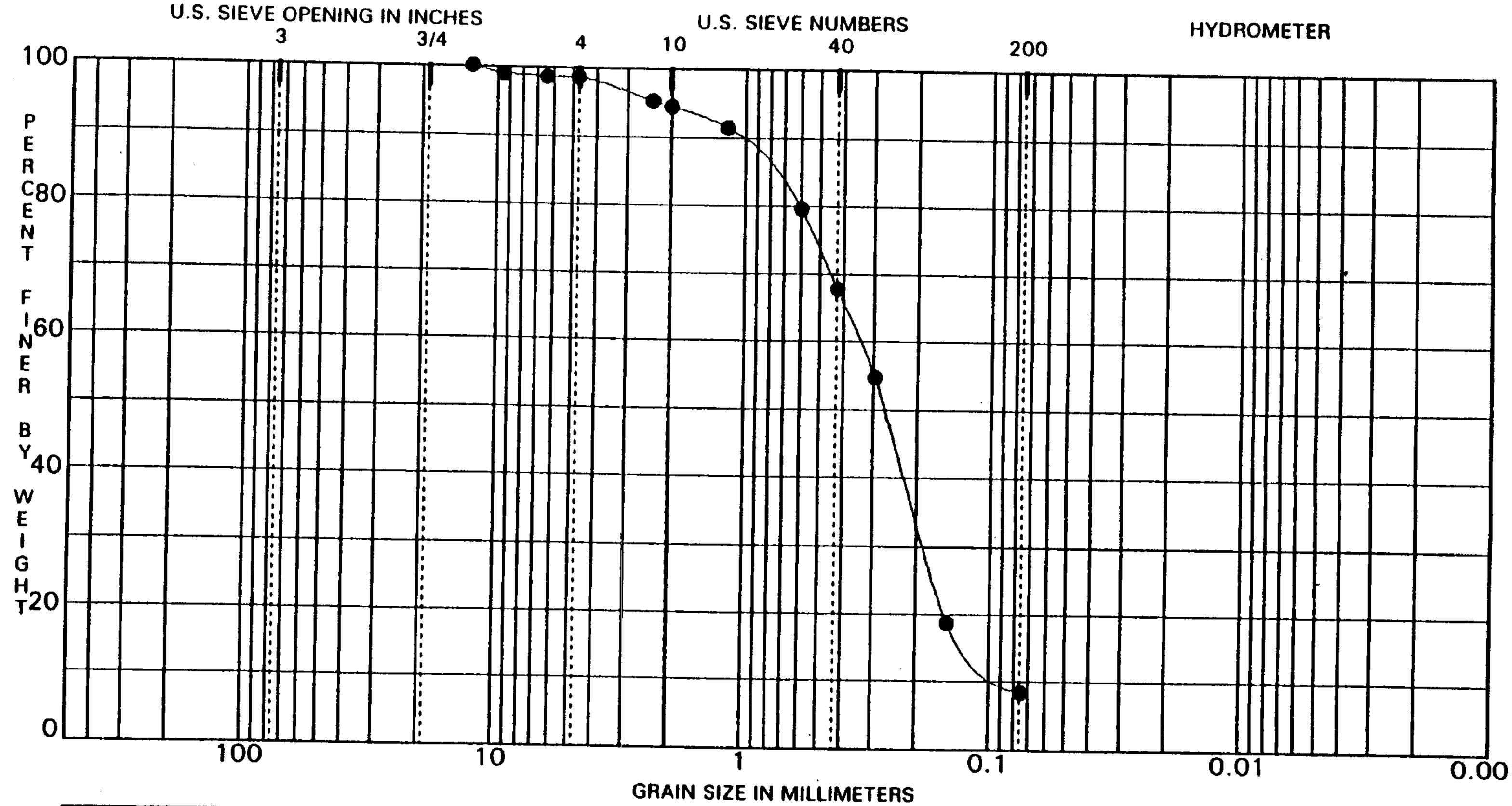
Sheet 1 of 1

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-2	10.0					1.5	90.0	8.5

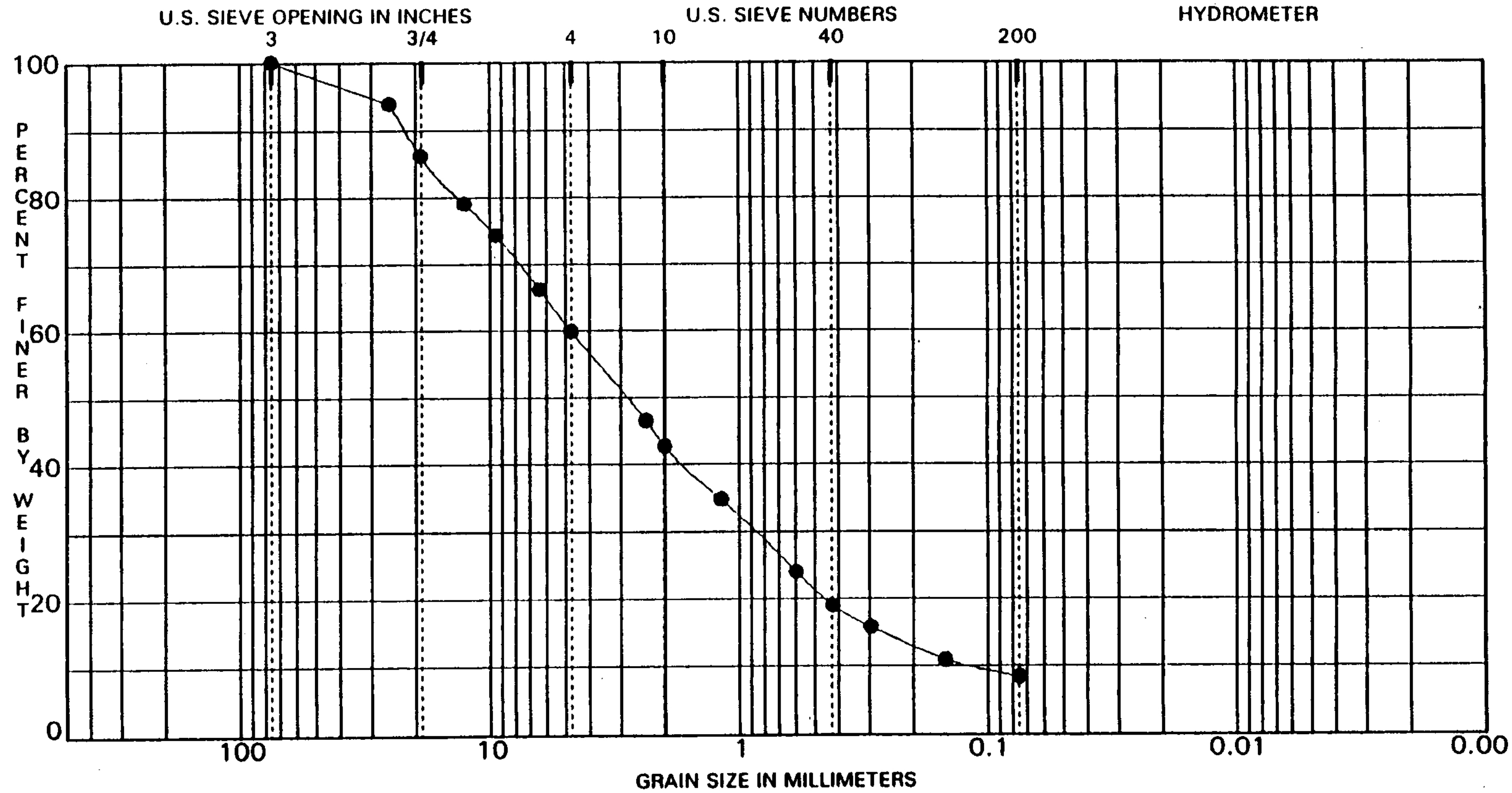
Sheet 1 of 1

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-2	15.0					40.1	51.4	8.5

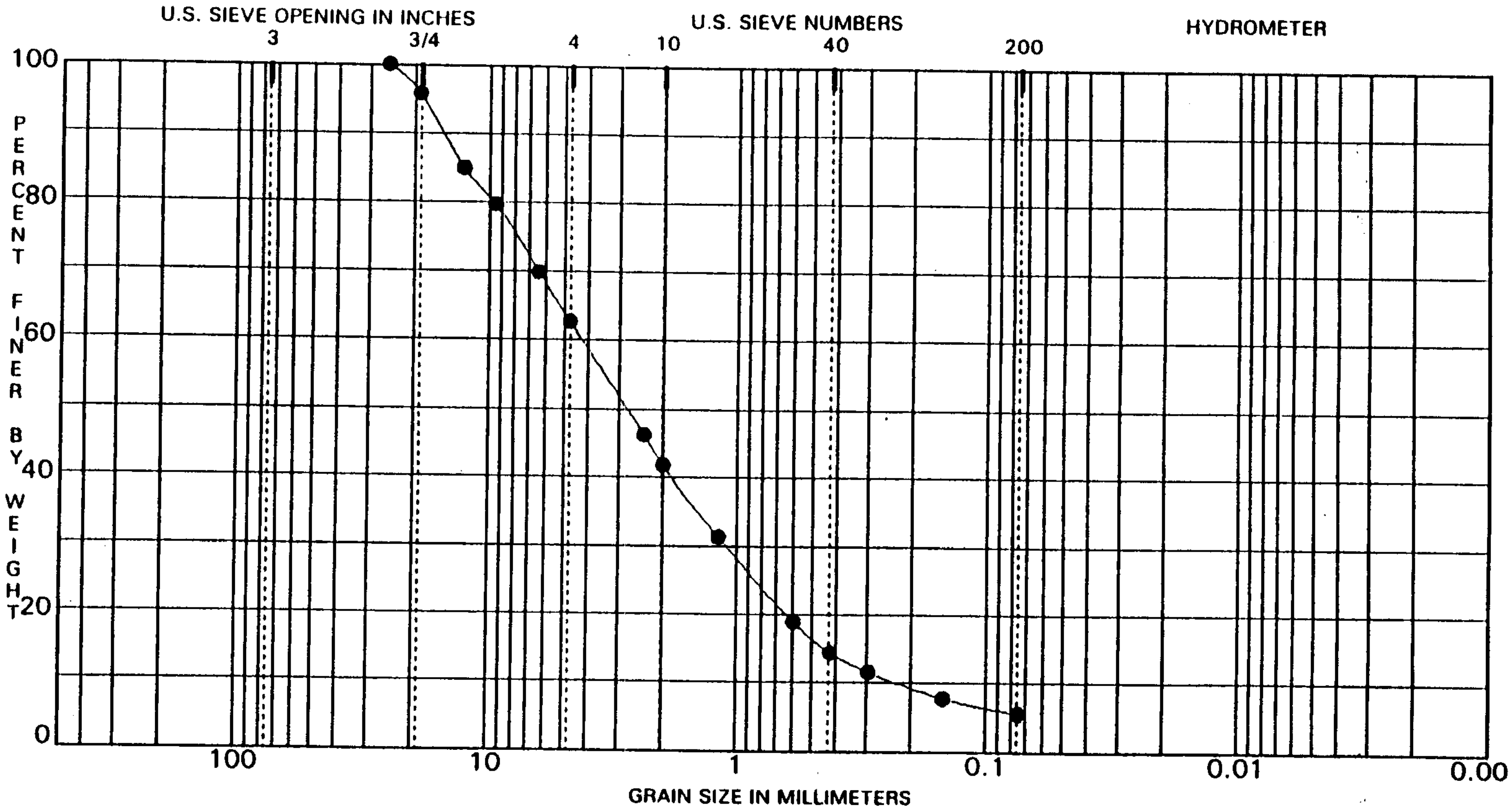
Sheet 1 of 1

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
● MW-2	25.0					37.3	57.1	5.6

Sheet

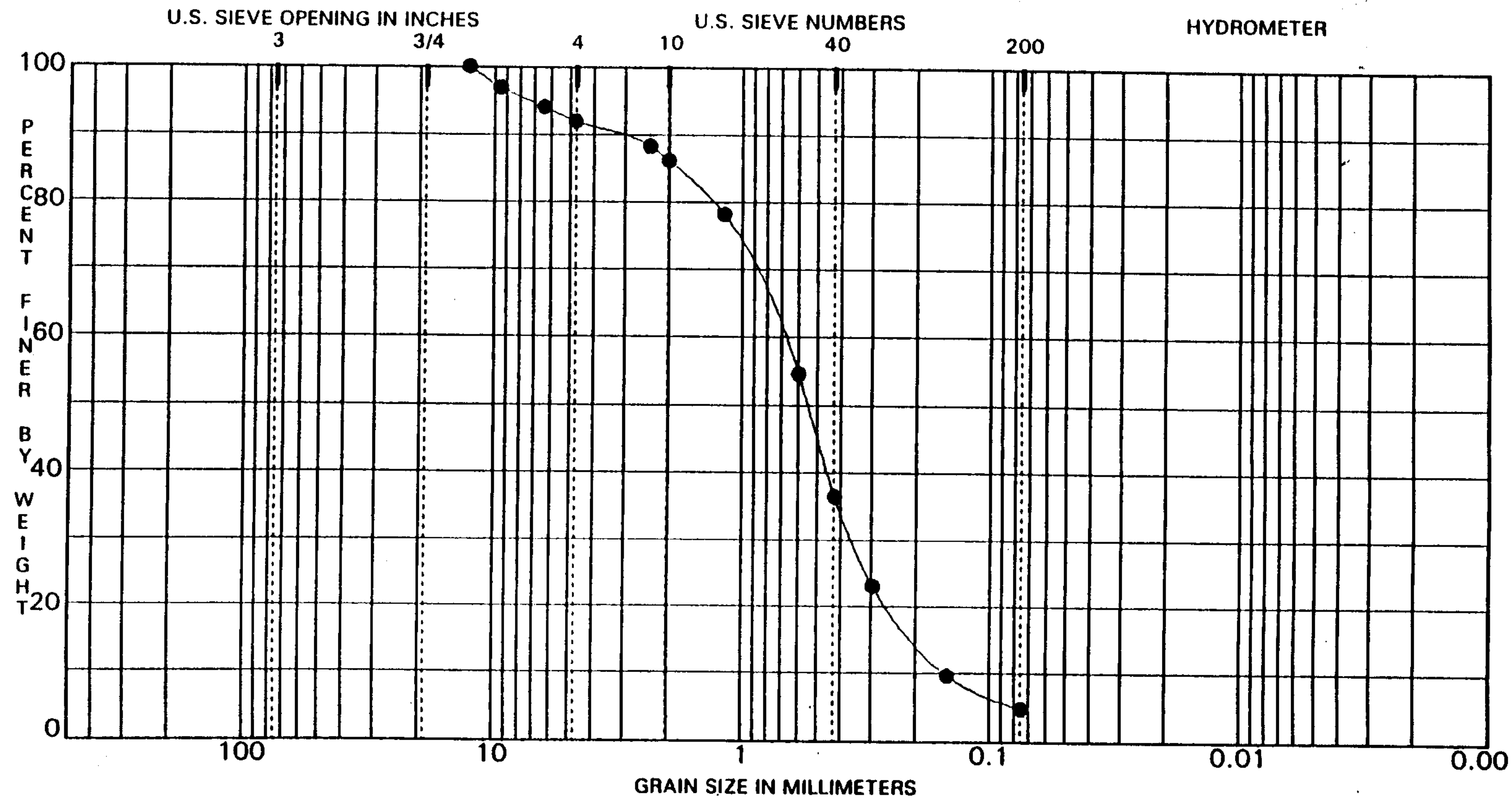
Gila Bend Landfill

Gila Bend, Arizona

C[illegible]act No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
● MW-2	35.0					8.1	87.0	4.9

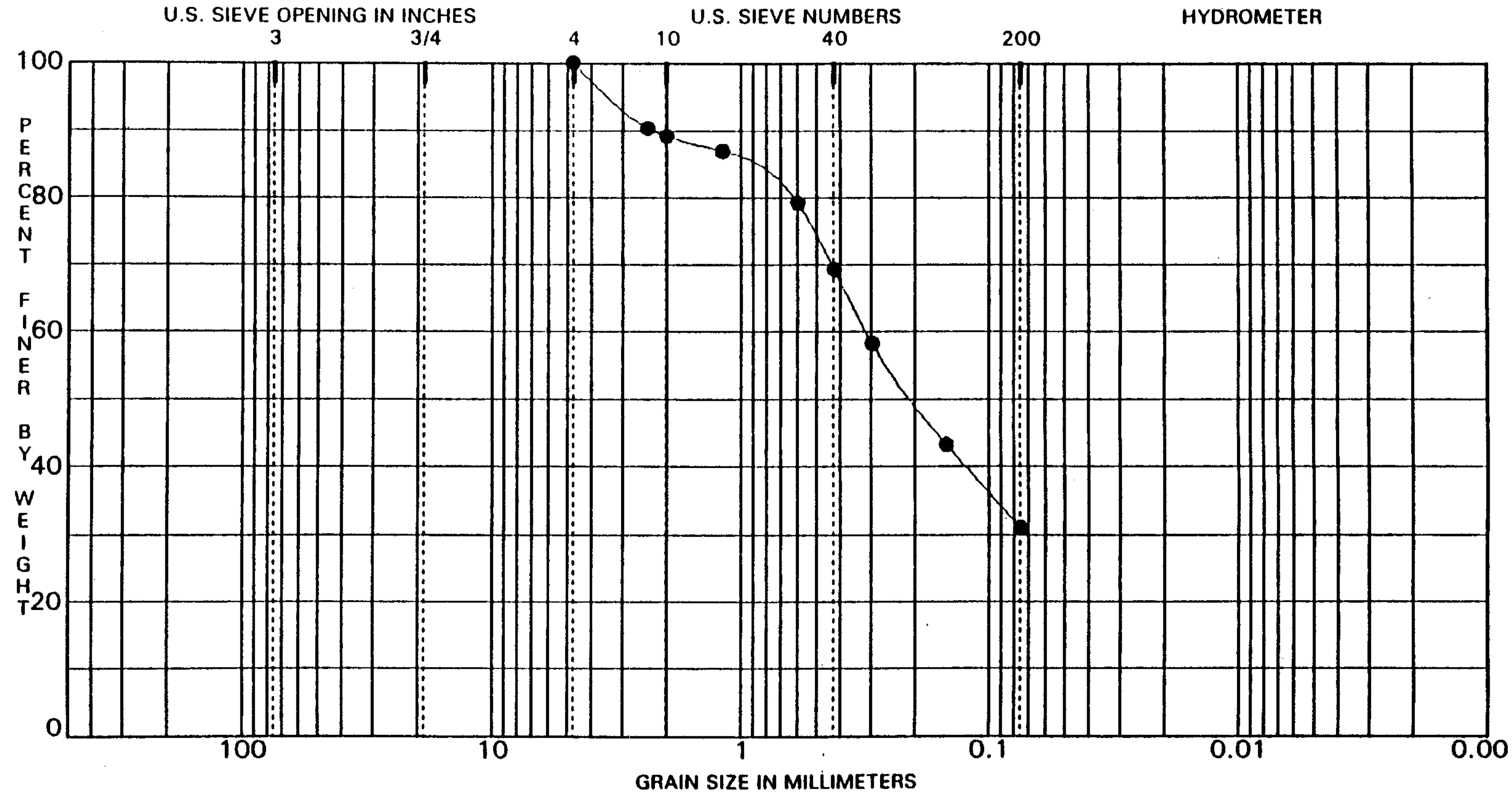
Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

Sheet 1 of 1

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-5	5.0					0.0	69.0	31.0

Sheet f

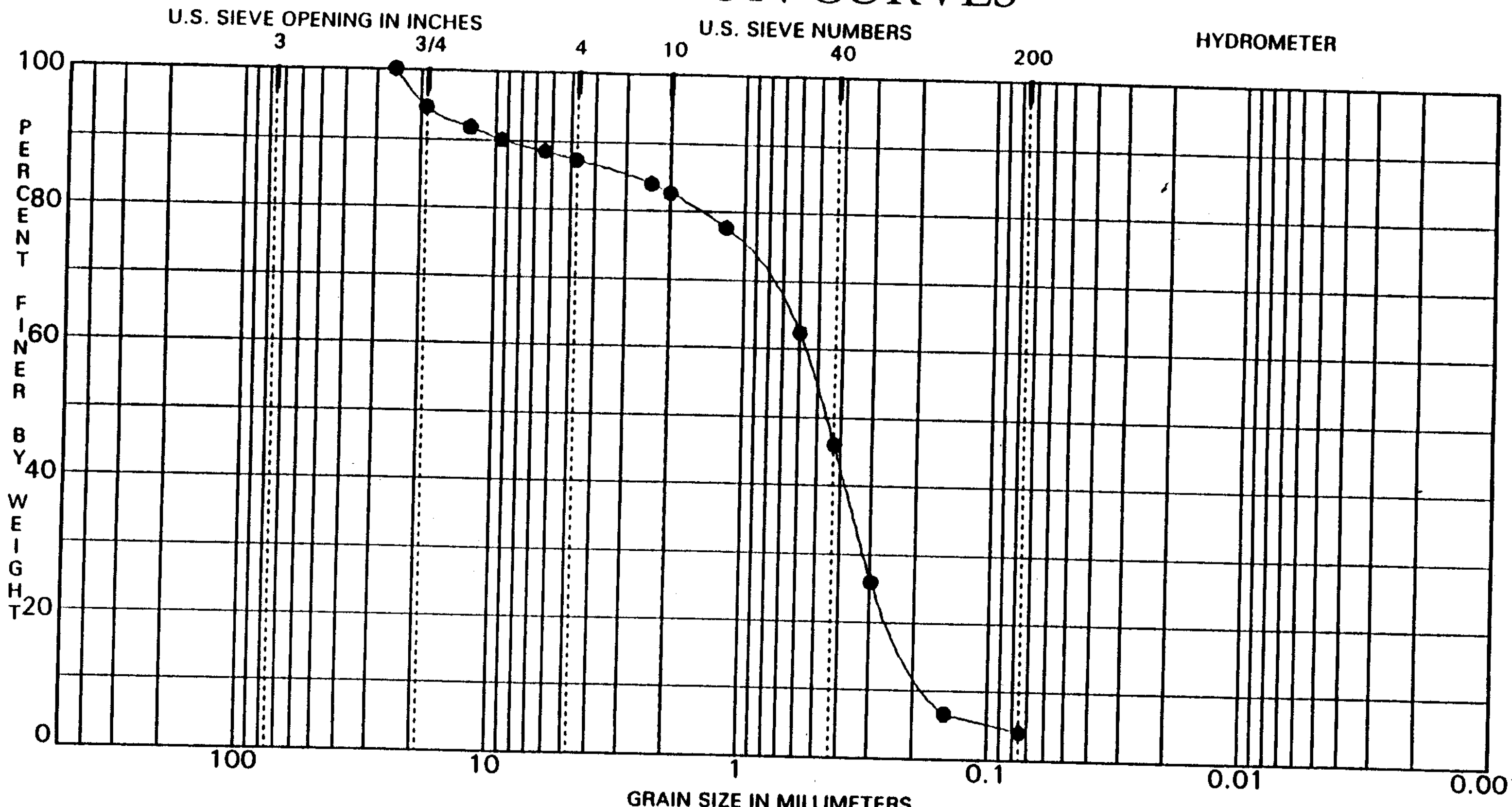
Gila Bend Landfill

Gila Bend, Arizona

ect No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-5	10.0	POORLY GRADED SAND	SP				12.8	83.1	4.1

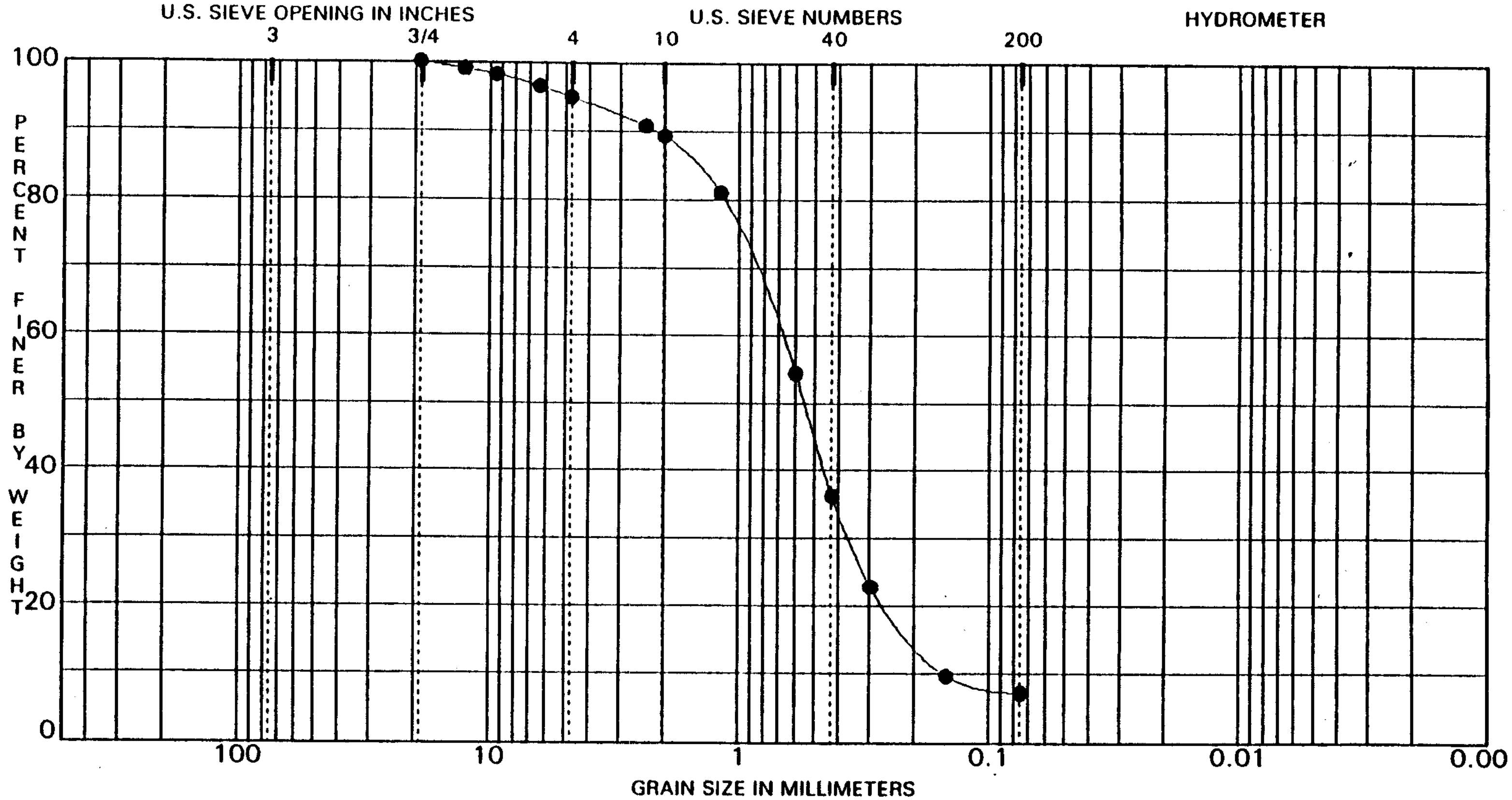
Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

Sheet 1 of 1

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
● MW-5	15.0					5.1	87.7	7.2

Sheet

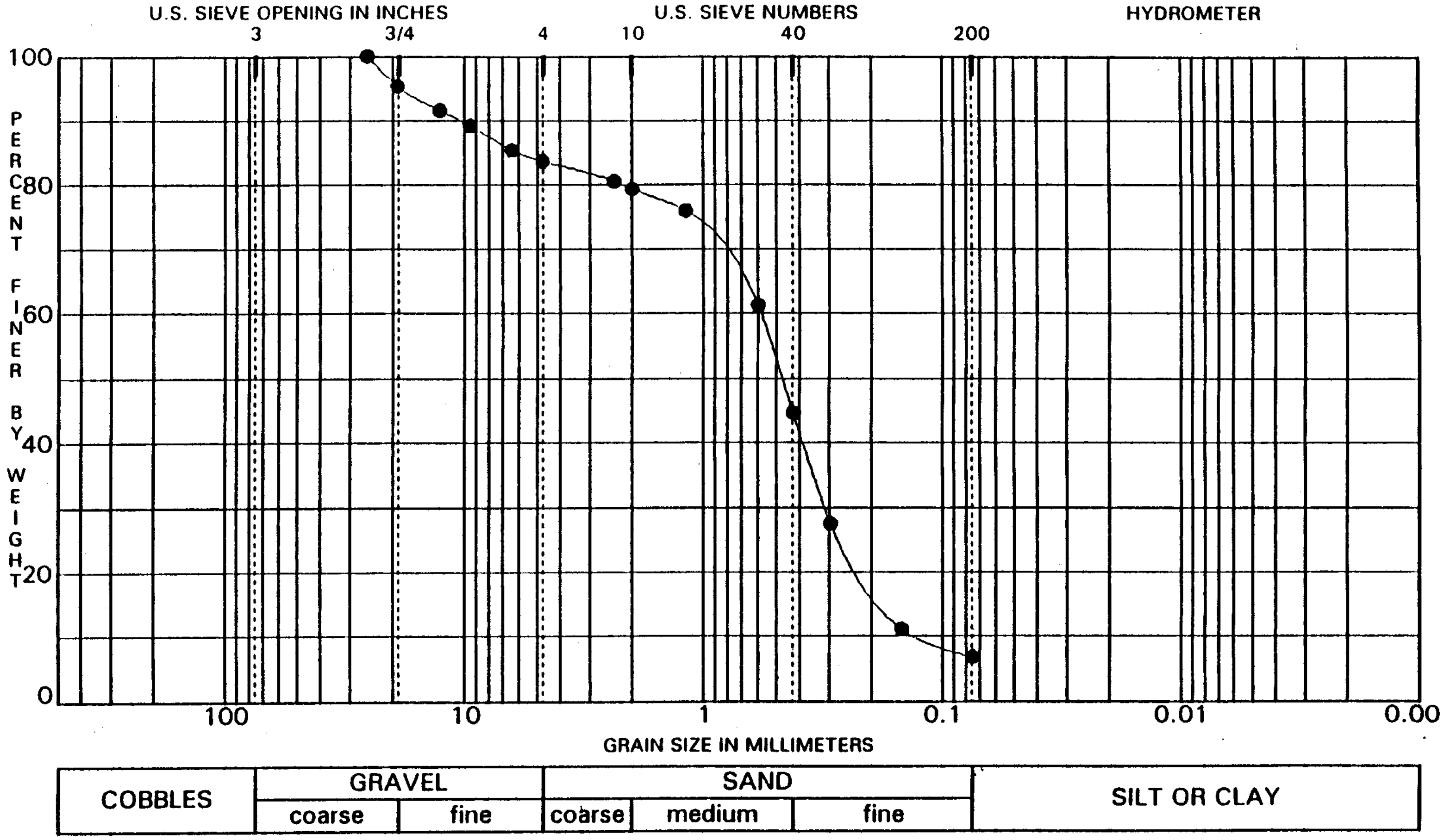
Gila Bend Landfill

Gila Bend, Arizona

...ect No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



	Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-5	20.0					16.4	76.8	6.8

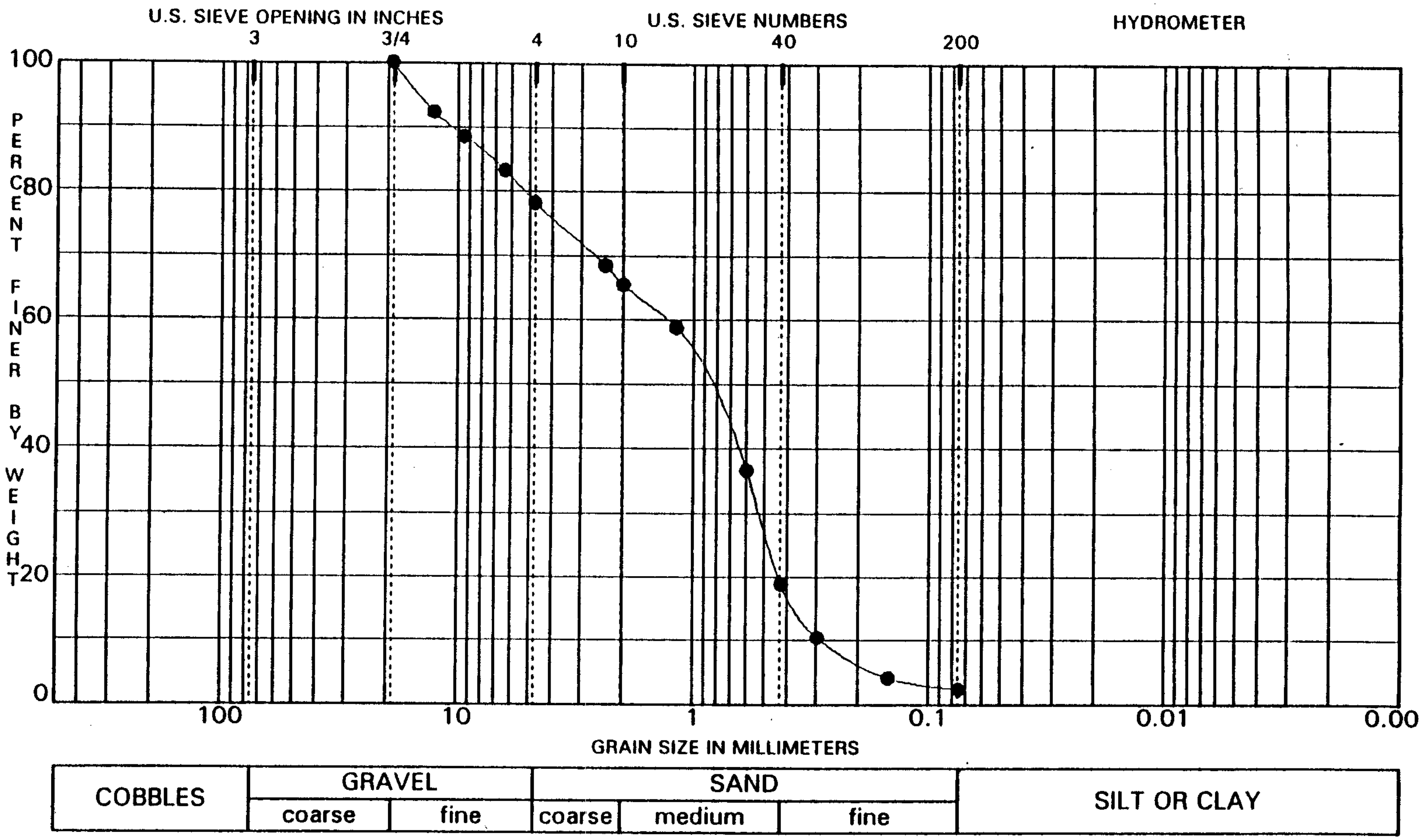
Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

Sheet 1 of 1

GRADATION CURVES



	Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-5	25.0	POORLY GRADED SAND with GRAVEL	SP				21.8	75.8	2.4

Sheet

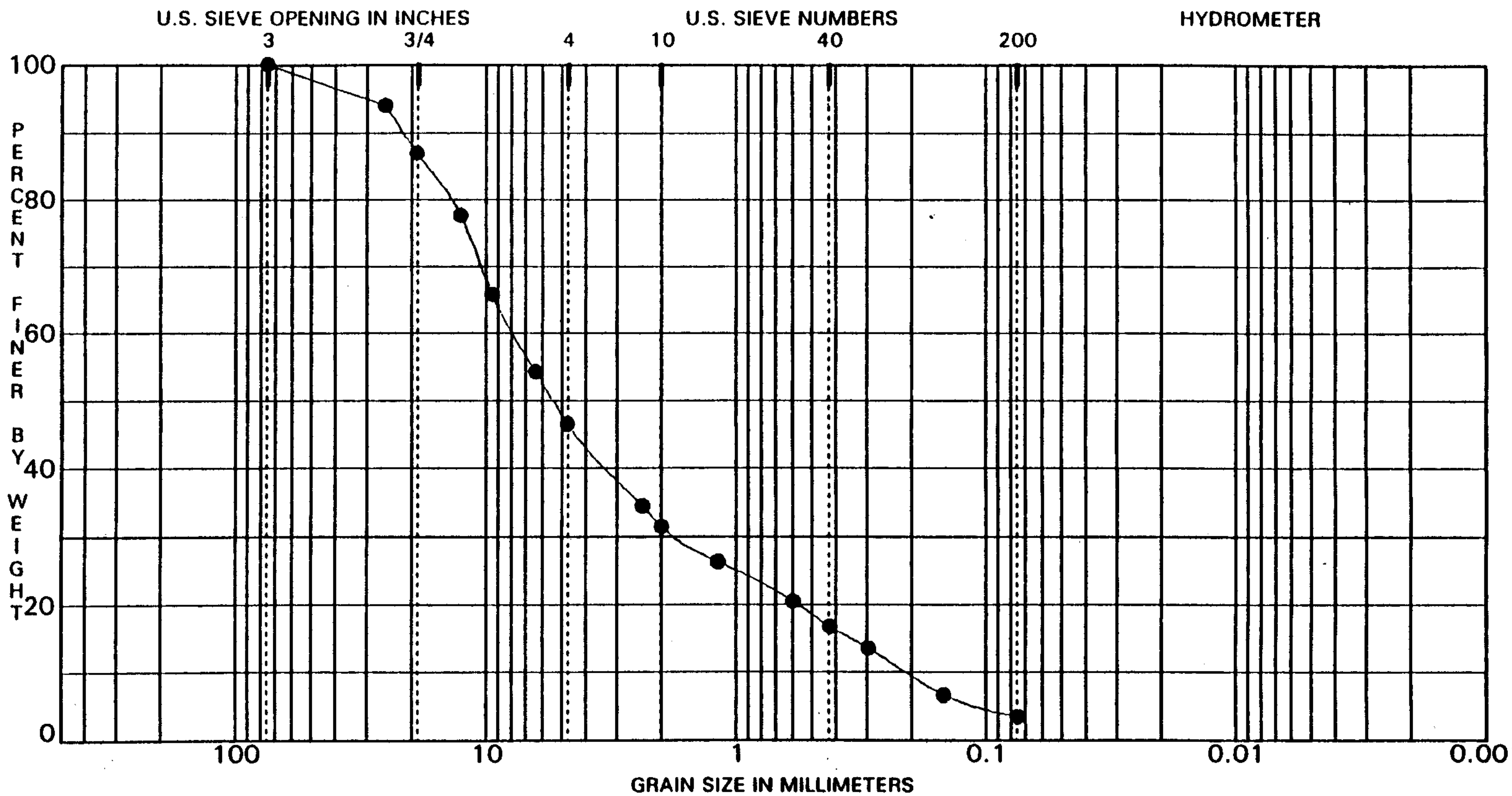
Gila Bend Landfill

Gila Bend, Arizona

ect No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification		LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-5	30.0	WELL GRADED GRAVEL with SAND	GW				53.5	43.0	3.5

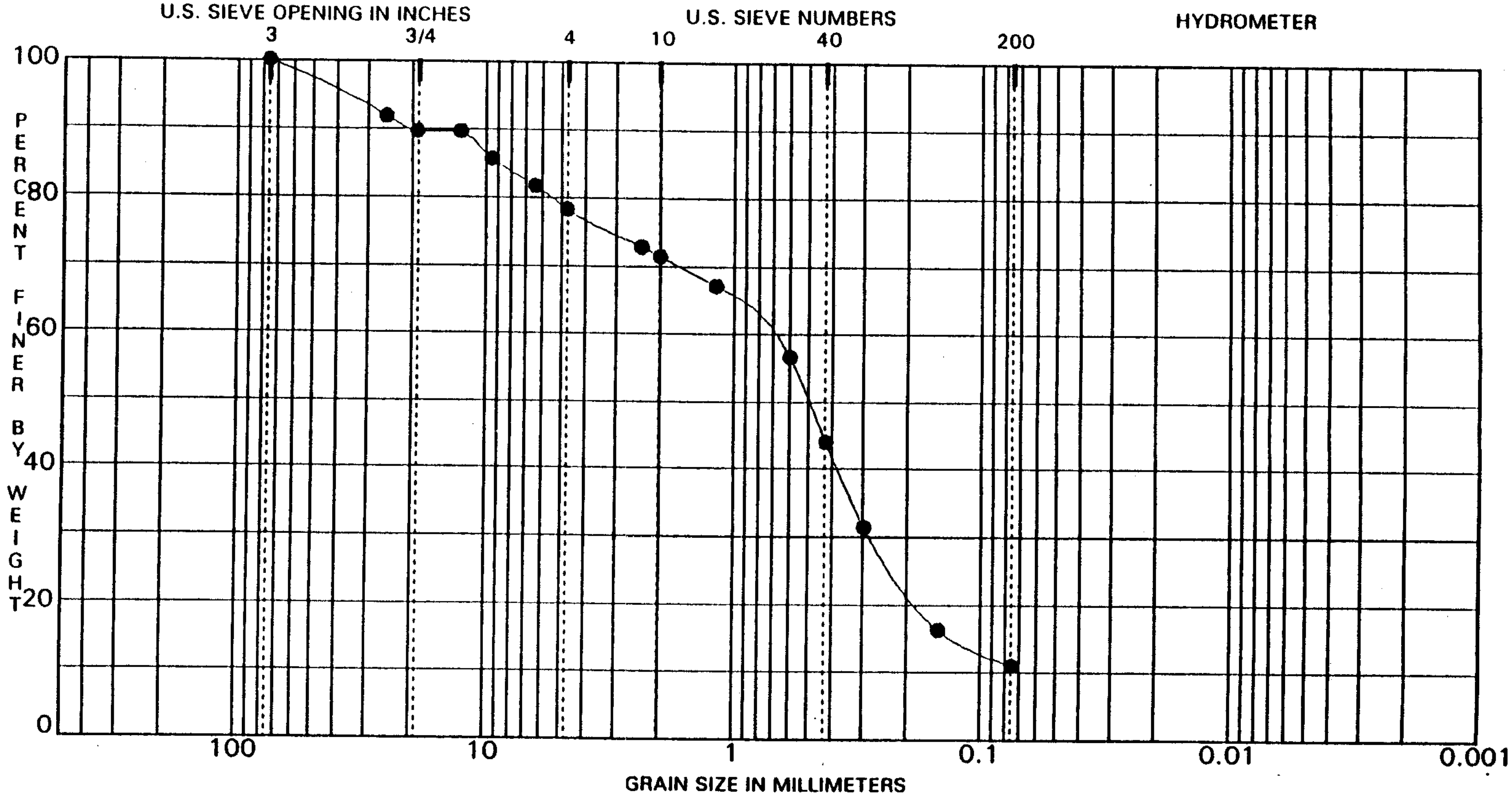
Sheet 1 of 1

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		ASTM Classification	LL	PL	PI	%Gravel	%Sand	%Fines
●	MW-5	35.0					21.7	67.2	11.1

Sheet 1 of

Gila Bend Landfill

Gila Bend, Arizona
Project No. 95577LA

SPEEDIE AND ASSOCIATES

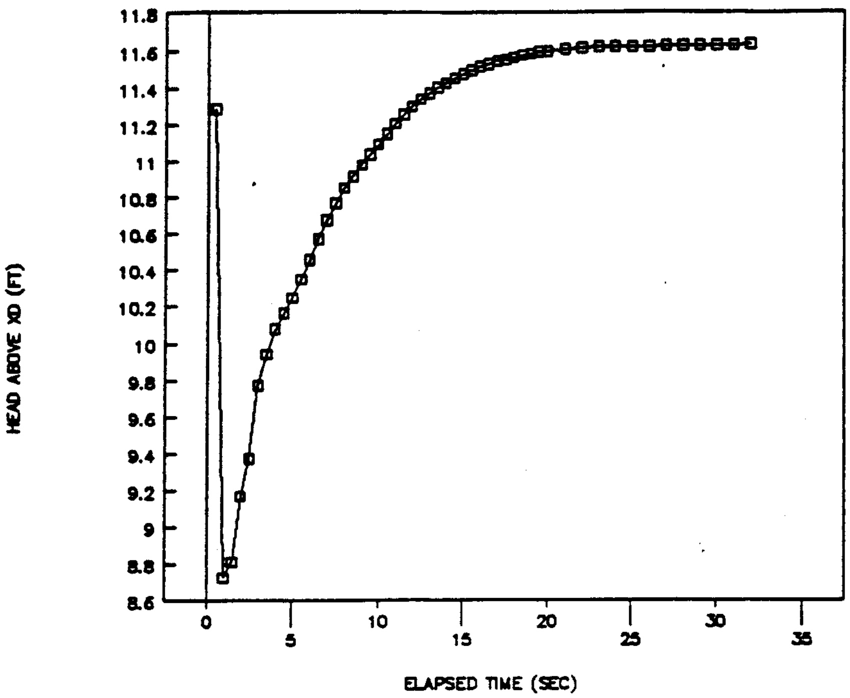
APPENDIX H

AQUIFER TEST RESULTS (MW-1S AND MW-2S)

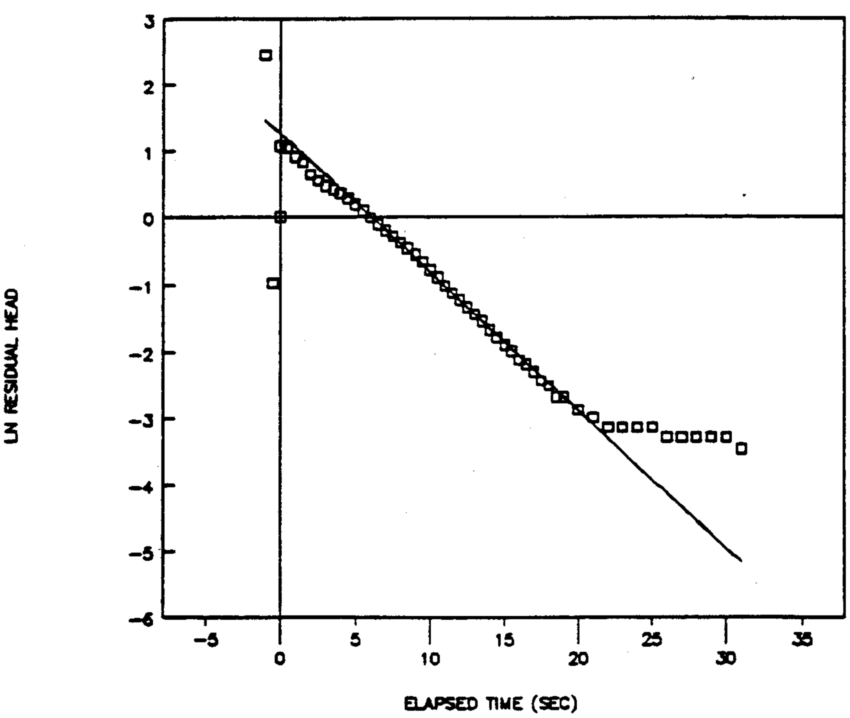
TABLE 7-3 SLUG TEST RESULTS		
Monitor Well No.	**Test Run Number [1]**	**Hydraulic Conductivity (cm/s)**
MW-1S	1	$1x10^{-2}$
MW-1S	2	$1x10^{-2}$
MW-2S	1	$1x10^{-2}$
MW-2S	3	$1x10^{-2}$
MW-2S	5	$1x10^{-2}$
MW-2S	6	$1x10^{-2}$

1. Data for Test Run 3 for MW-1S and Test Runs 2 and 4 for MW-2S are not presented as the test start conditions did not meet requirements for an instantaneous head change from static water level conditions.

TEST RECORD



BOUWER & RICE PLOT



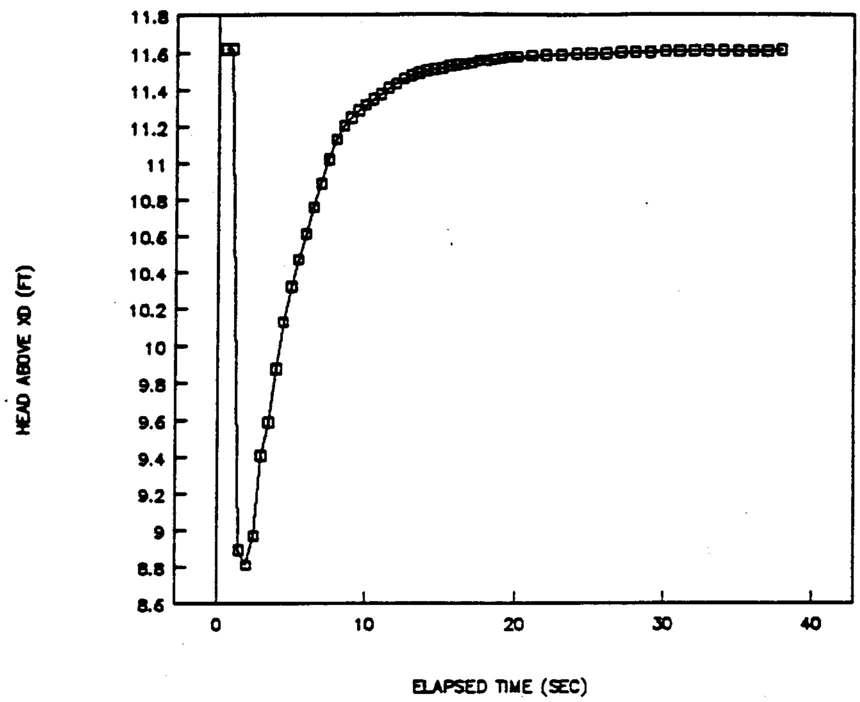
WELL MW-1

SLUG TEST PLOTS-TEST No. 1

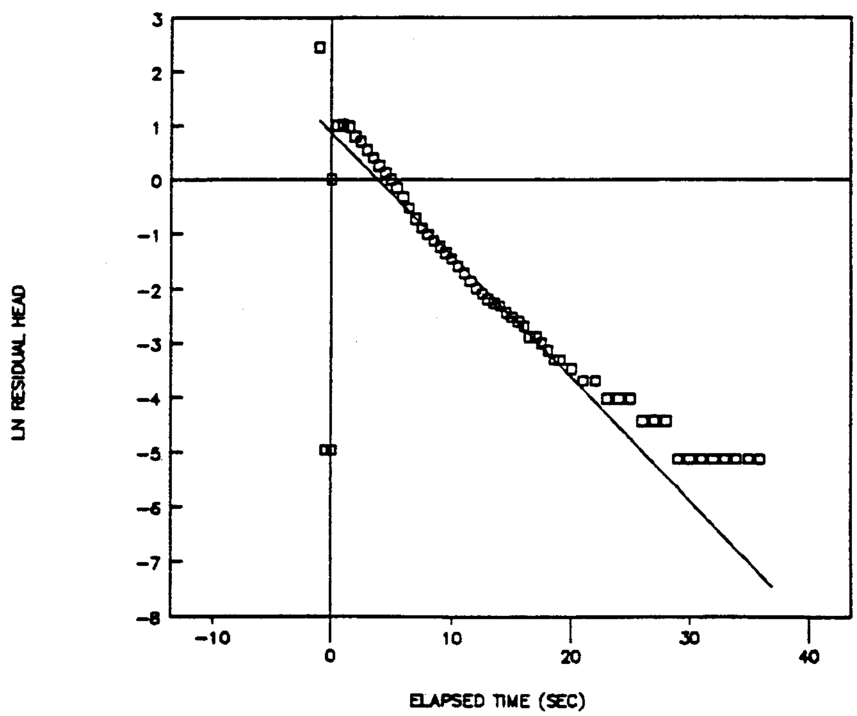
GILA BEND REGIONAL LANDFILL

MALCOLM PIRNIE, INC.

TEST RECORD



BOUWER & RICE PLOT



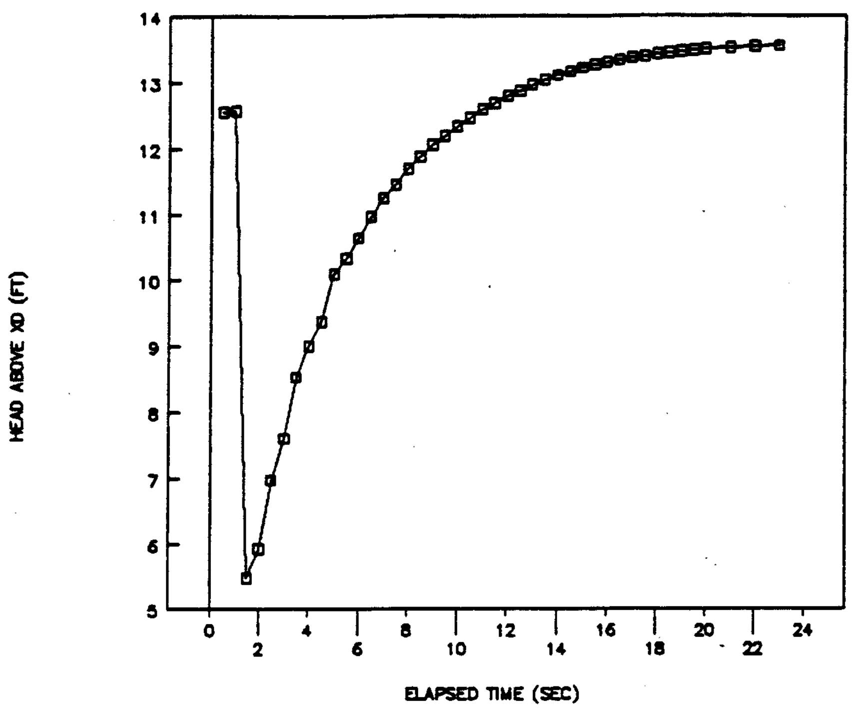
WELL MW-1

SLUG TEST PLOTS-TEST No. 2

GILA BEND REGIONAL LANDFILL

MALCOLM PIRNIE, INC.

TEST RECORD



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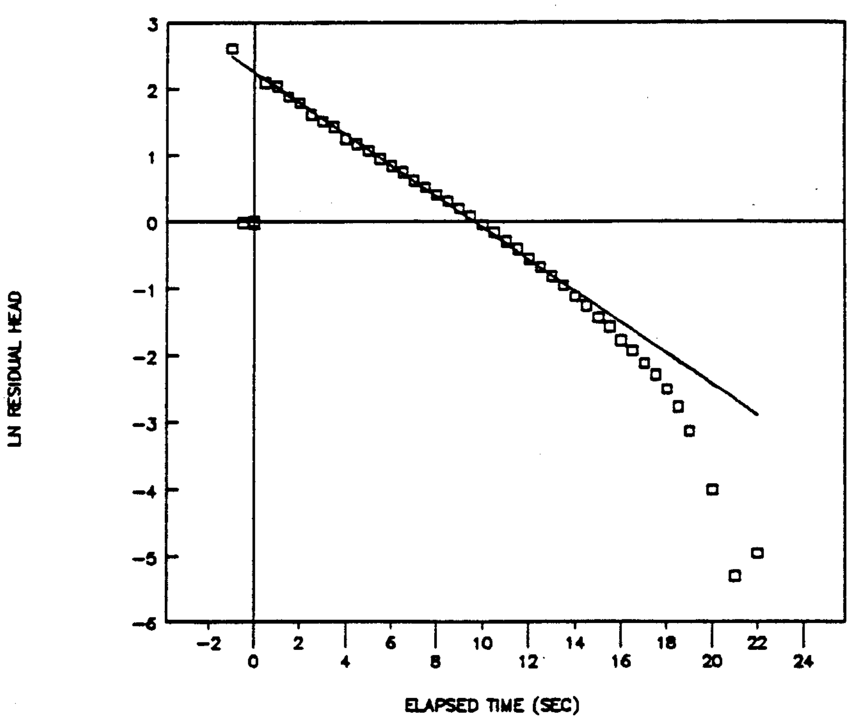


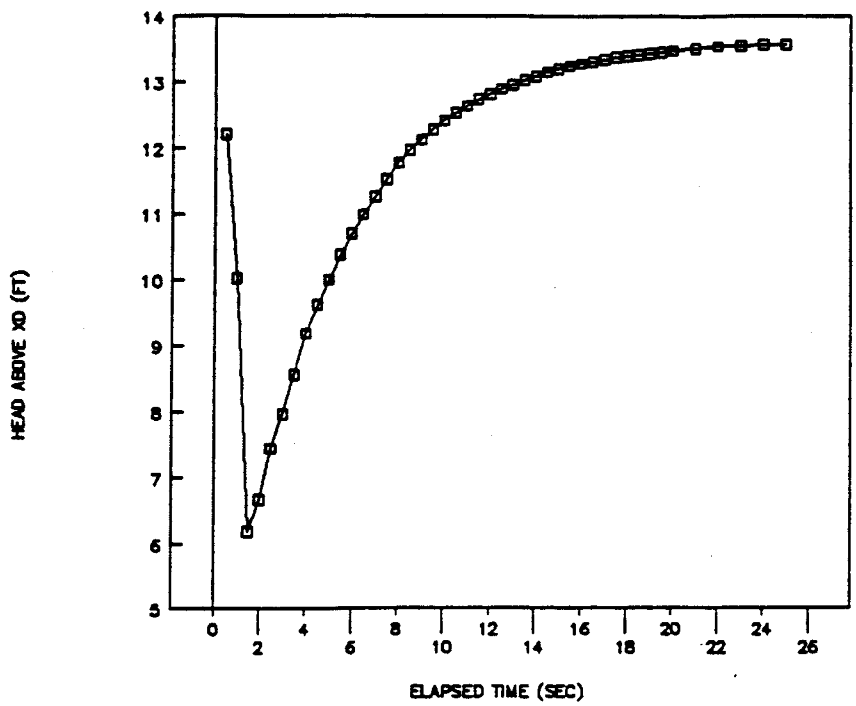
WELL MW-2

SLUG TEST PLOTS-TEST No. 1

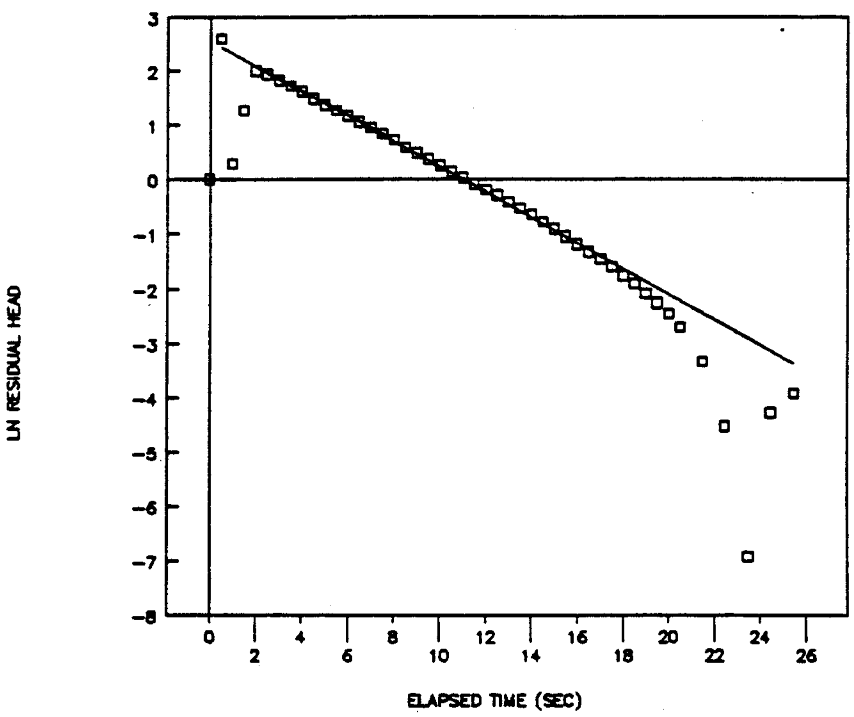
GILA BEND REGIONAL LANDFILL

MALCOLM PIRNIE, INC.

TEST RECORD



BOUWER & RICE PLOT

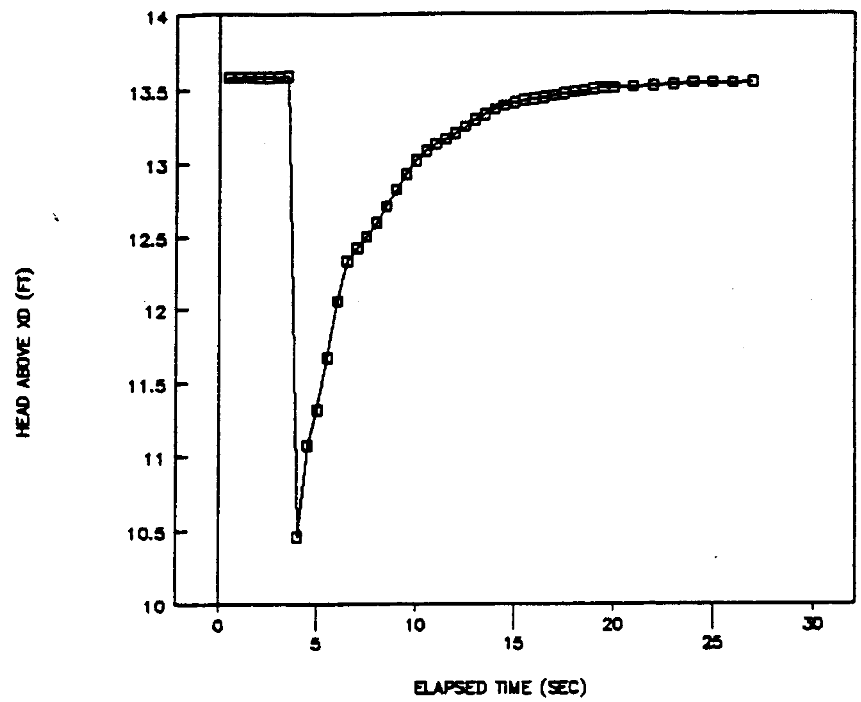


WELL MW-2

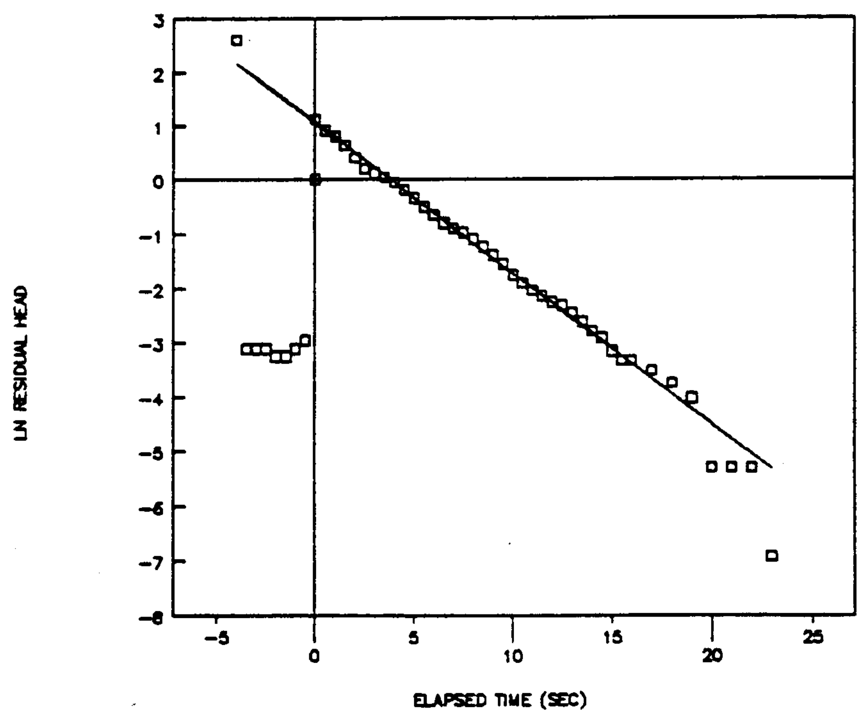
SLUG TEST PLOTS-TEST No. 3

GILA BEND REGIONAL LANDFILL

TEST RECORD



BOUWER & RICE PLOT

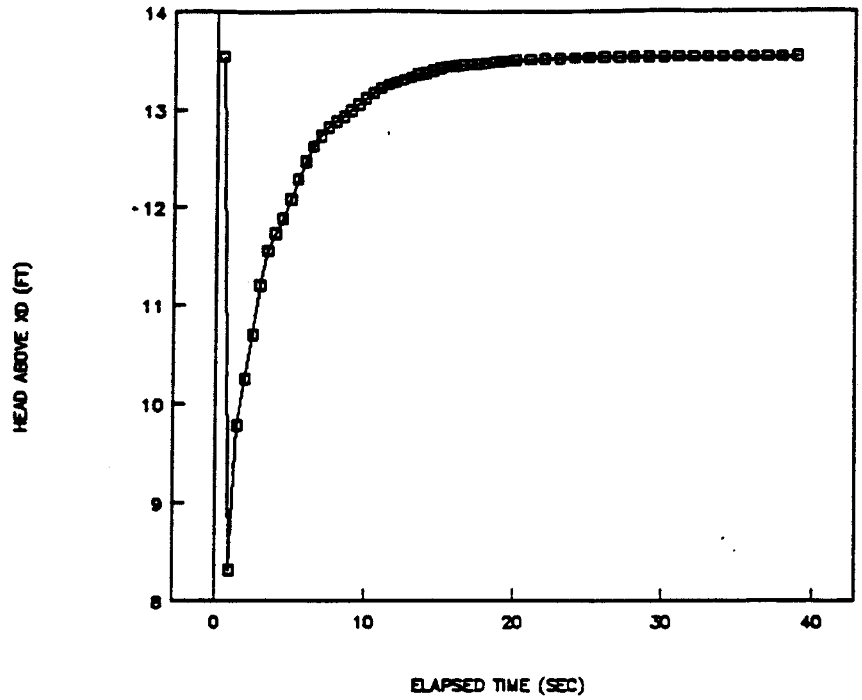


WELL MW-2

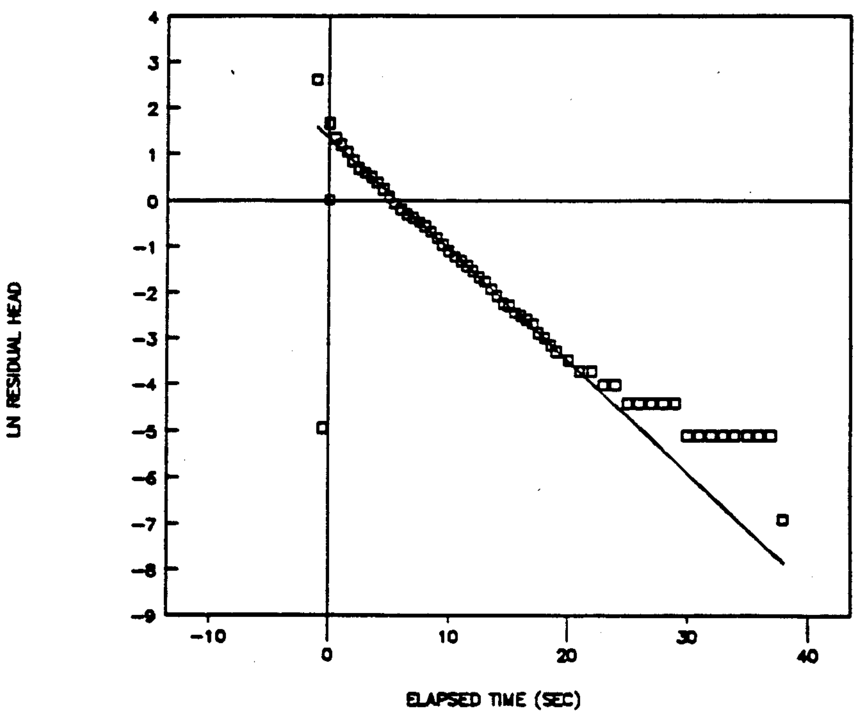
SLUG TEST PLOTS-TEST No. 5

GILA BEND REGIONAL LANDFILL

TEST RECORD



BOUWER & RICE PLOT



WELL MW-2

SLUG TEST PLOTS-TEST No. 6

GILA BEND REGIONAL LANDFILL

MALCOLM PIRNIE, INC.

APPENDIX I

GROUNDWATER QUALITY DOCUMENTATION

ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES COLLECTED FROM THE REGIONAL AQUIFER

HARGIS + ASSOCIATES, INC.

TABLE 3

GROUNDWATER QUALITY DATA

WELL IDENTIFIER	C(5-5) 18caa	C(5-5) 18dcd2	C(5-5) 18dda	C(5-5) 18ddc3	C(5-5) 18ddd	C(5-5) 19aab	C(5-5) 20dca	C(5-6) 02bbc	C(5-6) 02dbb	C(5-6) 03acc	C(5-6) 11caa	C(5-6) 11cda	C(5-6) 12daa
DATE SAMPLED	11/79	08/79	11/79	04/74	04/74	04/76	08/79	06/77	06/77	07/91	04/76	06/77	06/77
Temperature (°C)	--	25.5	--	24.5	27.0	--	30.0	24.0	25.0	25.5	--	26.0	24.0
Electrical conductivity	--	8,500	--	6,730	2,370	2,500	1,900	2,400	1,800	2,350	2,500	2,300	4,900
Dissolved Oxygen	--	--	--	--	--	--	--	--	--	0.3	--	--	--
pH (field)	--	7.8	--	7.5	8.0	--	--	--	--	8.0	--	--	--
pH (lab)	7.20	--	7.31	--	--	--	--	--	--	7.9	--	--	--
Alkalinity as $CaCO_3$	--	198	--	238	76	--	--	--	--	136	--	--	--
Nitrogen, dis. NO_2 + NO_3	--	--	--	6.5	1.5	--	--	--	--	1.10	--	--	--
Phosphorus, dissolved	--	--	--	0.070	0.03	--	--	--	--	<0.010	--	--	--
Hardness, tot. mg/L. as $CaCO_3$	--	1,600	--	970	180	--	--	--	--	210	--	--	--
Calcium, dissolved	440	540	560	240	60	--	--	59	16	400	--	--	--
Magnesium, dissolved	.71	70	137	90	7.0	--	--	--	--	16	--	--	--
Sodium, dissolved	1250	1,300	1440	1,100	410	--	--	--	--	400	--	--	--
Potassium, dissolved	--	--	--	13	6.6	--	--	--	--	5.6	--	--	--
Chloride, dissolved	2260	2,300	2800	1,800	590	--	--	--	--	580	--	--	--
Sulfate, dissolved	427	900	648	610	150	--	--	--	--	150	--	--	--
Fluoride, dissolved	--	1.0	--	2.1	3.6	5.7	4.1	1.9	1.8	3.4	4.1	3.1	1.7
Silica, dissolved	--	--	--	41	30	--	--	--	--	33	--	--	--
Arsenic, dissolved	--	--	--	--	--	--	--	--	--	6	--	--	--
Barium, dissolved	--	--	--	--	--	--	--	--	--	<100	--	--	--
Boron, dissolved	--	--	--	1,600	840	--	--	--	--	630	--	--	--
Cadmium, dissolved	--	--	--	--	--	--	--	--	--	<1.0	--	--	--
Chromium (hex), dissolved	--	--	--	--	--	--	--	--	--	<1	--	--	--
Copper, dissolved	--	--	--	--	--	--	--	--	--	<1	--	--	--
Iron, dissolved	--	--	--	70	30	--	--	--	--	10	--	--	--
Lead, dissolved	--	--	--	--	--	--	--	--	--	<1	--	--	--
Manganese, dissolved	--	--	--	<10	<10	--	--	--	--	10	--	--	--
Molybdenum, dissolved	--	--	--	--	--	--	--	--	--	11	--	--	--
Strontium, dissolved	--	--	--	--	--	--	--	--	--	870	--	--	--
Vanadium, dissolved	--	--	--	--	--	--	--	--	--	18	--	--	--
Zinc, dissolved	--	--	--	--	--	--	--	--	--	<10	--	--	--

Please refer to Page 2 for footnotes

HARGIS + ASSOCIATES, INC.

TABLE 3

WATER QUALITY

Lithium, dissolved	--	--	--	--	--	--	--	--	--	270	--	--	--

FOOTNOTES:

Note: Concentrations are in parts per million unless otherwise noted

°C = Degrees Celsius
(--) = Not analyzed
$CaCO_3$ = Calcium carbonate
(<) = Less than; value is less than the Limit of Detection for that compound
mg/L = Milligrams per liter

ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES COLLECTED FROM MONITORING WELLS (MW-1S THROUGH MW-6S)

Round 1 - February 20, 1996 (MW-2S, MW-4S, MW-5S)

McKENZIE
LABORATORIES

Business Unit
Phoenix
Divisions

3725 E. Atlanta Ave
Suite 1
Phoenix, AZ
85040

Fax 602 470-3756
Tel 602 470-0255

March 7, 1996

MALCOLM PIRNIE

MAR 14 1996

FILE
NOTED
ROUTE

Malcolm Pirnie, Inc.
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Re: McKenzie Labs Sample I.D. numbers E96-1752-1755

Dear Tim,

Attached are the original reports of analysis from Pace Analytical Services, Inc. for the water samples received on February 20, 1996. The following analysis was performed:

EPA 8260 Appendix 1

If you have any questions regarding the results, please contact Lizz Cohoon, Technical Services Representative for McKenzie. We appreciate your business and thank you for choosing McKenzie.

Sincerely,

Tracey L. Hockett

Tracey L. Hockett
Organic Laboratory Supervisor

cc: McKenzie Archive

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058

713-488-1810
Fax 713-488-4661

Pace Analytical

February 29, 1996
Report No.: 00049644
Section A Page 1

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

SAMPLE ID: MW-4
SAMPLE NO: H422958

LIMS CLIENT: 0819 0001
PACE PROJECT: H38338
PACE CLIENT: 620723
P.O. NO: MO 6169 ORG

DATE SAMPLED: 19-FEB-96 1345
DATE RECEIVED: 22-FEB-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	OVTCW2	8260A TCL Volatiles in Water		
		1,1,1,2-Tetrachloroethane	< 1	ug/L
		1,1,1-Trichloroethane	< 1	ug/L
		1,1,2,2-Tetrachloroethane	< 1	ug/L
		1,1,2-Trichloroethane	< 1	ug/L
		1,1-Dichloroethane	< 1	ug/L
		1,1-Dichloroethene	< 1	ug/L
		1,1-Dichloropropene	< 1	ug/L
		1,2,3-Trichlorobenzene	< 1	ug/L
		1,2,3-Trichloropropane	< 1	ug/L
		1,2,4-Trichlorobenzene	< 1	ug/L
		1,2,4-Trimethylbenzene	< 1	ug/L
		1,2-Dibromo-3-chloropropane	< 1	ug/L
		1,2-Dibromoethane	< 1	ug/L
		1,2-Dichlorobenzene	< 1	ug/L
		1,2-Dichloroethane	< 1	ug/L
		1,2-Dichloropropane	< 1	ug/L
		1,3,5-Trimethylbenzene	< 1	ug/L
		1,3-Dichlorobenzene	< 1	ug/L
		1,3-Dichloropropane	< 1	ug/L
		1,4-Dichlorobenzene	< 1	ug/L
		2,2-Dichloropropane	< 1	ug/L
		2-Chlorotoluene	< 1	ug/L
		4-Chlorotoluene	< 1	ug/L
		Benzene	< 1	ug/L
		Bromobenzene	< 1	ug/L
		Bromochloromethane	< 1	ug/L
		Bromodichloromethane	< 1	ug/L
		Bromoform	< 1	ug/L
		Bromomethane	< 1	ug/L
		Carbon tetrachloride	< 2	ug/L
		Chlorobenzene	< 1	ug/L
		Chlorodibromomethane	< 1	ug/L
		Chloroethane	< 1	ug/L
		Chloroform	< 2	ug/L
			< 1	ug/L

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058

713-488-1810
Fax 713-488-4661

Pace Analytical

February 29, 1996
Report No.: 00049644
Section A Page 2

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW-4
SAMPLE NO: H422958

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		Chloromethane	< 2	ug/L
		Dibromomethane	< 1	ug/L
		Dichlorodifluoromethane	< 1	ug/L
		Ethylbenzene	< 1	ug/L
		Hexachlorobutadiene	< 1	ug/L
		Isopropylbenzene	< 1	ug/L
		Methylene chloride	< 1	ug/L
		Naphthalene	< 2	ug/L
		Styrene	< 1	ug/L
		Tetrachloroethene	< 1	ug/L
		Toluene	< 1	ug/L
		Trichloroethene	< 1	ug/L
		Trichlorofluoromethane	< 1	ug/L
		Vinyl chloride	< 2	ug/L
		cis-1,2-Dichloroethene	< 1	ug/L
		m-Xylene	< 1	ug/L
		n-Butylbenzene	< 1	ug/L
		n-Propylbenzene	< 1	ug/L
		o-Xylene	< 1	ug/L
		p-Isopropyltoluene	< 1	ug/L
		p-Xylene	< 1	ug/L
		sec-Butylbenzene	< 1	ug/L
		tert-Butylbenzene	< 1	ug/L
		trans-1,2-Dichloroethene	< 1	ug/L

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Fax 713-488-4661

February 29, 1996
Report No.: 00049644

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

SAMPLE ID: TRIP BLANK
SAMPLE NO: H422959

LIMS CLIENT: 0819 0001
PACE PROJECT: H38338
PACE CLIENT: 620723
P.O. NO: MO 6169 ORG

DATE SAMPLED: UnAvail
DATE RECEIVED: 22-FEB-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	OVTCW2	8260A TCL Volatiles in Water		
		1,1,1,2-Tetrachloroethane	< 1	ug/L
		1,1,1-Trichloroethane	< 1	ug/L
		1,1,2,2-Tetrachloroethane	< 1	ug/L
		1,1,2-Trichloroethane	< 1	ug/L
		1,1-Dichloroethane	< 1	ug/L
		1,1-Dichloroethene	< 1	ug/L
		1,1-Dichloropropene	< 1	ug/L
		1,2,3-Trichlorobenzene	< 1	ug/L
		1,2,3-Trichloropropane	< 1	ug/L
		1,2,4-Trichlorobenzene	< 1	ug/L
		1,2,4-Trimethylbenzene	< 1	ug/L
		1,2-Dibromo-3-chloropropane	< 1	ug/L
		1,2-Dibromoethane	< 1	ug/L
		1,2-Dichlorobenzene	< 1	ug/L
		1,2-Dichloroethane	< 1	ug/L
		1,2-Dichloropropane	< 1	ug/L
		1,3,5-Trimethylbenzene	< 1	ug/L
		1,3-Dichlorobenzene	< 1	ug/L
		1,3-Dichloropropane	< 1	ug/L
		1,4-Dichlorobenzene	< 1	ug/L
		2,2-Dichloropropane	< 1	ug/L
		2-Chlorotoluene	< 1	ug/L
		4-Chlorotoluene	< 1	ug/L
		Benzene	< 1	ug/L
		Bromobenzene	< 1	ug/L
		Bromochloromethane	< 1	ug/L
		Bromodichloromethane	< 1	ug/L
		Bromoform	< 1	ug/L
		Bromomethane	< 2	ug/L
		Carbon tetrachloride	< 1	ug/L
		Chlorobenzene	< 1	ug/L
		Chlorodibromomethane	< 1	ug/L
		Chloroethane	< 1	ug/L
		Chloroform	< 2	ug/L
			< 1	ug/L

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February 29, 1996
Report No.: 00049644
Section A Page 4

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: TRIP BLANK
SAMPLE NO: H422959

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		Chloromethane	< 2	ug/L
		Dibromomethane	< 1	ug/L
		Dichlorodifluoromethane	< 1	ug/L
		Ethylbenzene	< 1	ug/L
		Hexachlorobutadiene	< 1	ug/L
		Isopropylbenzene	< 1	ug/L
		Methylene chloride	< 2	ug/L
		Naphthalene	< 2	ug/L
		Styrene	< 1	ug/L
		Tetrachloroethene	< 1	ug/L
		Toluene	< 1	ug/L
		Trichloroethene	< 1	ug/L
		Trichlorofluoromethane	< 1	ug/L
		Vinyl chloride	< 2	ug/L
		cis-1,2-Dichloroethene	< 1	ug/L
		m-Xylene	< 1	ug/L
		n-Butylbenzene	< 1	ug/L
		n-Propylbenzene	< 1	ug/L
		o-Xylene	< 1	ug/L
		p-Isopropyltoluene	< 1	ug/L
		p-Xylene	< 1	ug/L
		sec-Butylbenzene	< 1	ug/L
		tert-Butylbenzene	< 1	ug/L
		trans-1,2-Dichloroethene	< 1	ug/L

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February 29, 1996
Report No.: 00049644
Section A Page 5

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

SAMPLE ID: MW-5
SAMPLE NO: H422960

LIMS CLIENT: 0819 0001
PACE PROJECT: H38338
PACE CLIENT: 620723
P.O. NO: MO 6169 ORG

DATE SAMPLED: 20-FEB-96 0830
DATE RECEIVED: 22-FEB-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	OVTCW2	8260A TCL Volatiles in Water		
		1,1,1,2-Tetrachloroethane	< 1	ug/L
		1,1,1-Trichloroethane	< 1	ug/L
		1,1,2,2-Tetrachloroethane	< 1	ug/L
		1,1,2-Trichloroethane	< 1	ug/L
		1,1-Dichloroethane	< 1	ug/L
		1,1-Dichloroethene	< 1	ug/L
		1,1-Dichloropropene	< 1	ug/L
		1,2,3-Trichlorobenzene	< 1	ug/L
		1,2,3-Trichloropropane	< 1	ug/L
		1,2,4-Trichlorobenzene	< 1	ug/L
		1,2,4-Trimethylbenzene	< 1	ug/L
		1,2-Dibromo-3-chloropropane	< 1	ug/L
		1,2-Dibromoethane	< 1	ug/L
		1,2-Dichlorobenzene	< 1	ug/L
		1,2-Dichloroethane	< 1	ug/L
		1,2-Dichloropropane	< 1	ug/L
		1,3,5-Trimethylbenzene	< 1	ug/L
		1,3-Dichlorobenzene	< 1	ug/L
		1,3-Dichloropropane	< 1	ug/L
		1,4-Dichlorobenzene	< 1	ug/L
		2,2-Dichloropropane	< 1	ug/L
		2-Chlorotoluene	< 1	ug/L
		4-Chlorotoluene	< 1	ug/L
		Benzene	< 1	ug/L
		Bromobenzene	< 1	ug/L
		Bromochloromethane	< 1	ug/L
		Bromodichloromethane	< 1	ug/L
		Bromoform	< 1	ug/L
		Bromomethane	< 2	ug/L
		Carbon tetrachloride	< 1	ug/L
		Chlorobenzene	< 1	ug/L
		Chlorodibromomethane	< 1	ug/L
		Chloroethane	< 1	ug/L
		Chloroform	< 2	ug/L
			< 1	ug/L

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LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW-5
SAMPLE NO: H422960

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		Chloromethane	< 2	ug/L
		Dibromomethane	< 1	ug/L
		Dichlorodifluoromethane	< 1	ug/L
		Ethylbenzene	< 1	ug/L
		Hexachlorobutadiene	< 1	ug/L
		Isopropylbenzene	< 1	ug/L
		Methylene chloride	< 2	ug/L
		Naphthalene	< 2	ug/L
		Styrene	< 1	ug/L
		Tetrachloroethene	< 1	ug/L
		Toluene	< 1	ug/L
		Trichloroethene	< 1	ug/L
		Trichlorofluoromethane	< 1	ug/L
		Vinyl chloride	< 2	ug/L
		cis-1,2-Dichloroethene	< 1	ug/L
		m-Xylene	< 1	ug/L
		n-Butylbenzene	< 1	ug/L
		n-Propylbenzene	< 1	ug/L
		o-Xylene	< 1	ug/L
		p-Isopropyltoluene	< 1	ug/L
		p-Xylene	< 1	ug/L
		sec-Butylbenzene	< 1	ug/L
		tert-Butylbenzene	< 1	ug/L
		trans-1,2-Dichloroethene	< 1	ug/L

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February 29, 1996
Report No.: 00049644
Section A Page 7

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

SAMPLE ID: MW-2
SAMPLE NO: H422961

LIMS CLIENT: 0819 0001
PACE PROJECT: H38338
PACE CLIENT: 620723
P.O. NO: MO 6169 ORG

DATE SAMPLED: 20-FEB-96 1330
DATE RECEIVED: 22-FEB-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	OVTCW2	8260A TCL Volatiles in Water		
		1,1,1,2-Tetrachloroethane	< 1	ug/L
		1,1,1-Trichloroethane	< 1	ug/L
		1,1,2,2-Tetrachloroethane	< 1	ug/L
		1,1,2-Trichloroethane	< 1	ug/L
		1,1-Dichloroethane	< 1	ug/L
		1,1-Dichloroethene	< 1	ug/L
		1,1-Dichloropropene	< 1	ug/L
		1,2,3-Trichlorobenzene	< 1	ug/L
		1,2,3-Trichloropropane	< 1	ug/L
		1,2,4-Trichlorobenzene	< 1	ug/L
		1,2,4-Trimethylbenzene	< 1	ug/L
		1,2-Dibromo-3-chloropropane	< 1	ug/L
		1,2-Dibromoethane	< 1	ug/L
		1,2-Dichlorobenzene	< 1	ug/L
		1,2-Dichloroethane	< 1	ug/L
		1,2-Dichloropropane	< 1	ug/L
		1,3,5-Trimethylbenzene	< 1	ug/L
		1,3-Dichlorobenzene	< 1	ug/L
		1,3-Dichloropropane	< 1	ug/L
		1,4-Dichlorobenzene	< 1	ug/L
		2,2-Dichloropropane	< 1	ug/L
		2-Chlorotoluene	< 1	ug/L
		4-Chlorotoluene	< 1	ug/L
		Benzene	< 1	ug/L
		Bromobenzene	< 1	ug/L
		Bromochloromethane	< 1	ug/L
		Bromodichloromethane	< 1	ug/L
		Bromoform	< 1	ug/L
		Bromomethane	< 2	ug/L
		Carbon tetrachloride	< 1	ug/L
		Chlorobenzene	< 1	ug/L
		Chlorodibromomethane	< 1	ug/L
		Chloroethane	< 1	ug/L
		Chloroform	< 2	ug/L
		[illegible]	< 1	ug/L

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February 29, 1996
Report No.: 00049644
Section A Page 8

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW-2
SAMPLE NO: H422961

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		Chloromethane	< 2	ug/L
		Dibromomethane	< 1	ug/L
		Dichlorodifluoromethane	< 1	ug/L
		Ethylbenzene	< 1	ug/L
		Hexachlorobutadiene	< 1	ug/L
		Isopropylbenzene	< 1	ug/L
		Methylene chloride	< 2	ug/L
		Naphthalene	< 2	ug/L
		Styrene	< 1	ug/L
		Tetrachloroethene	< 1	ug/L
		Toluene	< 1	ug/L
		Trichloroethene	< 1	ug/L
		Trichlorofluoromethane	< 1	ug/L
		Vinyl chloride	< 2	ug/L
		cis-1,2-Dichloroethene	< 1	ug/L
		m-Xylene	< 1	ug/L
		n-Butylbenzene	< 1	ug/L
		n-Propylbenzene	< 1	ug/L
		o-Xylene	< 1	ug/L
		p-Isopropyltoluene	< 1	ug/L
		p-Xylene	< 1	ug/L
		sec-Butylbenzene	< 1	ug/L
		tert-Butylbenzene	< 1	ug/L
		trans-1,2-Dichloroethene	< 1	ug/L

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February 29, 1996
Report No.: 00049644
Section B Page 1

SUPPLEMENTAL INFORMATION

LN	TEST CODE	LCSR BLNK BATCH	DUP/MS MS/MSD BATCH	SAMPLE PREPARATION LR-METHOD	SAMPLE PREPARATION DATE/TIME	SAMPLE PREPARATION ANALYST	SAMPLE ANALYSIS LR-METHOD	SAMPLE ANALYSIS DATE/TIME	SAMPLE ANALYSIS ANALYST	SAMPLE ANALYSIS INSTRUMENT
SAMPLE ID: MW-4							SAMPLE NO: H422958			
1	OVTCW2	60651	60496	NA			19-8260A	27-FEB-96 0612	MH	GCMSY
SAMPLE ID: TRIP BLANK							SAMPLE NO: H422959			
1	OVTCW2	60707	60496	NA			19-8260A	27-FEB-96 1129	JC	GCMSY
SAMPLE ID: MW-5							SAMPLE NO: H422960			
1	OVTCW2	60707	60496	NA			19-8260A	27-FEB-96 1211	JC	GCMSY
SAMPLE ID: MW-2							SAMPLE NO: H422961			
1	OVTCW2	60707	60496	NA			19-8260A	27-FEB-96 1253	JC	GCM:

LR Method Literature Reference

19 EPA-Test Methods for Evaluating Solid Waste, 3rd ed, Nov. 1986 and updates

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February 29, 1996
Report No.: 00049644
Section C Page 1

SURROGATE STANDARD RECOVERY

LN	TEST CODE	SURROGATE COMPOUND	PERCENT RECOVERY	ACCEPTANCE LIMITS	REF LN
SAMPLE ID: MW-4			SAMPLE NO: H422958		
2	$VOA2W	GC/MS Volatiles Surrogates (8260)			1
		4-Bromofluorobenzene	104	-	
		Dibromofluoromethane	108	-	
		Toluene-d8	102	-	
SAMPLE ID: TRIP BLANK			SAMPLE NO: H422959		
2	$VOA2W	GC/MS Volatiles Surrogates (8260)			1
		4-Bromofluorobenzene	107	-	
		Dibromofluoromethane	99	-	
		Toluene-d8	101	-	
SAMPLE ID: MW-5			SAMPLE NO: H422960		
2	$VOA2W	GC/MS Volatiles Surrogates (8260)			1
		4-Bromofluorobenzene	103	-	
		Dibromofluoromethane	106	-	
		Toluene-d8	102	-	
SAMPLE ID: MW-2			SAMPLE NO: H422961		
2	$VOA2W	GC/MS Volatiles Surrogates (8260)			1
		4-Bromofluorobenzene	103	-	
		Dibromofluoromethane	108	-	
		Toluene-d8	102	-	

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February 29, 1996
Report No.: 00049644

LABORATORY CONTROL SAMPLE RECOVERY

TEST CODE	DETERMINATION	LCS % RECOVERY	ACCEPTANCE LIMITS
BATCH NO: 60651			SAMPLE NO: H364713
OVTCW2	8260A TCL Volatiles in Water		
	1,1-Dichloroethene	73	-
	Benzene	80	-
	Chlorobenzene	93	-
	Toluene	85	-
	Trichloroethene	78	-
BATCH NO: 60707			SAMPLE NO: H364796
OVTCW2	8260A TCL Volatiles in Water		
	1,1-Dichloroethene	113	-
	Benzene	113	-
	Chlorobenzene	112	-
	Toluene	113	-
	Trichloroethene	108	-

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METHOD BLANK DATA

TEST CODE	DETERMINATION	RESULT	UNIT
BATCH NO: 60651			SAMPLE NO: H364714
OVTCW2	8260A TCL Volatiles in Water		
	1,1,1,2-Tetrachloroethane	< 1	ug/L
	1,1,1-Trichloroethane	< 1	ug/L
	1,1,2,2-Tetrachloroethane	< 1	ug/L
	1,1,2-Trichloroethane	< 1	ug/L
	1,1-Dichloroethane	< 1	ug/L
	1,1-Dichloroethene	< 1	ug/L
	1,1-Dichloropropene	< 1	ug/L
	1,2,3-Trichlorobenzene	< 1	ug/L
	1,2,3-Trichloropropane	< 1	ug/L
	1,2,4-Trichlorobenzene	< 1	ug/L
	1,2,4-Trimethylbenzene	< 1	ug/L
	1,2-Dibromo-3-chloropropane	< 1	ug/L
	1,2-Dibromoethane	< 1	ug/L
	1,2-Dichlorobenzene	< 1	ug/L
	1,2-Dichloroethane	< 1	ug/L
	1,2-Dichloropropane	< 1	ug/L
	1,3,5-Trimethylbenzene	< 1	ug/L
	1,3-Dichlorobenzene	< 1	ug/L
	1,3-Dichloropropane	< 1	ug/L
	1,4-Dichlorobenzene	< 1	ug/L
	2,2-Dichloropropane	< 1	ug/L
	2-Chlorotoluene	< 1	ug/L
	4-Chlorotoluene	< 1	ug/L
	Benzene	< 1	ug/L
	Bromobenzene	< 1	ug/L
	Bromochloromethane	< 1	ug/L
	Bromodichloromethane	< 1	ug/L
	Bromoform	< 1	ug/L
	Bromomethane	< 2	ug/L
	Carbon tetrachloride	< 1	ug/L
	Chlorobenzene	< 1	ug/L
	Chlorodibromomethane	< 1	ug/L
	Chloroethane	< 2	ug/L
	Chloroform	< 1	ug/L
	Chloromethane	< 2	ug/L
	Dibromomethane	< 1	ug/L
	Dichlorodifluoromethane	< 1	ug/L
	Ethylbenzene	< 1	ug/L
	Hexachlorobutadiene	< 1	ug/L
	Isopropylbenzene	< 1	ug/L
	Methylene chloride	< 1	ug/L

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February 29, 1996
Report No.: 00049644

METHOD BLANK DATA

TEST CODE	DETERMINATION	RESULT	UNIT
	Naphthalene	< 2	ug/L
	Styrene	< 1	ug/L
	Tetrachloroethene	< 1	ug/L
	Toluene	< 1	ug/L
	Trichloroethene	< 1	ug/L
	Trichlorofluoromethane	< 1	ug/L
	Vinyl chloride	< 2	ug/L
	cis-1,2-Dichloroethene	< 1	ug/L
	m-Xylene	< 1	ug/L
	n-Butylbenzene	< 1	ug/L
	n-Propylbenzene	< 1	ug/L
	o-Xylene	< 1	ug/L
	p-Isopropyltoluene	< 1	ug/L
	p-Xylene	< 1	ug/L
	sec-Butylbenzene	< 1	ug/L
	tert-Butylbenzene	< 1	ug/L
	trans-1,2-Dichloroethene	< 1	ug/L

BATCH NO: 60707

SAMPLE NO: H364797

TEST CODE	DETERMINATION	RESULT	UNIT
OVTCW2	8260A TCL Volatiles in Water		
	1,1,1,2-Tetrachloroethane	< 1	ug/L
	1,1,1-Trichloroethane	< 1	ug/L
	1,1,2,2-Tetrachloroethane	< 1	ug/L
	1,1,2-Trichloroethane	< 1	ug/L
	1,1-Dichloroethane	< 1	ug/L
	1,1-Dichloroethene	< 1	ug/L
	1,1-Dichloropropene	< 1	ug/L
	1,2,3-Trichlorobenzene	< 1	ug/L
	1,2,3-Trichloropropane	< 1	ug/L
	1,2,4-Trichlorobenzene	< 1	ug/L
	1,2,4-Trimethylbenzene	< 1	ug/L
	1,2-Dibromo-3-chloropropane	< 1	ug/L
	1,2-Dibromoethane	< 1	ug/L
	1,2-Dichlorobenzene	< 1	ug/L
	1,2-Dichloroethane	< 1	ug/L
	1,2-Dichloropropane	< 1	ug/L
	1,3,5-Trimethylbenzene	< 1	ug/L
	1,3-Dichlorobenzene	< 1	ug/L
	1,3-Dichloropropane	< 1	ug/L
	1,4-Dichlorobenzene	< 1	ug/L
	2,2-Dichloropropane	< 1	ug/L
	2-Chlorotoluene	< 1	ug/L
	4-Chlorotoluene	< 1	ug/L

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METHOD BLANK DATA

TEST CODE	DETERMINATION	RESULT	UNIT
	Benzene	< 1	ug/L
	Bromobenzene	< 1	ug/L
	Bromochloromethane	< 1	ug/L
	Bromodichloromethane	< 1	ug/L
	Bromoform	< 1	ug/L
	Bromomethane	< 2	ug/L
	Carbon tetrachloride	< 1	ug/L
	Chlorobenzene	< 1	ug/L
	Chlorodibromomethane	< 1	ug/L
	Chloroethane	< 2	ug/L
	Chloroform	< 1	ug/L
	Chloromethane	< 2	ug/L
	Dibromomethane	< 1	ug/L
	Dichlorodifluoromethane	< 1	ug/L
	Ethylbenzene	< 1	ug/L
	Hexachlorobutadiene	< 1	ug/L
	Isopropylbenzene	< 1	ug/L
	Methylene chloride	< 2	ug/L
	Naphthalene	< 2	ug/L
	Styrene	< 1	ug/L
	Tetrachloroethene	< 1	ug/L
	Toluene	< 1	ug/L
	Trichloroethene	< 1	ug/L
	Trichlorofluoromethane	< 1	ug/L
	Vinyl chloride	< 2	ug/L
	cis-1,2-Dichloroethene	< 1	ug/L
	m-Xylene	< 1	ug/L
	n-Butylbenzene	< 1	ug/L
	n-Propylbenzene	< 1	ug/L
	o-Xylene	< 1	ug/L
	p-Isopropyltoluene	< 1	ug/L
	p-Xylene	< 1	ug/L
	sec-Butylbenzene	< 1	ug/L
	tert-Butylbenzene	< 1	ug/L
	trans-1,2-Dichloroethene	< 1	ug/L

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February 29, 1996
Report No.: 00049644

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE DATA

TEST CODE	DETERMINATION	MS RESULT	MSD RESULT	UNITS	RPD	MS PCT RCVRY	MSD PCT RCVRY
BATCH NO: 60496						SAMPLE NO: H422059	
OVPPW	Volatiles in Water						
	1,1-Dichloroethene	9.19	9.55	ug/L	3.84	92	96
	Benzene	9.57	9.54	ug/L	0.31	96	95
	Chlorobenzene	9.60	9.59	ug/L	0.10	96	96
	Toluene	9.57	9.40	ug/L	1.79	96	94
	Trichloroethene	9.45	9.62	ug/L	1.78	94	96
BATCH NO: 60496						SAMPLE NO: H422060	
OVPPW	Volatiles in Water						
	1,1-Dichloroethene	30.6	32.9	ug/L	7.21	102	110
	Benzene	30.5	32.6	ug/L	6.69	102	109
	Chlorobenzene	27.2	29.2	ug/L	7.10	90	97
	Toluene	27.8	29.9	ug/L	7.35	93	1[illegible]
	Trichloroethene	26.9	28.6	ug/L	6.30	90	[illegible]

McKENZIE LABORATORIES

Mc
372 Ave.
Phoenix, AZ 85040
(602) 470-0288
FAX (602) 470-0756

PACE

Chain of Custody

DATE 21 FEB 96 PAGE 1 of 1

PROJECT MANAGER:

COMPANY: McKenzie
ADDRESS: 3725 E ATLANTA
PHOENIX AZ 85040

BILL TO: Same
COMPANY:
ADDRESS:

SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST: Petroleum Hydrocarbons (418.1 / 418.1 AZ); BTXE (8021); Chlorinated Hydrocarbons (601/8021); Aromatic Hydrocarbons (602/8021); Organochlorine Pesticides (608/8081); Chlorinated Herbicides (615/8151); Organophosphate Pesticides (614/8141); Semi-Volatile Organics GC/MS (625/8270); Volatile Organics GC/MS (624/8240); 8260 APPENDIX I; SDWA Primary Standards; SDWA Secondary Standards; SDWA Volatiles (502.1/503.1/502.2); The 13 Priority Pollutant Metals; The 8 RCRA Metals by TCLP (1311)

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	8260 APPENDIX I	NUMBER OF CONTAINERS
MW-4	HCl	VOA	19FEB96	1345	GW		X	2
TRIP BLANK	|	|			|		X	2
MW-5	|	|	20FEB96	0830	|		X	2
MW-2	|	|	20FEB96	1330	|		X	2

PROJECT INFORMATION

PROJECT NO.:
PROJECT NAME:
P.O. NO.: MO 6169 DRG
SHIPPED VIA: FED EX
SAMPLE DISPOSAL INSTRUCTIONS*
☐ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS: 8
CHAIN OF CUSTODY SEALS:
RECEIVED INTACT:
TEMPERATURE: AMBIENT / COLD
ICE: PRESENT / ABSENT
WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: E96-1752-1755
Rec'd @ 11.0°C H422958-961

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Pete Brester Time: 1600	Signature: Time:	Signature: Time:
Printed Name: Pete Brester Date: 21 FEB 96	Printed Name: Date:	Printed Name: Date:
Company: McKenzie	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature: FED EX Time:	Signature: [illegible] Time: 0830	Signature: Time:
Printed Name: Date:	Printed Name: [illegible] Date: 2-22-96	Printed Name: Date:
Company:	Company: PASI	Company:

* Samples will be discarded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

McKENZIE LABORATORIES

3725 E. Atlanta Ave.
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Phoenix, AZ 85040
Voice: (602) 470-0288
FAX: (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc.
Attn: Tim Francis/MPI
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: 19 Feb 96
Date Received 20 Feb 96
Date Reported: 11 Mar 96
McKenzie I.D.: E96-1752
Project Name: Gila Bend Land.

Client Identification: MW-4

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	04 Mar 96
Arsenic	mg/L	<0.10	0.10	200.7	04 Mar 96
Barium	mg/L	0.26	0.05	200.7	04 Mar 96
Beryllium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cadmium	mg/L	<0.02	0.02	200.7	04 Mar 96
Chromium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cobalt	mg/L	<0.20	0.20	219.1	05 Mar 96
Copper	mg/L	<0.05	0.05	200.7	04 Mar 96
Iron	mg/L	9.5	0.05	200.7	07 Mar 96
Lead	mg/L	<0.10	0.10	200.7	04 Mar 96
Manganese	mg/L	0.29	0.05	200.7	07 Mar 96
Nickel	mg/L	<0.05	0.05	200.7	04 Mar 96
Selenium	mg/L	<0.10	0.10	200.7	04 Mar 96
Silver	mg/L	<0.05	0.05	200.7	01 Mar 96
Thallium	mg/L	<0.20	0.20	200.7	04 Mar 96
Vanadium	mg/L	<0.20	0.20	200.7	04 Mar 96
Zinc	mg/L	<0.05	0.05	200.7	04 Mar 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	240	5.0	*SM2320B	27 Feb 96
Calcium	mg/L	37	0.10	200.7	04 Mar 96
Chloride	mg/L	840	5.0	325.2	28 Feb 96
Fluoride	mg/L	9.2	0.10	340.2	28 Feb 96
Magnesium	mg/L	14	0.20	200.7	04 Mar 96
Nitrate/Nitrite as N	mg/L	15	0.10	353.2	22 Feb 96
pH	S.U.	8.2	N/A	150.1	20 Feb 96
Phenol	mg/L	<0.005	0.005	420.1	21 Feb 96
Potassium	mg/L	8.2	1.0	200.7	04 Mar 96
Specific Conductance	umhos/cm	3,810	1.0	120.1	26 Feb 96
Sodium	mg/L	910	0.50	200.7	04 Mar 96
Sulfate	mg/L	550	5.0	375.4	21 Feb 96
TDS	mg/L	2,400	5.0	160.1	22 Feb 96
Total Organic Carbon	mg/L	<10	10**	415.2	04 Mar 96

MRL = Minimum Reporting Limit
*Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
**Increased MRL due to matrix inteference and/or necessay dilution.

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

MCKENZIE LABORATORIES

3725 E. Atlanta Ave.
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FAX: (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc.
Attn: Tim Francis/MPI
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: 20 Feb 96
Date Received 20 Feb 96
Date Reported: 11 Mar 96
McKenzie I.D.: E96-1754
Project Name: Gila Bend Land.

Client Identification: MW-5

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	04 Mar 96
Arsenic	mg/L	<0.10	0.10	200.7	04 Mar 96
Barium	mg/L	0.15	0.05	200.7	04 Mar 96
Beryllium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cadmium	mg/L	<0.02	0.02	200.7	04 Mar 96
Chromium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cobalt	mg/L	<0.20	0.20	219.1	05 Mar 96
Copper	mg/L	<0.05	0.05	200.7	04 Mar 96
Iron	mg/L	3.6	0.05	200.7	07 Mar 96
Lead	mg/L	<0.10	0.10	200.7	04 Mar 96
Manganese	mg/L	0.10	0.05	200.7	07 Mar 96
Nickel	mg/L	<0.05	0.05	200.7	04 Mar 96
Selenium	mg/L	<0.10	0.10	200.7	04 Mar 96
Silver	mg/L	<0.05	0.05	200.7	01 Mar 96
Thallium	mg/L	<0.20	0.20	200.7	04 Mar 96
Vanadium	mg/L	<0.20	0.20	200.7	04 Mar 96
Zinc	mg/L	<0.05	0.05	200.7	04 Mar 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	230	5.0	*SM2320B	27 Feb 96
Calcium	mg/L	69	0.10	200.7	04 Mar 96
Chloride	mg/L	1,400	5.0	325.2	28 Feb 96
Fluoride	mg/L	7.4	0.10	340.2	28 Feb 96
Magnesium	mg/L	16	0.20	200.7	04 Mar 96
Nitrate/Nitrite as N	mg/L	26	0.10	353.2	22 Feb 96
pH	S.U.	7.8	N/A	150.1	20 Feb 96
Phenol	mg/L	<0.005	0.005	420.1	21 Feb 96
Potassium	mg/L	7.2	1.0	200.7	04 Mar 96
Specific Conductance	umhos/cm	6,060	1.0	120.1	26 Feb 96
Sodium	mg/L	1,400	0.50	200.7	04 Mar 96
Sulfate	mg/L	1,200	5.0	375.4	21 Feb 96
TDS	mg/L	4,100	5.0	160.1	22 Feb 96
Total Organic Carbon	mg/L	<10	10**	415.2	04 Mar 96

MRL = Minimum Reporting Limit
*Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
**Increased MRL due to matrix inteference and/or necessay dilution.

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

MPI1752.DOC/m

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ADHS License AZ 0034

Malcolm Pirnie, Inc.
Attn: Tim Francis/MPI
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: 19 Feb 96
Date Received 20 Feb 96
Date Reported: 11 Mar 96
McKenzie I.D.: E96-1755
Project Name: Gila Bend Land.

Client Identification: MW-2

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	04 Mar 96
Arsenic	mg/L	<0.10	0.10	200.7	04 Mar 96
Barium	mg/L	0.18	0.05	200.7	04 Mar 96
Beryllium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cadmium	mg/L	<0.02	0.02	200.7	04 Mar 96
Chromium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cobalt	mg/L	<0.20	0.20	219.1	05 Mar 96
Copper	mg/L	<0.05	0.05	200.7	04 Mar 96
Iron	mg/L	5.0	0.05	200.7	07 Mar 96
Lead	mg/L	<0.10	0.10	200.7	04 Mar 96
Manganese	mg/L	0.10	0.05	200.7	07 Mar 96
Nickel	mg/L	<0.05	0.05	200.7	04 Mar 96
Selenium	mg/L	<0.10	0.10	200.7	04 Mar 96
Silver	mg/L	<0.05	0.05	200.7	01 Mar 96
Thallium	mg/L	<0.20	0.20	200.7	04 Mar 96
Vanadium	mg/L	<0.20	0.20	200.7	04 Mar 96
Zinc	mg/L	<0.05	0.05	200.7	04 Mar 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	260	5.0	*SM2320B	27 Feb 96
Calcium	mg/L	66	0.10	200.7	04 Mar 96
Chloride	mg/L	1,500	5.0	325.2	28 Feb 96
Fluoride	mg/L	6.8	0.10	340.2	28 Feb 96
Magnesium	mg/L	19	0.20	200.7	04 Mar 96
Nitrate/Nitrite as N	mg/L	28	0.10	353.2	22 Feb 96
pH	S.U.	7.7	N/A	150.1	20 Feb 96
Phenol	mg/L	<0.005	0.005	420.1	21 Feb 96
Potassium	mg/L	8.2	1.0	200.7	04 Mar 96
Specific Conductance	umhos/cm	6,630	1.0	120.1	26 Feb 96
Sodium	mg/L	1,500	0.50	200.7	04 Mar 96
Sulfate	mg/L	1,200	5.0	375.4	21 Feb 96
TDS	mg/L	4,300	5.0	160.1	22 Feb 96
Total Organic Carbon	mg/L	<10	10**	415.2	04 Mar 96

MRL = Minimum Reporting Limit
*Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
**Increased MRL due to matrix inteference and/or necessay dilution.

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Attn: Tim Francis/MPI
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: 19 Feb 96
Date Received 20 Feb 96
Date Reported: 11 Mar 96
McKenzie I.D.: E96-1752
Project Name: Gila Bend Land.

Client Identification: MW-4

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	04 Mar 96
Arsenic	mg/L	<0.10	0.10	200.7	04 Mar 96
Barium	mg/L	<0.05	0.05	200.7	04 Mar 96
Beryllium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cadmium	mg/L	<0.02	0.02	200.7	04 Mar 96
Chromium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cobalt	mg/L	<0.20	0.20	219.1	05 Mar 96
Copper	mg/L	<0.05	0.05	200.7	04 Mar 96
Iron	mg/L	<0.05	0.05	200.7	04 Mar 96
Lead	mg/L	<0.10	0.10	200.7	04 Mar 96
Manganese	mg/L	<0.05	0.05	200.7	04 Mar 96
Nickel	mg/L	<0.05	0.05	200.7	04 Mar 96
Selenium	mg/L	<0.10	0.10	200.7	04 Mar 96
Silver	mg/L	<0.05	0.05	200.7	05 Mar 96
Thallium	mg/L	<0.20	0.20	200.7	04 Mar 96
Vanadium	mg/L	<0.20	0.20	200.7	04 Mar 96
Zinc	mg/L	<0.05	0.05	200.7	04 Mar 96
Non-Metals, Dissolved					
Calcium	mg/L	17	0.10	200.7	04 Mar 96
Magnesium	mg/L	8.4	0.20	200.7	04 Mar 96
Potassium	mg/L	6.6	1.0	200.7	04 Mar 96
Sodium	mg/L	870	0.50	200.7	04 Mar 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Attn: Tim Francis/MPI
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Phoenix, AZ 85008

Date Sampled: 20 Feb 96
Date Received: 20 Feb 96
Date Reported: 11 Mar 96
McKenzie I.D.: E96-1754
Project Name: Gila Bend Land.

Client Identification: MW-5

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	04 Mar 96
Arsenic	mg/L	<0.10	0.10	200.7	04 Mar 96
Barium	mg/L	<0.05	0.05	200.7	04 Mar 96
Beryllium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cadmium	mg/L	<0.02	0.02	200.7	04 Mar 96
Chromium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cobalt	mg/L	<0.20	0.20	219.1	05 Mar 96
Copper	mg/L	<0.05	0.05	200.7	04 Mar 96
Iron	mg/L	<0.05	0.05	200.7	04 Mar 96
Lead	mg/L	<0.10	0.10	200.7	04 Mar 96
Manganese	mg/L	<0.05	0.05	200.7	04 Mar 96
Nickel	mg/L	<0.05	0.05	200.7	04 Mar 96
Selenium	mg/L	<0.10	0.10	200.7	04 Mar 96
Silver	mg/L	<0.05	0.05	200.7	05 Mar 96
Thallium	mg/L	<0.20	0.20	200.7	04 Mar 96
Vanadium	mg/L	<0.20	0.20	200.7	04 Mar 96
Zinc	mg/L	<0.05	0.05	200.7	04 Mar 96
Non-Metals, Dissolved					
Calcium	mg/L	53	0.10	200.7	04 Mar 96
Magnesium	mg/L	14	0.20	200.7	04 Mar 96
Potassium	mg/L	6.2	1.0	200.7	04 Mar 96
Sodium	mg/L	1,400	0.50	200.7	04 Mar 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Malcolm Pirnie, Inc.
Attn: Tim Francis/MPI
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: 20 Feb 96
Date Received 20 Feb 96
Date Reported: 11 Mar 96
McKenzie I.D.: E96-1755
Project Name: Gila Bend Land.

Client Identification: MW-2

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	04 Mar 96
Arsenic	mg/L	<0.10	0.10	200.7	04 Mar 96
Barium	mg/L	<0.05	0.05	200.7	04 Mar 96
Beryllium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cadmium	mg/L	<0.02	0.02	200.7	04 Mar 96
Chromium	mg/L	<0.05	0.05	200.7	04 Mar 96
Cobalt	mg/L	<0.20	0.20	219.1	05 Mar 96
Copper	mg/L	<0.05	0.05	200.7	04 Mar 96
Iron	mg/L	<0.05	0.05	200.7	04 Mar 96
Lead	mg/L	<0.10	0.10	200.7	04 Mar 96
Manganese	mg/L	<0.05	0.05	200.7	04 Mar 96
Nickel	mg/L	<0.05	0.05	200.7	04 Mar 96
Selenium	mg/L	<0.10	0.10	200.7	04 Mar 96
Silver	mg/L	<0.05	0.05	200.7	05 Mar 96
Thallium	mg/L	<0.20	0.20	200.7	04 Mar 96
Vanadium	mg/L	<0.20	0.20	200.7	04 Mar 96
Zinc	mg/L	<0.05	0.05	200.7	04 Mar 96
Non-Metals, Dissolved					
Calcium	mg/L	49	0.10	200.7	04 Mar 96
Magnesium	mg/L	16	0.20	200.7	04 Mar 96
Potassium	mg/L	6.5	1.0	200.7	04 Mar 96
Sodium	mg/L	1,500	0.50	200.7	04 Mar 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

MPI1752.DOC/m

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McKENZIE LABORATORIES

Chain of Custody

McKenzie Laboratories
37[illegible] Atla[illegible]
Phoenix, AZ 85040
(602) 470-0288
FAX (602) 470-0756

DATE 2-19-96 PAGE 1 of 3

PROJECT MANAGER: Jim Francis [illegible]

COMPANY: [illegible]

ADDRESS: [illegible]

BILL TO: [illegible]

COMPANY: [illegible]

ADDRESS:

SAMPLERS: (Signature) [illegible] FAX NUMBER [illegible] PHONE NUMBER [illegible]

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260 APPENDIX 1	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	Metals Dissolved*	Metals, Total	TDS (misc. as see list)	Phenols	TOC	Nitrate/Nitrite	NUMBER OF CONTAINERS
MW-1	HCL	VOA	2-[illegible]	13:15	[illegible]											X												2
MW-1	[illegible]	[illegible]	[illegible]	"	[illegible]																	X	X					2
MW-1	[illegible]	[illegible]	[illegible]	"	[illegible]	1752																		X				1
MW-1	[illegible]	[illegible]	[illegible]	"	[illegible]																				X			1
MW-1	[illegible]	[illegible]	[illegible]	"	[illegible]																					X		1
MW-1	[illegible]	[illegible]	[illegible]	"	[illegible]																						X	1
Trip Blank	HCL	VOA	2-15-96		[illegible]	1753										X												2

PROJECT INFORMATION	
PROJECT NO:	—
PROJECT NAME:	[illegible]
P.O. NO.:	—
SHIPPED VIA:	[illegible]
SAMPLE DISPOSAL INSTRUCTIONS*	☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT	
TOTAL NO. OF CONTAINERS:	10
CHAIN OF CUSTODY SEALS:	NO
RECEIVED INTACT:	YES
TEMPERATURE:	AMBIENT / COLD
ICE:	PRESENT / ABSENT
	WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: * filtered container

	1.	2.	3.
RELINQUISHED BY: Signature	Derrik Spodman		
Time	4:45		
Printed Name	Derrik Spodman		
Date	2-20-96		
Company	Malcolm Pirnie		
RECEIVED BY: Signature	[illegible]		
Time	1645		
Printed Name	Peta Brewer		
Date	20 Feb 96		
Company	McKenzie		

* Samples will be discarded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

MCKENZIE LABORATORIES

McKenzie Labs
37[illegible] Atlanta Ave.
Phoenix, AZ 85040
(602) 470-0288
FAX (602) 470-0756

Chain of Custody

DATE 2 20 96 PAGE 2 of 3

PROJECT MANAGER: Tim Francis / MPI
COMPANY: Malcolm Pirnie Inc
ADDRESS: 432 N. 44th st #400
Phoenix, Az 85008

BILL TO: Bill Kozich
COMPANY: Continental Waste
ADDRESS:

D. Sweet
SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260 Appendix I	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	Metals dissolved (filtered)	Metals total	TDS + misc analytes *	Phenols	TOC	Nitrate + Nitrite	NUMBER OF CONTAINERS
MW 5	H.L	VOA	2 20 96	830	[illegible]											X												2
MW 5	Nitric	500 ml plastic	"	830	"																	X	X					2
MW 5	–	liter plastic	"	830	"	1754																		X				1
MW 5	Sulfuric	1 liter [illegible]	"	830	"																				X			1
MW 5		500 ml amber	"	830	"																					X		1
MW 5	"	2.0ml AMBER	"	830	"																						X	1

PROJECT INFORMATION	
PROJECT NO:	—
PROJECT NAME:	Gila Bend Land
P.O. NO.:	—
SHIPPED VIA:	In person
SAMPLE DISPOSAL INSTRUCTIONS*	☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT	
TOTAL NO. OF CONTAINERS:	8
CHAIN OF CUSTODY SEALS:	N/O
RECEIVED INTACT:	Yes
TEMPERATURE:	AMBIENT / COLD
ICE:	PRESENT / ABSENT WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS
TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: * [illegible] list of [illegible] parameters.

	RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature:	Derik Spelman		
Time:	4:45		
Printed Name:	Derik Spelman		
Date:	2-20-96		
Company:	Malcolm Pirnie Inc.		

	RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature:	[illegible]		
Time:	1615		
Printed Name:	[illegible]		
Date:	20 Feb 96		
Company:	McK		

* Samples will [illegible]carded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

McKENZIE LABORATORIES

Mc
37 ... Ave.
Phoenix, A... 85040
(602) 470-0288
FAX (602) 470-0756

Chain of Custody

DATE 2-20-96 PAGE 3 of 3

PROJECT MANAGER: Tim Francis / MPI

COMPANY: Malcolm Pirnie Inc (MPI)

ADDRESS: 432 N 44th St #400
Phoenix AZ 85008

BILL TO: Bill Kezuh

COMPANY: Continental Waste

ADDRESS:

SAMPLERS: (Signature) [signature] FAX NUMBER 231-0131 PHONE NUMBER 231-1770

ANALYSIS REQUEST

Printed analysis columns: Petroleum Hydrocarbons (418.1 / 418.1 AZ); BTXE (8021); Chlorinated Hydrocarbons (601/8021); Aromatic Hydrocarbons (602/8021); Organochlorine Pesticides (608/8081); Chlorinated Herbicides (615/8151); Organophosphate Pesticides (614/8141); Semi-Volatile Organics GC/MS (625/8270); Volatile Organics GC/MS (624/8240); SDWA Primary Standards; SDWA Secondary Standards; SDWA Volatiles (502.1/503.1/502.2); The 13 Priority Pollutant Metals; The 8 RCRA Metals by TCLP (1311)

Handwritten analysis columns: 8260 Appendix I; Metals Dissolved (filtered); Metals Total; TDS (misc. general chemistry)*; Phenols; TOC; Nitrite / Nitrate

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	8260 Appendix I	Metals Dissolved (filtered)	Metals Total	TDS (misc. general chemistry)*	Phenols	TOC	Nitrite / Nitrate	NUMBER OF CONTAINERS
MW-2	HCL	VOA	2-20-96	13:30	H2O	1755	X							2
MW-2	Nitric	500ml plastic	2-20-96	13:30	H2O	1755		X	X					2
MW-2	—	1L plastic	2-20-96	13:30	H2O	1755				X				1
MW-2	Sulfuric	1L plastic	2-20-96	13:30	H2O	1755					X			1
MW-2	Sulfuric	500ml glass	2-20-96	13:30	H2O	1755						X		1
MW-2	Sulfuric	250ml glass	2-20-96	13:30	H2O	1755							X	1

PROJECT INFORMATION

PROJECT NO: —
PROJECT NAME: Colorado Landfill
P.O. NO.: —
SHIPPED VIA: hand carry
SAMPLE DISPOSAL INSTRUCTIONS*
☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS: 8
CHAIN OF CUSTODY SEALS: NO
RECEIVED INTACT: yes
TEMPERATURE: AMBIENT / COLD
ICE: ~~PRESENT~~ / ABSENT
WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS ☐
TAT (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: See Liz Gibson for list of general water chemistry parameters

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: [signature] Time: 4:45	Signature: Time:	Signature: Time:
Printed Name: Derrik Spoelman Date: 2-20-96	Printed Name: Date:	Printed Name: Date:
Company: Malcolm Pirnie Inc	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature: [signature] Time: 1645	Signature: Time:	Signature: Time:
Printed Name: Pat Bressler Date: 20 FEB 96	Printed Name: Date:	Printed Name: Date:
Company: McKenzie	Company:	Company:

* Samples will be discarded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

Round 2 - March 19-20, 1996
(MW-1S, MW-2S, MW-3S, MW-4S, MW-5S, MW-6S)

McKENZIE
LABORATORIES

April 11, 1996

Malcolm Pirnie, Inc.
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Re: McKenzie Labs Sample I.D. numbers E96-2703-2706, 2738-2740

Dear Tim,

Attached are the original reports of analysis from Pace Analytical Services, Inc. for the water samples received on March 20, 21, 1996. The following analysis was performed:

EPA 8260 Appendix 1

If you have any questions regarding the results, please contact Lizz Cohoon, Technical Services Representative for McKenzie. We appreciate your business and thank you for choosing McKenzie.

Sincerely,

Tracey L. Hockett

Tracey L. Hockett
Organic Laboratory Supervisor

cc: McKenzie Archive

I:\env\letters, MPSUBO.doc

CONFIDENTIAL AND PRIVILEGED

Pace Analytical

Pace Analytical Services, Inc
900 Gemini Avenue
Houston, TX 77058
Tel: 713-488-1810
Fax: 713-488-4661

April 05, 1996
Report No.: 00050579
Section A Page 1

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

LIMS CLIENT: 0819 0001
PACE PROJECT: H38796
PACE CLIENT: 620723
P.O. NO: MO 7081 ORG

SAMPLE ID: MW 1S
SAMPLE NO: H424958
SAMPLE MATRIX: WATER

DATE SAMPLED: 19-MAR-96 1200
DATE RECEIVED: 22-MAR-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
3	OVTCWD	Volatiles by 8260 - Subtitle D			
		1,1,1,2-Tetrachloroethane	1	< 1	ug/L
		1,1,1-Trichloroethane	1	< 1	ug/L
		1,1,2,2-Tetrachloroethane	1	< 1	ug/L
		1,1,2-Trichloroethane	1	< 1	ug/L
		1,1-Dichloroethane	1	< 1	ug/L
		1,1-Dichloroethene	1	< 1	ug/L
		1,2,3-Trichloropropane	1	< 1	ug/L
		1,2-Dibromo-3-chloropropane	1	< 1	ug/L
		1,2-Dibromoethane	1	< 1	ug/L
		1,2-Dichlorobenzene	1	< 1	ug/L
		1,2-Dichloroethane	1	< 1	ug/L
		1,2-Dichloropropane	1	< 1	ug/L
		1,4-Dichlorobenzene	1	< 1	ug/L
		2-Butanone	1	< 5	ug/L
		2-Chloroethylvinylether	1	< 5	ug/L
		2-Hexanone	1	< 5	ug/L
		4-Methyl-2-pentanone	1	< 5	ug/L
		Acetone	1	< 5	ug/L
		Acrylonitrile	1	< 10	ug/L
		Benzene	1	< 1	ug/L
		Bromochloromethane	1	< 1	ug/L
		Bromodichloromethane	1	< 1	ug/L
		Bromoform	1	< 1	ug/L
		Bromomethane	1	< 2	ug/L
		Carbon disulfide	1	< 1	ug/L
		Carbon tetrachloride	1	< 1	ug/L
		Chlorobenzene	1	< 1	ug/L
		Chloroethane	1	< 2	ug/L
		Chloroform	1	< 1	ug/L
		Chloromethane	1	< 2	ug/L
		Dibromochloromethane	1	< 1	ug/L
		Dibromomethane	1	< 1	ug/L
		Dichlorodifluoromethane	1	< 1	ug/L
		Ethylbenzene	1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

Pace Analytical

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058
Tel: 713-488-1810
Fax: 713-488-4661

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW 1S
SAMPLE NO: H424958

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
		Iodomethane	1	< 1	ug/L
		Methylene chloride	1	< 2	ug/L
		Styrene	1	< 1	ug/L
		Tetrachloroethene	1	< 1	ug/L
		Toluene	1	< 1	ug/L
		Trichloroethene	1	< 1	ug/L
		Trichlorofluoromethane	1	< 1	ug/L
		Vinyl acetate	1	< 1	ug/L
		Vinyl chloride	1	< 2	ug/L
		Xylenes (total)	1	< 2	ug/L
		cis-1,2-Dichloroethene	1	< 1	ug/L
		cis-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,2-Dichloroethene	1	< 1	ug/L
		trans-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,4-Dichloro-2-butene	1	< 1	ug/L

Pace Analytical Services, Inc.
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Pace Analytical

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

LIMS CLIENT: 0819 0001
PACE PROJECT: H38796
PACE CLIENT: 620723
P.O. NO: MO 7081 ORG

SAMPLE ID: MW 3S
SAMPLE NO: H425025
SAMPLE MATRIX: WATER

DATE SAMPLED: 19-MAR-96 1450
DATE RECEIVED: 22-MAR-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
3	OVTCWD	Volatiles by 8260 - Subtitle D			
		1,1,1,2-Tetrachloroethane	1	< 1	ug/L
		1,1,1-Trichloroethane	1	< 1	ug/L
		1,1,2,2-Tetrachloroethane	1	< 1	ug/L
		1,1,2-Trichloroethane	1	< 1	ug/L
		1,1-Dichloroethane	1	< 1	ug/L
		1,1-Dichloroethene	1	< 1	ug/L
		1,2,3-Trichloropropane	1	< 1	ug/L
		1,2-Dibromo-3-chloropropane	1	< 1	ug/L
		1,2-Dibromoethane	1	< 1	ug/L
		1,2-Dichlorobenzene	1	< 1	ug/L
		1,2-Dichloroethane	1	< 1	ug/L
		1,2-Dichloropropane	1	< 1	ug/L
		1,4-Dichlorobenzene	1	< 1	ug/L
		2-Butanone	1	< 5	ug/L
		2-Chloroethylvinylether	1	< 5	ug/L
		2-Hexanone	1	< 5	ug/L
		4-Methyl-2-pentanone	1	< 5	ug/L
		Acetone	1	< 5	ug/L
		Acrylonitrile	1	< 10	ug/L
		Benzene	1	< 1	ug/L
		Bromochloromethane	1	< 1	ug/L
		Bromodichloromethane	1	< 1	ug/L
		Bromoform	1	< 1	ug/L
		Bromomethane	1	< 2	ug/L
		Carbon disulfide	1	< 1	ug/L
		Carbon tetrachloride	1	< 1	ug/L
		Chlorobenzene	1	< 1	ug/L
		Chloroethane	1	< 1	ug/L
		Chloroform	1	< 2	ug/L
		Chloromethane	1	< 1	ug/L
		Dibromochloromethane	1	< 2	ug/L
		Dibromomethane	1	< 1	ug/L
		Dichlorodifluoromethane	1	< 1	ug/L
		Ethylbenzene	1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058
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Pace Analytical

April 05, 1996
Report No.: 00050579
Section A Page 4

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW 3S
SAMPLE NO: H425025

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
		Iodomethane	1	< 1	ug/L
		Methylene chloride	1	< 2	ug/L
		Styrene	1	< 1	ug/L
		Tetrachloroethene	1	< 1	ug/L
		Toluene	1	< 1	ug/L
		Trichloroethene	1	< 1	ug/L
		Trichlorofluoromethane	1	< 1	ug/L
		Vinyl acetate	1	< 2	ug/L
		Vinyl chloride	1	< 2	ug/L
		Xylenes (total)	1	< 1	ug/L
		cis-1,2-Dichloroethene	1	< 1	ug/L
		cis-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,2-Dichloroethene	1	< 1	ug/L
		trans-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,4-Dichloro-2-butene	1	< 1	ug/L

Pace Analytical

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058
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April 05, 1996
Report No.: 00050579
Section A Page 5

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

SAMPLE ID: MW 6S
SAMPLE NO: H425026
SAMPLE MATRIX: WATER

LIMS CLIENT: 0819 0001
PACE PROJECT: H38796
PACE CLIENT: 620723
P.O. NO: MO 7081 ORG

DATE SAMPLED: 19-MAR-96 1700
DATE RECEIVED: 22-MAR-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
3	OVTCWD	Volatiles by 8260 - Subtitle D			
		1,1,1,2-Tetrachloroethane	1	< 1	ug/L
		1,1,1-Trichloroethane	1	< 1	ug/L
		1,1,2,2-Tetrachloroethane	1	< 1	ug/L
		1,1,2-Trichloroethane	1	< 1	ug/L
		1,1-Dichloroethane	1	< 1	ug/L
		1,1-Dichloroethene	1	< 1	ug/L
		1,2,3-Trichloropropane	1	< 1	ug/L
		1,2-Dibromo-3-chloropropane	1	< 1	ug/L
		1,2-Dibromoethane	1	< 1	ug/L
		1,2-Dichlorobenzene	1	< 1	ug/L
		1,2-Dichloroethane	1	< 1	ug/L
		1,2-Dichloropropane	1	< 1	ug/L
		1,4-Dichlorobenzene	1	< 1	ug/L
		2-Butanone	1	< 5	ug/L
		2-Chloroethylvinylether	1	< 5	ug/L
		2-Hexanone	1	< 5	ug/L
		4-Methyl-2-pentanone	1	< 5	ug/L
		Acetone	1	< 5	ug/L
		Acrylonitrile	1	< 10	ug/L
		Benzene	1	< 1	ug/L
		Bromochloromethane	1	< 1	ug/L
		Bromodichloromethane	1	< 1	ug/L
		Bromoform	1	< 1	ug/L
		Bromomethane	1	< 2	ug/L
		Carbon disulfide	1	< 1	ug/L
		Carbon tetrachloride	1	< 1	ug/L
		Chlorobenzene	1	< 1	ug/L
		Chloroethane	1	< 2	ug/L
		Chloroform	1	< 1	ug/L
		Chloromethane	1	< 2	ug/L
		Dibromochloromethane	1	< 1	ug/L
		Dibromomethane	1	< 1	ug/L
		Dichlorodifluoromethane	1	< 1	ug/L
		Ethylbenzene	1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058
Tel: 713-488-1810
Fax: 713-488-4661

Pace Analytical

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW 6S
SAMPLE NO: H425026

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
		Iodomethane	1	< 1	ug/L
		Methylene chloride	1	< 2	ug/L
		Styrene	1	< 1	ug/L
		Tetrachloroethene	1	< 1	ug/L
		Toluene	1	< 1	ug/L
		Trichloroethene	1	< 1	ug/L
		Trichlorofluoromethane	1	< 1	ug/L
		Vinyl acetate	1	< 2	ug/L
		Vinyl chloride	1	< 2	ug/L
		Xylenes (total)	1	< 1	ug/L
		cis-1,2-Dichloroethene	1	< 1	ug/L
		cis-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,2-Dichloroethene	1	< 1	ug/L
		trans-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,4-Dichloro-2-butene	1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058
Tel: 713-488-1810
Fax: 713-488-4661

Pace Analytical

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME:	MCKENZIE LABORATORIES	LIMS CLIENT:	0819 0001
ADDRESS:	3725 E. ATLANTA PHOENIX, AZ 85040-	PACE PROJECT:	H38796
		PACE CLIENT:	620723
ATTENTION:	CHARLI PERRY	P.O. NO:	MO 7081 ORG
SAMPLE ID:	TRIP BLANK	DATE SAMPLED:	UnAvail
SAMPLE NO:	H425027	DATE RECEIVED:	22-MAR-96
SAMPLE MATRIX:	WATER	PROJECT MANAGER:	Jennifer Adams

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
3	OVTCWD	Volatiles by 8260 - Subtitle D			
		1,1,1,2-Tetrachloroethane	1	< 1	ug/L
		1,1,1-Trichloroethane	1	< 1	ug/L
		1,1,2,2-Tetrachloroethane	1	< 1	ug/L
		1,1,2-Trichloroethane	1	< 1	ug/L
		1,1-Dichloroethane	1	< 1	ug/L
		1,1-Dichloroethene	1	< 1	ug/L
		1,2,3-Trichloropropane	1	< 1	ug/L
		1,2-Dibromo-3-chloropropane	1	< 2	ug/L
		1,2-Dibromoethane	1	< 1	ug/L
		1,2-Dichlorobenzene	1	< 1	ug/L
		1,2-Dichloroethane	1	< 1	ug/L
		1,2-Dichloropropane	1	< 1	ug/L
		1,4-Dichlorobenzene	1	< 1	ug/L
		2-Butanone	1	< 5	ug/L
		2-Chloroethylvinylether	1	< 5	ug/L
		2-Hexanone	1	< 5	ug/L
		4-Methyl-2-pentanone	1	< 5	ug/L
		Acetone	1	< 5	ug/L
		Acrylonitrile	1	< 10	ug/L
		Benzene	1	< 1	ug/L
		Bromochloromethane	1	< 1	ug/L
		Bromodichloromethane	1	< 1	ug/L
		Bromoform	1	< 1	ug/L
		Bromomethane	1	< 2	ug/L
		Carbon disulfide	1	< 1	ug/L
		Carbon tetrachloride	1	< 1	ug/L
		Chlorobenzene	1	< 1	ug/L
		Chloroethane	1	< 2	ug/L
		Chloroform	1	< 1	ug/L
		Chloromethane	1	< 2	ug/L
		Dibromochloromethane	1	< 1	ug/L
		Dibromomethane	1	< 1	ug/L
		Dichlorodifluoromethane	1	< 1	ug/L
		Ethylbenzene	1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058
Tel: 713-488-1810
Fax: 713-488-4661

Pace Analytical

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: TRIP BLANK
SAMPLE NO: H425027

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
		Iodomethane	1	< 1	ug/L
		Methylene chloride	1	< 2	ug/L
		Styrene	1	< 1	ug/L
		Tetrachloroethene	1	< 1	ug/L
		Toluene	1	< 1	ug/L
		Trichloroethene	1	< 1	ug/L
		Trichlorofluoromethane	1	< 1	ug/L
		Vinyl acetate	1	< 2	ug/L
		Vinyl chloride	1	< 2	ug/L
		Xylenes (total)	1	< 1	ug/L
		cis-1,2-Dichloroethene	1	< 1	ug/L
		cis-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,2-Dichloroethene	1	< 1	ug/L
		trans-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,4-Dichloro-2-butene	1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
900 Gemini Avenue
Houston, TX 77058
Tel: 713-488-1810
Fax: 713-488-4661

Pace Analytical

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

SAMPLE ID: MW 4S
SAMPLE NO: H425028
SAMPLE MATRIX: WATER

LIMS CLIENT: 0819 0001
PACE PROJECT: H38796
PACE CLIENT: 620723
P.O. NO: MO 7081 ORG

DATE SAMPLED: 20-MAR-96 0930
DATE RECEIVED: 22-MAR-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
3	OVTCWD	Volatiles by 8260 - Subtitle D			
		1,1,1,2-Tetrachloroethane	1	< 1	ug/L
		1,1,1-Trichloroethane	1	< 1	ug/L
		1,1,2,2-Tetrachloroethane	1	< 1	ug/L
		1,1,2-Trichloroethane	1	< 1	ug/L
		1,1-Dichloroethane	1	< 1	ug/L
		1,1-Dichloroethene	1	< 1	ug/L
		1,2,3-Trichloropropane	1	< 1	ug/L
		1,2-Dibromo-3-chloropropane	1	< 2	ug/L
		1,2-Dibromoethane	1	< 1	ug/L
		1,2-Dichlorobenzene	1	< 1	ug/L
		1,2-Dichloroethane	1	< 1	ug/L
		1,2-Dichloropropane	1	< 1	ug/L
		1,4-Dichlorobenzene	1	< 1	ug/L
		2-Butanone	1	< 5	ug/L
		2-Chloroethylvinylether	1	< 5	ug/L
		2-Hexanone	1	< 5	ug/L
		4-Methyl-2-pentanone	1	< 5	ug/L
		Acetone	1	< 5	ug/L
		Acrylonitrile	1	< 5	ug/L
		Benzene	1	< 10	ug/L
		Bromochloromethane	1	< 1	ug/L
		Bromodichloromethane	1	< 1	ug/L
		Bromoform	1	< 1	ug/L
		Bromomethane	1	< 1	ug/L
		Carbon disulfide	1	< 2	ug/L
		Carbon tetrachloride	1	< 1	ug/L
		Chlorobenzene	1	< 1	ug/L
		Chloroethane	1	< 1	ug/L
		Chloroform	1	< 2	ug/L
		Chloromethane	1	< 1	ug/L
		Dibromochloromethane	1	< 2	ug/L
		Dibromomethane	1	< 1	ug/L
		Dichlorodifluoromethane	1	< 1	ug/L
		Ethylbenzene	1	< 1	ug/L
			1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
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Tel: 713-488-1810
Fax: 713-488-4661

Pace Analytical

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW 4S
SAMPLE NO: H425028

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
		Iodomethane	1	< 1	ug/L
		Methylene chloride	1	< 2	ug/L
		Styrene	1	< 1	ug/L
		Tetrachloroethene	1	< 1	ug/L
		Toluene	1	< 1	ug/L
		Trichloroethene	1	< 1	ug/L
		Trichlorofluoromethane	1	< 1	ug/L
		Vinyl acetate	1	< 2	ug/L
		Vinyl chloride	1	< 2	ug/L
		Xylenes (total)	1	< 1	ug/L
		cis-1,2-Dichloroethene	1	< 1	ug/L
		cis-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,2-Dichloroethene	1	< 1	ug/L
		trans-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,4-Dichloro-2-butene	1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

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April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

LIMS CLIENT: 0819 0001
PACE PROJECT: H38796
PACE CLIENT: 620723
P.O. NO: MO 7081 ORG

SAMPLE ID: MW 5S
SAMPLE NO: H425029
SAMPLE MATRIX: WATER

DATE SAMPLED: 20-MAR-96 1430
DATE RECEIVED: 22-MAR-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
3	OVTCWD	Volatiles by 8260 - Subtitle D			
		1,1,1,2-Tetrachloroethane	1	< 1	ug/L
		1,1,1-Trichloroethane	1	< 1	ug/L
		1,1,2,2-Tetrachloroethane	1	< 1	ug/L
		1,1,2-Trichloroethane	1	< 1	ug/L
		1,1-Dichloroethane	1	< 1	ug/L
		1,1-Dichloroethene	1	< 1	ug/L
		1,2,3-Trichloropropane	1	< 1	ug/L
		1,2-Dibromo-3-chloropropane	1	< 2	ug/L
		1,2-Dibromoethane	1	< 1	ug/L
		1,2-Dichlorobenzene	1	< 1	ug/L
		1,2-Dichloroethane	1	< 1	ug/L
		1,2-Dichloropropane	1	< 1	ug/L
		1,4-Dichlorobenzene	1	< 1	ug/L
		2-Butanone	1	< 5	ug/L
		2-Chloroethylvinylether	1	< 5	ug/L
		2-Hexanone	1	< 5	ug/L
		4-Methyl-2-pentanone	1	< 5	ug/L
		Acetone	1	< 5	ug/L
		Acrylonitrile	1	< 10	ug/L
		Benzene	1	< 1	ug/L
		Bromochloromethane	1	< 1	ug/L
		Bromodichloromethane	1	< 1	ug/L
		Bromoform	1	< 1	ug/L
		Bromomethane	1	< 1	ug/L
		Carbon disulfide	1	< 2	ug/L
		Carbon tetrachloride	1	< 1	ug/L
		Chlorobenzene	1	< 1	ug/L
		Chloroethane	1	< 1	ug/L
		Chloroform	1	< 2	ug/L
		Chloromethane	1	< 1	ug/L
		Dibromochloromethane	1	< 2	ug/L
		Dibromomethane	1	< 1	ug/L
		Dichlorodifluoromethane	1	< 1	ug/L
		Ethylbenzene	1	< 1	ug/L

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Pace Analytical

April 05, 1996
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LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW 5S
SAMPLE NO: H425029

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
		Iodomethane	1	< 1	ug/L
		Methylene chloride	1	< 2	ug/L
		Styrene	1	< 1	ug/L
		Tetrachloroethene	1	< 1	ug/L
		Toluene	1	< 1	ug/L
		Trichloroethene	1	< 1	ug/L
		Trichlorofluoromethane	1	< 1	ug/L
		Vinyl acetate	1	< 1	ug/L
		Vinyl chloride	1	< 2	ug/L
		Xylenes (total)	1	< 2	ug/L
		cis-1,2-Dichloroethene	1	3	ug/L
		cis-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,2-Dichloroethene	1	< 1	ug/L
		trans-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,4-Dichloro-2-butene	1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

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Pace Analytical

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
ADDRESS: 3725 E. ATLANTA
PHOENIX, AZ 85040-
ATTENTION: CHARLI PERRY

LIMS CLIENT: 0819 0001
PACE PROJECT: H38796
PACE CLIENT: 620723
P.O. NO: MO 7081 ORG

SAMPLE ID: MW 2S
SAMPLE NO: H425030
SAMPLE MATRIX: WATER

DATE SAMPLED: 20-MAR-96 1630
DATE RECEIVED: 22-MAR-96
PROJECT MANAGER: Jennifer Adams

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
3	OVTCWD	Volatiles by 8260 - Subtitle D			
		1,1,1,2-Tetrachloroethane	1	< 1	ug/L
		1,1,1-Trichloroethane	1	< 1	ug/L
		1,1,2,2-Tetrachloroethane	1	< 1	ug/L
		1,1,2-Trichloroethane	1	< 1	ug/L
		1,1-Dichloroethane	1	< 1	ug/L
		1,1-Dichloroethene	1	< 1	ug/L
		1,2,3-Trichloropropane	1	< 1	ug/L
		1,2-Dibromo-3-chloropropane	1	< 2	ug/L
		1,2-Dibromoethane	1	< 1	ug/L
		1,2-Dichlorobenzene	1	< 1	ug/L
		1,2-Dichloroethane	1	< 1	ug/L
		1,2-Dichloropropane	1	< 1	ug/L
		1,4-Dichlorobenzene	1	< 1	ug/L
		2-Butanone	1	< 5	ug/L
		2-Chloroethylvinylether	1	< 5	ug/L
		2-Hexanone	1	< 5	ug/L
		4-Methyl-2-pentanone	1	< 5	ug/L
		Acetone	1	< 5	ug/L
		Acrylonitrile	1	< 5	ug/L
		Benzene	1	< 10	ug/L
		Bromochloromethane	1	< 1	ug/L
		Bromodichloromethane	1	< 1	ug/L
		Bromoform	1	< 1	ug/L
		Bromomethane	1	< 1	ug/L
		Carbon disulfide	1	< 2	ug/L
		Carbon tetrachloride	1	< 1	ug/L
		Chlorobenzene	1	< 1	ug/L
		Chloroethane	1	< 1	ug/L
		Chloroform	1.	< 2	ug/L
		Chloromethane	1	< 1	ug/L
		Dibromochloromethane	1	< 2	ug/L
		Dibromomethane	1	< 1	ug/L
		Dichlorodifluoromethane	1	< 1	ug/L
		Ethylbenzene	1	< 1	ug/L
			1	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

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Pace Analytical

April 05, 1996
Report No.: 00050579

LABORATORY ANALYSIS REPORT

CLIENT NAME: MCKENZIE LABORATORIES
SAMPLE ID: MW 2S
SAMPLE NO: H425030

LN	TEST CODE	DETERMINATION	DILUTION FACTOR	RESULT	UNITS
		Iodomethane	1	< 1	ug/L
		Methylene chloride	1	< 2	ug/L
		Styrene	1	< 1	ug/L
		Tetrachloroethene	1	< 1	ug/L
		Toluene	1	< 1	ug/L
		Trichloroethene	1	< 1	ug/L
		Trichlorofluoromethane	1	< 1	ug/L
		Vinyl acetate	1	< 2	ug/L
		Vinyl chloride	1	< 2	ug/L
		Xylenes (total)	1	< 1	ug/L
		cis-1,2-Dichloroethene	1	< 1	ug/L
		cis-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,2-Dichloroethene	1	< 1	ug/L
		trans-1,3-Dichloropropene	1	< 1	ug/L
		trans-1,4-Dichloro-2-butene	1	< 1	ug/L

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SUPPLEMENTAL INFORMATION

LN	TEST CODE	LCSR BLNK BATCH	DUP/MS MS/MSD BATCH	SAMPLE PREPARATION LR-METHOD	DATE/TIME	ANALYST	SAMPLE ANALYSIS LR-METHOD	DATE/TIME	ANALYST	INSTRUMENT
SAMPLE ID: MW 1S								SAMPLE NO: H424958		
3	OVTCWD	61886	61753	NA			19-8260A	28-MAR-96 1537	HGV	GCMSX
SAMPLE ID: MW 3S								SAMPLE NO: H425025		
3	OVTCWD	61886	61753	NA			19-8260A	28-MAR-96 1613	HGV	GCMSX
SAMPLE ID: MW 6S								SAMPLE NO: H425026		
3	OVTCWD	61886	61753	NA			19-8260A	28-MAR-96 1650	HGV	GCMSX
SAMPLE ID: TRIP BLANK								SAMPLE NO: H425027		
3	OVTCWD	61706	61753	NA			19-8260A	28-MAR-96 1500	HGV	GCMSX
SAMPLE ID: MW 4S								SAMPLE NO: H425028		
3	OVTCWD	61706	61753	NA			19-8260A	28-MAR-96 1727	HGV	GCMSX
SAMPLE ID: MW 5S								SAMPLE NO: H425029		
3	OVTCWD	61706	61753	NA			19-8260A	28-MAR-96 1803	HGV	GCMSX
SAMPLE ID: MW 2S								SAMPLE NO: H425030		
3	OVTCWD	61706	61753	NA			19-8260A	28-MAR-96 1840	HGV	GCMSX

LR Method Literature Reference

19 EPA-Test Methods for Evaluating Solid Waste, 3rd ed, Nov. 1986 and updates

REPORT OF LABORATORY ANALYSIS

Pace Analytical

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SURROGATE STANDARD RECOVERY

LN	TEST CODE	SURROGATE COMPOUND	PERCENT RECOVERY	ACCEPTANCE LIMITS	REF LN
SAMPLE ID: MW 1S				SAMPLE NO: H424958	
4	$VOA2W	GC/MS Volatiles Surrogates (8260)			3
		4-Bromofluorobenzene	98	-	
		Dibromofluoromethane	105	-	
		Toluene-d8	95	-	
SAMPLE ID: MW 3S				SAMPLE NO: H425025	
4	$VOA2W	GC/MS Volatiles Surrogates (8260)			3
		4-Bromofluorobenzene	98	-	
		Dibromofluoromethane	105	-	
		Toluene-d8	95	-	
SAMPLE ID: MW 6S				SAMPLE NO: H425026	
4	$VOA2W	GC/MS Volatiles Surrogates (8260)			3
		4-Bromofluorobenzene	99	-	
		Dibromofluoromethane	104	-	
		Toluene-d8	95	-	
SAMPLE ID: TRIP BLANK				SAMPLE NO: H425027	
4	$VOA2W	GC/MS Volatiles Surrogates (8260)			3
		4-Bromofluorobenzene	97	-	
		Dibromofluoromethane	101	-	
		Toluene-d8	95	-	
SAMPLE ID: MW 4S				SAMPLE NO: H425028	
4	$VOA2W	GC/MS Volatiles Surrogates (8260)			3
		4-Bromofluorobenzene	97	-	
		Dibromofluoromethane	106	-	
		Toluene-d8	95	-	
SAMPLE ID: MW 5S				SAMPLE NO: H425029	
4	$VOA2W	GC/MS Volatiles Surrogates (8260)			3
		4-Bromofluorobenzene	99	-	
		Dibromofluoromethane	105	-	
		Toluene-d8	94	-	

REPORT OF LABORATORY ANALYSIS

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Pace Analytical

April 05, 1996
Report No.: 00050579

SURROGATE STANDARD RECOVERY

LN	TEST CODE	SURROGATE COMPOUND	PERCENT RECOVERY	ACCEPTANCE LIMITS	REF LN
SAMPLE ID: MW 2S			SAMPLE NO: H425030		
4	SVOA2W	GC/MS Volatiles Surrogates (8260)			3
		4-Bromofluorobenzene	99	-	
		Dibromofluoromethane	106	-	
		Toluene-d8	94	-	

REPORT OF LABORATORY ANALYSIS

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April 05, 1996
Report No.: 00050579
Section D Page 1

LABORATORY CONTROL SAMPLE RECOVERY

TEST CODE	DETERMINATION	LCS % RECOVERY	ACCEPTANCE LIMITS
BATCH NO: 61706			SAMPLE NO: H366373
OVTCWD	Volatiles by 8260 - Subtitle D		
	1,1-Dichloroethene	99	-
	Benzene	109	-
	Chlorobenzene	117	-
	Toluene	110	-
	Trichloroethene	107	-
BATCH NO: 61886			SAMPLE NO: H366669
OVTCWD	Volatiles by 8260 - Subtitle D		
	1,1-Dichloroethene	99	-
	Benzene	109	-
	Chlorobenzene	117	-
	Toluene	110	-
	Trichloroethene	107	-

REPORT OF LABORATORY ANALYSIS

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Pace Analytical

April 05, 1996
Report No.: 00050579
Section E Page 1

METHOD BLANK DATA

BATCH NO: 61706 SAMPLE NO: H366374

TEST CODE	DETERMINATION	RESULT	UNIT
OVTCWD	Volatiles by 8260 - Subtitle D		
	1,1,1,2-Tetrachloroethane	< 1	ug/L
	1,1,1-Trichloroethane	< 1	ug/L
	1,1,2,2-Tetrachloroethane	< 1	ug/L
	1,1,2-Trichloroethane	< 1	ug/L
	1,1-Dichloroethane	< 1	ug/L
	1,1-Dichloroethene	< 1	ug/L
	1,2,3-Trichloropropane	< 1	ug/L
	1,2-Dibromo-3-chloropropane	< 2	ug/L
	1,2-Dibromoethane	< 1	ug/L
	1,2-Dichlorobenzene	< 1	ug/L
	1,2-Dichloroethane	< 1	ug/L
	1,2-Dichloropropane	< 1	ug/L
	1,4-Dichlorobenzene	< 1	ug/L
	2-Butanone	< 5	ug/L
	2-Chloroethylvinylether	< 5	ug/L
	2-Hexanone	< 5	ug/L
	4-Methyl-2-pentanone	< 5	ug/L
	Acetone	< 5	ug/L
	Acrylonitrile	< 10	ug/L
	Benzene	< 1	ug/L
	Bromochloromethane	< 1	ug/L
	Bromodichloromethane	< 1	ug/L
	Bromoform	< 1	ug/L
	Bromomethane	< 2	ug/L
	Carbon disulfide	< 1	ug/L
	Carbon tetrachloride	< 1	ug/L
	Chlorobenzene	< 1	ug/L
	Chloroethane	< 2	ug/L
	Chloroform	< 1	ug/L
	Chloromethane	< 2	ug/L
	Dibromochloromethane	< 1	ug/L
	Dibromomethane	< 1	ug/L
	Dichlorodifluoromethane	< 1	ug/L
	Ethylbenzene	< 1	ug/L
	Iodomethane	< 1	ug/L
	Methylene chloride	< 1	ug/L
	Styrene	< 2	ug/L
	Tetrachloroethene	< 1	ug/L
	Toluene	< 1	ug/L
	Trichloroethene	< 1	ug/L
	Trichlorofluoromethane	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

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Tel: 713-488-1810
Fax: 713-488-4661

METHOD BLANK DATA

TEST CODE	DETERMINATION	RESULT	UNIT
	Vinyl acetate	< 2	ug/L
	Vinyl chloride	< 2	ug/L
	Xylenes (total)	< 1	ug/L
	cis-1,2-Dichloroethene	< 1	ug/L
	cis-1,3-Dichloropropene	< 1	ug/L
	trans-1,2-Dichloroethene	< 1	ug/L
	trans-1,3-Dichloropropene	< 1	ug/L
	trans-1,4-Dichloro-2-butene	< 1	ug/L

BATCH NO: 61886 SAMPLE NO: H366670

TEST CODE	DETERMINATION	RESULT	UNIT
OVTCWD	Volatiles by 8260 - Subtitle D		
	1,1,1,2-Tetrachloroethane	< 1	ug/L
	1,1,1-Trichloroethane	< 1	ug/L
	1,1,2,2-Tetrachloroethane	< 1	ug/L
	1,1,2-Trichloroethane	< 1	ug/L
	1,1-Dichloroethane	< 1	ug/L
	1,1-Dichloroethene	< 1	ug/L
	1,2,3-Trichloropropane	< 1	ug/L
	1,2-Dibromo-3-chloropropane	< 1	ug/L
	1,2-Dibromoethane	< 1	ug/L
	1,2-Dichlorobenzene	< 1	ug/L
	1,2-Dichloroethane	< 1	ug/L
	1,2-Dichloropropane	< 1	ug/L
	1,4-Dichlorobenzene	< 1	ug/L
	2-Butanone	< 5	ug/L
	2-Chloroethylvinylether	< 5	ug/L
	2-Hexanone	< 5	ug/L
	4-Methyl-2-pentanone	< 5	ug/L
	Acetone	< 5	ug/L
	Acrylonitrile	< 10	ug/L
	Benzene	< 1	ug/L
	Bromochloromethane	< 1	ug/L
	Bromodichloromethane	< 1	ug/L
	Bromoform	< 1	ug/L
	Bromomethane	< 1	ug/L
	Carbon disulfide	< 2	ug/L
	Carbon tetrachloride	< 1	ug/L
	Chlorobenzene	< 1	ug/L
	Chloroethane	< 1	ug/L
	Chloroform	< 2	ug/L
	Chloromethane	< 1	ug/L
	Dibromochloromethane	< 2	ug/L
	Dibromomethane	< 1	ug/L

REPORT OF LABORATORY ANALYSIS

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Pace Analytical

April 05, 1996
Report No.: 00050579
Section E Page 3

METHOD BLANK DATA

TEST CODE	DETERMINATION	RESULT	UNIT
	Dichlorodifluoromethane	< 1	ug/L
	Ethylbenzene	< 1	ug/L
	Iodomethane	< 1	ug/L
	Methylene chloride	< 2	ug/L
	Styrene	< 1	ug/L
	Tetrachloroethene	< 1	ug/L
	Toluene	< 1	ug/L
	Trichloroethene	< 1	ug/L
	Trichlorofluoromethane	< 1	ug/L
	Vinyl acetate	< 1	ug/L
	Vinyl chloride	< 2	ug/L
	Xylenes (total)	< 2	ug/L
	cis-1,2-Dichloroethene	< 1	ug/L
	cis-1,3-Dichloropropene	< 1	ug/L
	trans-1,2-Dichloroethene	< 1	ug/L
	trans-1,3-Dichloropropene	< 1	ug/L
	trans-1,4-Dichloro-2-butene	< 1	ug/L

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Section H Page 1

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE DATA

TEST CODE	DETERMINATION	MS RESULT	MSD RESULT	UNITS	RPD	MS PCT RCVRY	MSD PCT RCVRY
BATCH NO: 61753						SAMPLE NO: H424875	
OVPPW	Volatiles in Water						
	1,1-Dichloroethene	33.4	30.4	ug/L	9.42	83	76
	Benzene	36.4	32.0	ug/L	13.1	91	80
	Chlorobenzene	40.6	35.4	ug/L	13.8	102	88
	Toluene	39.1	29.1	ug/L	29.3	98	73
	Trichloroethene	37.4	35.1	ug/L	6.29	93	88

RPD was out of range due to matrix interference.

REPORT OF LABORATORY ANALYSIS

McKENZIE LABORATORIES PACE

McKenzie Labs
3725 E. Atlanta Ave.
Phoenix, AZ 85040
(602) 470-0288
FAX (602) 470-0756

Chain of Custody

DATE 20 MAR 96 PAGE 1 of 1

PROJECT MANAGER: CHARLI PERRY

COMPANY: McKenzie

ADDRESS: 3725 E ATLANTA
PHOENIX AZ 85040

BILL TO: SAME

COMPANY:

ADDRESS:

SAMPLERS (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260 APPEND I *	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	NUMBER OF CONTAINERS
MW 1S	HCl	VOA	19 MAR 96	1200	G.W.											X						2
MW 3S	|	|	|	1450	|											X						2
MW 6S	|	|	|	1700	|											X						2
TRIP BLANK	|	|	20		H_2O											X						2
MW 4S	|	|	20 MAR 96	0930	GW											X						2
MW 5S	|	|	|	1430	|											X						2
MW 2S	|	|	|	1630	|											X						2
																						2

PROJECT INFORMATION

PROJECT NO:

PROJECT NAME:

P.O. NO.: MO 7081 ORG

SHIPPED VIA: FED EX

SAMPLE DISPOSAL INSTRUCTIONS*

☐ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS: 14

CHAIN OF CUSTODY SEALS:

RECEIVED INTACT:

TEMPERATURE: AMBIENT / COLD

ICE: PRESENT / ABSENT

WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: E96-2703-2706, 2738-2740

* APPENDIX I

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: [signature] Time: 1600	Signature: Time:	Signature: Time:
Printed Name: Pete Bassett Date: 21 MAR 96	Printed Name: Date:	Printed Name: Date:
Company: McKenzie	Company:	Company:

21 MAR 96

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature: FED EX Time:	Signature: Time:	Signature: [signature] Time: 0900
Printed Name: Date:	Printed Name: Date:	Printed Name: [illegible] Date: 3/22/96
Company:	Company:	Company: [illegible]

* Samples will be [illegible] / returned after 60 days

White Canary McKenzie Labs Pink Originator

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Attn: Tim Francis/MPI
432 N. 44th St., #400
Phoenix, AZ 85008

Date Sampled:	19 Mar 96
Date Received	20 Mar 96
Date Reported:	09 Apr 96
McKenzie I.D.:	E96-2703
Project No.:	2602-002
Project Name:	Gila Bend

Client Identification: MW 1 S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	03 Apr 96
Arsenic	mg/L	<0.10	0.10	200.7	03 Apr 96
Barium	mg/L	0.26	0.05	200.7	03 Apr 96
Beryllium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cadmium	mg/L	<0.02	0.02	200.7	03 Apr 96
Chromium	mg/L	0.05	0.05	200.7	03 Apr 96
Cobalt	mg/L	<0.20	0.20	219.1	04 Apr 96
Copper	mg/L	<0.05	0.05	200.7	03 Apr 96
Iron	mg/L	18	0.05	200.7	03 Apr 96
Lead	mg/L	<0.10	0.10	200.7	03 Apr 96
Manganese	mg/L	0.75	0.05	200.7	03 Apr 96
Nickel	mg/L	<0.05	0.05	200.7	03 Apr 96
Selenium	mg/L	<0.10	0.10	200.7	03 Apr 96
Silver	mg/L	<0.05	0.05	200.7	03 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	03 Apr 96
Vanadium	mg/L	<0.20	0.20	200.7	03 Apr 96
Zinc	mg/L	0.11	0.05	200.7	03 Apr 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	240	5.0	SM2320B[a]	22 Mar 96
Calcium	mg/L	99	0.10	200.7	03 Apr 96
Chloride	mg/L	1,400	5.0	325.2	27 Mar 96
Fluoride	mg/L	5.6	0.10	340.2	25 Mar 96
Magnesium	mg/L	15	0.20	200.7	03 Apr 96
Nitrate/Nitrite-N	mg/L	29	0.10	353.2	25 Mar 96
pH	S.U.	8.0	N/A	150.1	20 Mar 96
Phenol	mg/L	<0.005	0.005	420.1	28 Mar 96
Potassium	mg/L	19	1.0	200.7	03 Apr 96
Sodium	mg/L	1,000	0.50	200.7	03 Apr 96
Specific Conductance	µmhos/cm	6,150	1.0	120.1	22 Mar 96
Sulfate	mg/L	940	5.0	375.4	26 Mar 96
TDS	mg/L	4,000	5.0	160.1	22 Mar 96
TOC	mg/L	<20	20[b]	415.2	04 Apr 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
[b]Increased MRL due to matrix interference and/or necessary dilution.

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Attn: Tim Francis/MPI
432 N. 44th St., #400
Phoenix, AZ 85008

Date Sampled: 19 Mar 96
Date Received 20 Mar 96
Date Reported: 09 Apr 96
McKenzie I.D.: E96-2704
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW 3 S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	03 Apr 96
Arsenic	mg/L	<0.10	0.10	200.7	03 Apr 96
Barium	mg/L	0.77	0.05	200.7	03 Apr 96
Beryllium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cadmium	mg/L	<0.02	0.02	200.7	03 Apr 96
Chromium	mg/L	0.07	0.05	200.7	03 Apr 96
Cobalt	mg/L	<0.20	0.20	219.1	04 Apr 96
Copper	mg/L	<0.05	0.05	200.7	03 Apr 96
Iron	mg/L	35	0.05	200.7	03 Apr 96
Lead	mg/L	<0.10	0.10	200.7	03 Apr 96
Manganese	mg/L	1.1	0.05	200.7	03 Apr 96
Nickel	mg/L	<0.05	0.05	200.7	03 Apr 96
Selenium	mg/L	<0.10	0.10	200.7	03 Apr 96
Silver	mg/L	<0.05	0.05	200.7	03 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	03 Apr 96
Vanadium	mg/L	<0.20	0.20	200.7	03 Apr 96
Zinc	mg/L	0.12	0.05	200.7	03 Apr 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	230	5.0	SM2320B[a]	22 Mar 96
Calcium	mg/L	220	0.10	200.7	03 Apr 96
Chloride	mg/L	1,600	5.0	325.2	27 Mar 96
Fluoride	mg/L	5.6	0.10	340.2	25 Mar 96
Magnesium	mg/L	22	0.20	200.7	03 Apr 96
Nitrate/Nitrite-N	mg/L	28	0.10	353.2	25 Mar 96
pH	S.U.	7.9	N/A	150.1	20 Mar 96
Phenol	mg/L	0.026	0.005	420.1	28 Mar 96
Potassium	mg/L	14	1.0	200.7	03 Apr 96
Sodium	mg/L	1,100	0.50	200.7	03 Apr 96
Specific Conductance	µmhos/cm	6,530	1.0	120.1	22 Mar 96
Sulfate	mg/L	1,100	5.0	375.4	26 Mar 96
TDS	mg/L	4,300	5.0	160.1	22 Mar 96
TOC	mg/L	64	20[b]	415.2	04 Apr 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
[b]Increased MRL due to matrix interference and/or necessary dilution.

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Phoenix, AZ 85008

Date Sampled:	19 Mar 96
Date Received	20 Mar 96
Date Reported:	09 Apr 96
McKenzie I.D.:	E96-2705
Project No.:	2602-002
Project Name:	Gila Bend

Client Identification: MW 6 S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	03 Apr 96
Arsenic	mg/L	<0.10	0.10	200.7	03 Apr 96
Barium	mg/L	0.68	0.05	200.7	03 Apr 96
Beryllium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cadmium	mg/L	<0.02	0.02	200.7	03 Apr 96
Chromium	mg/L	0.08	0.05	200.7	03 Apr 96
Cobalt	mg/L	<0.20	0.20	219.1	04 Apr 96
Copper	mg/L	<0.05	0.05	200.7	03 Apr 96
Iron	mg/L	52	0.05	200.7	03 Apr 96
Lead	mg/L	0.14	0.10	200.7	03 Apr 96
Manganese	mg/L	3.1	0.05	200.7	03 Apr 96
Nickel	mg/L	0.07	0.05	200.7	03 Apr 96
Selenium	mg/L	<0.10	0.10	200.7	03 Apr 96
Silver	mg/L	<0.05	0.05	200.7	03 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	03 Apr 96
Vanadium	mg/L	0.78	0.40[b]	200.7	03 Apr 96
Zinc	mg/L	0.19	0.05	200.7	03 Apr 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	230	5.0	SM2320B[a]	22 Mar 96
Calcium	mg/L	510	0.20[b]	200.7	03 Apr 96
Chloride	mg/L	1,700	5.0	325.2	27 Mar 96
Fluoride	mg/L	4.8	0.10	340.2	25 Mar 96
Magnesium	mg/L	62	0.20	200.7	03 Apr 96
Nitrate/Nitrite-N	mg/L	30	0.10	353.2	25 Mar 96
pH	S.U.	7.6	N/A	150.1	20 Mar 96
Phenol	mg/L	<0.005	0.005	420.1	28 Mar 96
Potassium	mg/L	16	1.0	200.7	03 Apr 96
Sodium	mg/L	1,100	0.50	200.7	03 Apr 96
Specific Conductance	µmhos/cm	6,920	1.0	120.1	22 Mar 96
Sulfate	mg/L	1,400	5.0	375.4	26 Mar 96
TDS	mg/L	4,600	5.0	160.1	22 Mar 96
TOC	mg/L	<20	20[b]	415.2	04 Apr 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
[b]Increased MRL due to matrix interference and/or necessary dilution.

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Phoenix, AZ 85008

Date Sampled:	20 Mar 96
Date Received	21 Mar 96
Date Reported:	09 Apr 96
McKenzie I.D.:	E96-2738
Project No.:	2602-002
Project Name:	Gila Bend

Client Identification: MW 4 S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	03 Apr 96
Arsenic	mg/L	<0.10	0.10	200.7	03 Apr 96
Barium	mg/L	0.11	0.05	200.7	03 Apr 96
Beryllium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cadmium	mg/L	<0.02	0.02	200.7	03 Apr 96
Chromium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cobalt	mg/L	<0.20	0.20	219.1	04 Apr 96
Copper	mg/L	<0.05	0.05	200.7	03 Apr 96
Iron	mg/L	7.2	0.05	200.7	03 Apr 96
Lead	mg/L	<0.10	0.10	200.7	03 Apr 96
Manganese	mg/L	0.19	0.05	200.7	03 Apr 96
Nickel	mg/L	<0.05	0.05	200.7	03 Apr 96
Selenium	mg/L	<0.10	0.10	200.7	03 Apr 96
Silver	mg/L	<0.05	0.05	200.7	03 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	03 Apr 96
Vanadium	mg/L	<0.20	0.20	200.7	03 Apr 96
Zinc	mg/L	<0.05	0.05	200.7	03 Apr 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	250	5.0	SM2320B[a]	22 Mar 96
Calcium	mg/L	30	0.10	200.7	03 Apr 96
Chloride	mg/L	690	5.0	325.2	27 Mar 96
Fluoride	mg/L	8.4	0.10	340.2	25 Mar 96
Magnesium	mg/L	14	0.20	200.7	03 Apr 96
Nitrate/Nitrite-N	mg/L	16	0.10	353.2	25 Mar 96
pH	S.U.	8.0	N/A	150.1	21 Mar 96
Phenol	mg/L	<0.005	0.005	420.1	28 Mar 96
Potassium	mg/L	7.5	1.0	200.7	03 Apr 96
Sodium	mg/L	740	0.50	200.7	03 Apr 96
Specific Conductance	µmhos/cm	4,210	1.0	120.1	22 Mar 96
Sulfate	mg/L	540	5.0	375.4	26 Mar 96
TDS	mg/L	2,700	5.0	160.1	22 Mar 96
TOC	mg/L	3.8	2.0[b]	415.2	04 Apr 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
[b]Increased MRL due to matrix interference and/or necessary dilution.

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Phoenix, AZ 85008

Date Sampled: 20 Mar 96
Date Received 21 Mar 96
Date Reported: 09 Apr 96
McKenzie I.D.: E96-2739
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW 5 S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	03 Apr 96
Arsenic	mg/L	<0.10	0.10	200.7	03 Apr 96
Barium	mg/L	0.15	0.05	200.7	03 Apr 96
Beryllium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cadmium	mg/L	<0.02	0.02	200.7	03 Apr 96
Chromium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cobalt	mg/L	<0.20	0.20	219.1	04 Apr 96
Copper	mg/L	<0.05	0.05	200.7	03 Apr 96
Iron	mg/L	8.1	0.05	200.7	03 Apr 96
Lead	mg/L	<0.10	0.10	200.7	03 Apr 96
Manganese	mg/L	0.20	0.05	200.7	03 Apr 96
Nickel	mg/L	<0.05	0.05	200.7	03 Apr 96
Selenium	mg/L	<0.10	0.10	200.7	03 Apr 96
Silver	mg/L	<0.05	0.05	200.7	03 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	03 Apr 96
Vanadium	mg/L	0.21	0.20	200.7	03 Apr 96
Zinc	mg/L	<0.05	0.05	200.7	03 Apr 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	250	5.0	SM2320B[a]	22 Mar 96
Calcium	mg/L	83	0.10	200.7	03 Apr 96
Chloride	mg/L	1,400	5.0	325.2	27 Mar 96
Fluoride	mg/L	7.4	0.10	340.2	25 Mar 96
Magnesium	mg/L	17	0.20	200.7	03 Apr 96
Nitrate/Nitrite-N	mg/L	28	0.10	353.2	25 Mar 96
pH	S.U.	7.7	N/A	150.1	21 Mar 96
Phenol	mg/L	<0.005	0.005	420.1	28 Mar 96
Potassium	mg/L	6.5	1.0	200.7	03 Apr 96
Sodium	mg/L	1,000	0.50	200.7	03 Apr 96
Specific Conductance	µmhos/cm	6,150	1.0	120.1	22 Mar 96
Sulfate	mg/L	860	5.0	375.4	26 Mar 96
TDS	mg/L	4,200	5.0	160.1	22 Mar 96
TOC	mg/L	<2.0	2.0[b]	415.2	04 Apr 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.
[b]Increased MRL due to matrix interference and/or necessary dilution.

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Maja Chadwick, Inorganic Lab Manager

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Date Sampled: 20 Mar 96
Date Received 21 Mar 96
Date Reported: 09 Apr 96
McKenzie I.D.: E96-2740
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW 2 S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	03 Apr 96
Arsenic	mg/L	<0.10	0.10	200.7	03 Apr 96
Barium	mg/L	0.07	0.05	200.7	03 Apr 96
Beryllium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cadmium	mg/L	<0.02	0.02	200.7	03 Apr 96
Chromium	mg/L	<0.05	0.05	200.7	03 Apr 96
Cobalt	mg/L	<0.20	0.20	219.1	04 Apr 96
Copper	mg/L	<0.05	0.05	200.7	03 Apr 96
Iron	mg/L	2.2	0.05	200.7	03 Apr 96
Lead	mg/L	<0.10	0.10	200.7	03 Apr 96
Manganese	mg/L	<0.05	0.05	200.7	03 Apr 96
Nickel	mg/L	<0.05	0.05	200.7	03 Apr 96
Selenium	mg/L	<0.10	0.10	200.7	03 Apr 96
Silver	mg/L	<0.05	0.05	200.7	03 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	03 Apr 96
Vanadium	mg/L	<0.20	0.20	200.7	03 Apr 96
Zinc	mg/L	<0.05	0.05	200.7	03 Apr 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	260	5.0	SM2320B[a]	22 Mar 96
Calcium	mg/L	55	0.10	200.7	03 Apr 96
Chloride	mg/L	1,500	5.0	325.2	27 Mar 96
Fluoride	mg/L	6.6	0.10	340.2	25 Mar 96
Magnesium	mg/L	18	0.20	200.7	03 Apr 96
Nitrate/Nitrite-N	mg/L	27	0.10	353.2	02 Apr 96
pH	S.U.	7.7	N/A	150.1	21 Mar 96
Phenol	mg/L	<0.005	0.005	420.1	28 Mar 96
Potassium	mg/L	6.1	1.0	200.7	03 Apr 96
Sodium	mg/L	1,100	0.50	200.7	03 Apr 96
Specific Conductance	µmhos/cm	6,690	1.0	120.1	22 Mar 96
Sulfate	mg/L	1,100	5.0	375.4	26 Mar 96
TDS	mg/L	4,400	5.0	160.1	22 Mar 96
TOC	mg/L	1.8	1.0	415.2	04 Apr 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Phoenix, AZ 85008

Date Sampled: 19 Mar 96
Date Received 20 Mar 96
Date Reported: 09 Apr 96
McKenzie I.D.: E96-2703
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW 1 S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	04 Apr 96
Arsenic	mg/L	<0.10	0.10	200.7	04 Apr 96
Barium	mg/L	<0.05	0.05	200.7	04 Apr 96
Beryllium	mg/L	<0.05	0.05	200.7	04 Apr 96
Cadmium	mg/L	<0.02	0.02	200.7	04 Apr 96
Chromium	mg/L	<0.05	0.05	200.7	04 Apr 96
Cobalt	mg/L	<0.20	0.20	219.1	04 Apr 96
Copper	mg/L	<0.05	0.05	200.7	04 Apr 96
Iron	mg/L	0.20	0.05	200.7	04 Apr 96
Lead	mg/L	<0.10	0.10	200.7	04 Apr 96
Manganese	mg/L	<0.05	0.05	200.7	04 Apr 96
Nickel	mg/L	<0.05	0.05	200.7	04 Apr 96
Selenium	mg/L	<0.10	0.10	200.7	04 Apr 96
Silver	mg/L	<0.05	0.05	200.7	04 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	04 Apr 96
Vanadium	mg/L	<0.20	0.20	200.7	04 Apr 96
Zinc	mg/L	<0.05	0.05	200.7	04 Apr 96
Non-Metals					
Calcium	mg/L	40	0.10	200.7	04 Apr 96
Magnesium	mg/L	9.7	0.20	200.7	04 Apr 96
Potassium	mg/L	17	1.0	200.7	04 Apr 96
Sodium	mg/L	640	0.50	200.7	04 Apr 96

MRL = Minimum Reporting Limit

Maja Chadwick

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Date Sampled:	19 Mar 96
Date Received	20 Mar 96
Date Reported:	09 Apr 96
McKenzie I.D.:	E96-2704
Project No.:	2602-002
Project Name:	Gila Bend

Client Identification: MW 3 S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	04 Apr 96
Arsenic	mg/L	<0.10	0.10	200.7	04 Apr 96
Barium	mg/L	0.06	0.05	200.7	04 Apr 96
Beryllium	mg/L	<0.05	0.05	200.7	04 Apr 96
Cadmium	mg/L	<0.02	0.02	200.7	04 Apr 96
Chromium	mg/L	<0.05	0.05	200.7	04 Apr 96
Cobalt	mg/L	<0.20	0.20	219.1	04 Apr 96
Copper	mg/L	<0.05	0.05	200.7	04 Apr 96
Iron	mg/L	<0.05	0.05	200.7	04 Apr 96
Lead	mg/L	<0.10	0.10	200.7	04 Apr 96
Manganese	mg/L	0.09	0.05	200.7	04 Apr 96
Nickel	mg/L	<0.05	0.05	200.7	04 Apr 96
Selenium	mg/L	<0.10	0.10	200.7	04 Apr 96
Silver	mg/L	<0.05	0.05	200.7	04 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	04 Apr 96
Vanadium	mg/L	<0.20	0.20	200.7	04 Apr 96
Zinc	mg/L	<0.05	0.05	200.7	04 Apr 96
Non-Metals					
Calcium	mg/L	45	0.10	200.7	04 Apr 96
Magnesium	mg/L	10	0.20	200.7	04 Apr 96
Potassium	mg/L	9.1	1.0	200.7	04 Apr 96
Sodium	mg/L	1,400	0.50	200.7	04 Apr 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

MPI2703.DOC/m

CONFIDENTIAL AND PRIVILGED

MC[redacted]ENZIE LAB[redacted]RATORIES

Chain of Custody

[redacted]ie Labs
[redacted] Ave.
P[redacted] [redacted]40
(602) 470-[redacted]
FAX (602) 470-0756

DATE 3.20.96 PAGE 2 of 2

PROJECT MANAGER: Tim Francis

COMPANY: Malcolm Pirnie, Inc (MPI)
ADDRESS: 432 N 44th St #400
Phoenix, Az 85008

BILL TO: Bill Kozub
COMPANY: Continental Waste
ADDRESS:

SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	Metals, dissolved (field filtered)	Metals, totals	TDS + Misc Analytes	Phenols	T.O.C.	Nitrate + Nitrite	NUMBER OF CONTAINERS
MW-5S	sulphuric	liter G	3.20.96	1430	GW																				X			1
MW-5S	"	500ml pl	3.20.96	1430	GW	2737																				X		1
MW-5S	"	500ml G	3.20.96	1430	GW																						X	1
MW-2S	HCl	VOA	3.20.96	1630	GW											X												2
MW-2S	Nitric	500ml pl	3.20.96	1630	GW																	X	X					2
MW-2S	—	liter pl	3.20.96	1630	GW	2740																		X				1
MW-2S	sulphuric	liter G	3.20.96	1630	GW																				X			1
MW-2S	"	500ml pl	3.20.96	1630	GW																					X		1
MW-2S	"	500ml G	3.20.96	1630	GW																						X	1

PROJECT INFORMATION

PROJECT NO: 2602'002
PROJECT NAME: Gila Bend
P.O. NO.:
SHIPPED VIA:
SAMPLE DISPOSAL INSTRUCTIONS*
☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS: 11
CHAIN OF CUSTODY SEALS: N
RECEIVED INTACT: Y
TEMPERATURE: AMBIENT / COLD
ICE: PRESENT / ABSENT
WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments:
* See Liz Calhoun for additional analytes.

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: [signature] Time: 3.21.96	Signature: Time:	Signature: Time:
Printed Name: DAVID SWEETEN Date: 7AM	Printed Name: Date:	Printed Name: Date:
Company: Malcolm Pirnie, Inc.	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature: [signature] Time: 0700	Signature: Time:	Signature: Time:
Printed Name: Scott Jordan Date: 21Mar96	Printed Name: Date:	Printed Name: Date:
Company: McKenzie	Company:	Company:

* Samples will be discarded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

LABORATORIES

Chain of Custody

(602) 470-0288
FAX (602) 470-0756

DATE 3.20.96 PAGE 1 of 2

PROJECT MANAGER: Tim Francis (MPI)

COMPANY: Malcolm Pirnie, Inc (MPI)

ADDRESS: 432 N 44th St #400
Phoenix, Az 85008

BILL TO: Bill Kozuh

COMPANY: Continental Waste

ADDRESS:

SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	METALS, Dissolved (field filtered)	METALS, Total	TDS + Misc. Analytes (*)	Phenols	T.O.C	Nitrite + Nitrate	NUMBER OF CONTAINERS
MW 4S	HCl	VOA	3.20.96	0930	G.W											X												2
MW 4S	Nitric	pl.	3.20.96	0930	GW																	X	X					2
MW 4S	-	1 liter pl.	3.20.96	0930	GW	2738																		X				1
MW 4S	sulfuric	1 liter G.	3.20.96	0930	GW																				X			1
MW 4S	sulfuric	pl	3.20.96	0930	GW																					X		1
MW 4S	sulfuric	G.	3.20.96	0930	GW																						X	1
MW 5S	HCl	VOA	3.20.96	1430	GW											X												2
MW 5S	Nitric	500ml pl.	3.20.96	1430	GW	2739																X	X					2
MW 5S	—	1 liter pl.	3.20.96	1430	GW																			X				1

PROJECT INFORMATION

PROJECT NO: 2602 002

PROJECT NAME: Gila Bend

P.O. NO.:

SHIPPED VIA:

SAMPLE DISPOSAL INSTRUCTIONS*

☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS:	13
CHAIN OF CUSTODY SEALS:	N
RECEIVED INTACT:	✓
TEMPERATURE:	AMBIENT / COLD
ICE:	PRESENT / ABSENT
	WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments:
(*) See Liz Calhoun for additional analytes.

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: [signature] Time: 7 AM	Signature: Time:	Signature: Time:
Printed Name: David Swelton Date: 3.21.96	Printed Name: Date:	Printed Name: Date:
Company: Malcolm Pirnie, Inc	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature: [signature] Time: 07:00	Signature: Time:	Signature: Time:
Printed Name: Scott Jordan Date: 21 Mar 96	Printed Name: Date:	Printed Name: Date:
Company: McKenzie	Company:	Company:

* Samples will be discarded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

McKENZIE LABORATORIES

Chain of Custody

Ave.
Ph... ...x, ...040
(602) 470-0288
FAX (602) 470-0756

DATE 3-19-96 PAGE 1 of 2

PROJECT MANAGER: TIM FRANKS / MPI

COMPANY: Malcolm Pirnie, Inc (MPI)

ADDRESS: 432 N. 44th St #400
Phoenix, Az 85008

BILL TO: Bill Kozuh

COMPANY: Continental Waste

ADDRESS:

D. Sweeten (602)231-0131 241770
SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID
MW1S	Hcl	VOA	3.19.96	1200	GW	
MW1S	Nitric	500ml plastic	3.19.96	1100	GW	
MW1S	-	1 l plastic	3.19.96	1200	GW	2703
MW1S	sulphuric	liter G	3.19.96	1200	GW	
MW1S	sulphuric	500ml plastic	3.19.96	1200	GW	
MW1S	sulphuric	glass	3.19.96	1200	GW	
MW3S	Hcl	VOA	3.19.96	1450	GW	
MW3S	Nitric	500ml p.	3.19.96	1450	GW	2704
MW3S	-	liter p.	3.19.96	1450	GW	

ANALYSIS REQUEST

SAMPLE ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	Metals, dissolved (field filtered)	Metals, total	TDS + misc analytes (*)	Phenols	T.O.C.	Nitrite / Nitrate	NUMBER OF CONTAINERS
MW1S										X												2
MW1S																X	X					2
MW1S																		X				1
MW1S																			X			1
MW1S																				X		1
MW1S																					X	1
MW3S										X												2
MW3S																X	X					2
MW3S																		X				1

PROJECT INFORMATION

PROJECT NO: 2602.002
PROJECT NAME: Gila Bend
P.O. NO.:
SHIPPED VIA: Sampler/McKenzie
SAMPLE DISPOSAL INSTRUCTIONS*
☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS:	13
CHAIN OF CUSTODY SEALS:	NO
RECEIVED INTACT:	yes
TEMPERATURE:	AMBIENT / COLD
ICE:	PRESENT / ABSENT
	WET / BLUE

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: D. Sweeten Time:	Signature: Time:	Signature: Time:
Printed Name: D. Sweeten Date:	Printed Name: Date:	Printed Name: Date:
Company: Malcolm Pirnie, Inc.	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature: Time:	Signature: [signature] Time: 1000	Signature: Time:
Printed Name: Date:	Printed Name: Pete Briscoe Date: 20 Mar 96	Printed Name: Date:
Company:	Company: McKenzie	Company:

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS ☐

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: (*) See Liz Calhoun for list of additional analytes

* Samples will be discarded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

McKENZIE LABORATORIES

Chain of Custody

McKenzie Labs
37[illegible] Atlanta Ave.
Phoenix, AZ 85040
(602) 470-0288
FAX (602) 470-0756

DATE 3.19.96 PAGE 2 of 2

PROJECT MANAGER: Tim Francis

COMPANY: Malcolm Pirnie, Inc

ADDRESS: 432 N. 44th St. #400
Phoenix, AZ 85008

BILL TO: Bill Kozuh

COMPANY: Continental Waste

ADDRESS:

SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID
MW 3 S	sulphuric	1 L G	3.19.96	1450	GW	
MW 3 S	sulphuric	pl	3.19.96	1450	GW	2704
MW 3 S	sulphuric	pl	3.19.96	1450	GW	
MW 6 S	HCl	VOA	3.19.96	1700	GW	
MW 6 S	nitric	pl	3.19.96	1700	GW	
MW 6 S	—	1 L pl	3.19.96	1700	GW	2705
MW 6 S	sulphuric	1 L G	3.19.96	1700	GW	
MW 6 S	"	pl	3.19.96	1700	GW	
MW 6 S	"	G	3.19.96	1700	GW	

ANALYSIS REQUEST

SAMPLE ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	metals, dissolved (field filtered)	Metals, total	TDS + Misc Analytes (*)	Phenols	T.O.C.	Nitrate + Nitrite	NUMBER OF CONTAINERS
MW 3 S																			X			1
MW 3 S																				X		1
MW 3 S																					X	1
MW 6 S										X												2
MW 6 S																X	X					2
MW 6 S																		X				1
MW 6 S																			X			1
MW 6 S																				X		1
MW 6 S																					X	1

PROJECT INFORMATION

PROJECT NO: 2602.002

PROJECT NAME: Gila Bend

P.O. NO.:

SHIPPED VIA: Sampler/McKenzie

SAMPLE DISPOSAL INSTRUCTIONS*

☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS:	13
CHAIN OF CUSTODY SEALS:	No
RECEIVED INTACT:	Yes
TEMPERATURE:	AMBIENT / COLD
ICE:	PRESENT / ABSENT
	WET / BLUE

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: D Sweeton Time:	Signature: Time:	Signature: Time:
Printed Name: D. Sweeton Date:	Printed Name: Date:	Printed Name: Date:
Company: Malcolm Pirnie, Inc	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature: Time:	Signature: [signature] Time: 1000	Signature: Time:
Printed Name: Date:	Printed Name: Pete Bessette Date: 20 MAR 1996	Printed Name: Date:
Company:	Company: McKenzie	Company:

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: (*) See Liz Calhoun for additional analytes

* TRIP BLANK : E96-2706

* Samples will [illegible]ded / returned after 60 days

20 MAR 96 PB

White, Canary: McKenzie Labs Pink: Originator

Round 3 - April 26-29, 1996
(MW-1S, MW-2S, MW-3S, MW-4S, MW-5S, MW-6S)

MCKENZIE
LABORATORIES

3725 E. Atlanta Ave
Suite One
Phoenix, AZ 85040
Voice: (602) 470-0288
FAX: (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4091
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-2S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

MCKENZIE
LABORATORIES

3725 E Atlanta Ave.
Suite One
Phoenix, AZ 85040
Voice (602) 470-0288
FAX: (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc. (MPI)

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4091
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 2 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-2S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	9.7	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	94	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L Hockett

Tracey L Hockett, Organic Laboratory Supervisor

MPI4091.DOC/sl

CONFIDENTIAL AND PRIVILEGED

MCKENZIE
LABORATORIES

3725 E. Atlanta Ave
Suite One
Phoenix AZ 85040
Voice: (602) 470-0288
FAX: (602) 470-0758
ADHS License AZ 003-

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4092
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-3S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

MCKENZIE
LABORATORIES

3725 E. Atlanta Ave.
Suite One
Phoenix AZ 85040
Voice. (602) 470-0288
FAX: (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc. (MPI)

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4092
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 2 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-3S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	8.5	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	95	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

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McKENZIE LABORATORIES

3725 E. Atlanta Ave.
Suite One
Phoenix, AZ 85040
Voice (602) 470-0288
FAX: (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4093
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-6S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc. (MPI)

Date Sampled: 29 Apr 96
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Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 2 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-6S	MRL
Ethylbenzene	5.3	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	7.2	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	17	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	94	86-115
Dibromofluoromethane	102	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

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MCKENZIE
LABORATORIES

3725 E. Atlanta Ave
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ADHS License AZ 0034

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Method Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1.2-Dibromo-3-chloropropane	<5.0	5.0
1.2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1.1-Dichloroethane	<5.0	5.0
1.2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc. (MPI)

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 2 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Method Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	96	86-115
Dibromofluoromethane	101	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

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McKENZIE
LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4091
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 1 of 2
Corrected Report: 30 May 96

EPA 8260

Compound	MW-2S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc. (MPI)

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4091
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.

Corrected Report: 30 May 96

EPA 8260

Compound	MW-2S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	9.7	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	94	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

SUPERSEDED

Tracey L. Hockett, Organic Laboratory Supervisor

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McKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4092
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 1 of 2
Corrected Report: 30 May 96

EPA 8260

Compound	MW-3S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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McKenzie I.D.: E96-4092
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.

Corrected Report: 30 May 96

EPA 8260

Compound	MW-3S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	8.5	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	95	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4093
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 1 of 2
Corrected Report: 30 May 96

EPA 8260

Compound	MW-6S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc. (MPI)

Date Sampled: 29 Apr 96
Date Received: 29 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4093
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.
Page 2 of 2
Corrected Report: 30 May 96

EPA 8260

Compound	MW-6S	MRL
Ethylbenzene	5.3	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	7.2	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	17	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	94	86-115
Dibromofluoromethane	102	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

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LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

EPA 8260

Compound	Method Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

McKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill
Page 2 of 2

EPA 8260

Compound	Method Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	96	86-115
Dibromofluoromethane	101	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

MPI4007.DOC/sl

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McKENZIE LABORATORIES

3.
Phoenix, AZ
(602) 470-02..
FAX (602) 470-..

Chain of Custody

DATE 4-29-96 PAGE 1 of __

PROJECT MANAGER: Tim Francis

COMPANY: Malcolm Pirnie Inc (MPI)

ADDRESS: 432 N. 44th St. #400
Phoenix Az 85008

BILL TO: Bill Kozub

COMPANY: Continental Waste

ADDRESS:

SAMPLERS: (Signature) Derrik Spelman — FAX NUMBER 231-0131 — PHONE NUMBER 241-1770

ANALYSIS REQUEST

- Petroleum Hydrocarbons (418.1 / 418.1 AZ)
- BTXE (8020)
- Chlorinated Hydrocarbons (601/8010)
- Aromatic Hydrocarbons (602/8020)
- Organochlorine Pesticides (608/8080)
- Chlorinated Herbicides (615/8150)
- Organophosphate Pesticides (614/8140)
- 8260
- Semi-Volatile Organics GC/MS (625/8270)
- Volatile Organics GC/MS (624/8240)
- SDWA Primary Standards
- SDWA Secondary Standards
- SDWA Volatiles (502.1/503.1/502.2)
- The 13 Priority Pollutant Metals
- The 8 TC Metals by TCLP (1311)
- Metals Dissolved (Filtered)
- Metals Total
- TDS & Misc. analysis *
- Phenols
- TOC
- Nitrate/Nitrite
- NUMBER OF CONTAINERS

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	8260	Metals Dissolved (Filtered)	Metals Total	TDS & Misc. analysis *	Phenols	TOC	Nitrate/Nitrite	NUMBER OF CONTAINERS
MW-2S	–	–	4-29-96	10:30	H_2O	4091	X	X	X	X	X	X	X	8
MW-3S	–	–	4-29-96	12:00	H_2O	4092	X	X	X	X	X	X	X	8
MW-6S	–	–	4-29-96	14:00	H_2O	4093	X	X	X	X	X	X	X	8

PROJECT INFORMATION

PROJECT NO: 2602-002

PROJECT NAME: Gila Bend Landfill

P.O. NO.:

SHIPPED VIA: Sampler

SAMPLE DISPOSAL INSTRUCTIONS*

☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS: 24

CHAIN OF CUSTODY SEALS: No

RECEIVED INTACT: Yes

TEMPERATURE: AMBIENT / COLD

ICE: PRESENT / ABSENT

WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: * See Liz Cohen for list of miscellaneous analysis

RELINQUISHED BY: 1.
Signature: Derrik Spelman Time: 1631
Printed Name: Derrik Spelman Date: 4-29-96
Company: Malcolm Pirnie Inc

RELINQUISHED BY: 2.
Signature: Time:
Printed Name: Date:
Company:

RELINQUISHED BY: 3.
Signature: Time:
Printed Name: Date:
Company:

RECEIVED BY: 1.
Signature: Time: 1631
Printed Name: Christina Delahanty Date: 29APR96
Company: McKenzie

RECEIVED BY: 2.
Signature: Time:
Printed Name: Date:
Company:

RECEIVED BY: 3.
Signature: Time:
Printed Name: Date:
Company: McKenzie Labs

* Samples will be discarded / returned after 90 days

White, Canary: McKenzie Labs Pink: Originator

MCKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

EPA 8260

Quality Control Data

Client I.D.: Blank Spike

Compound	Sample Result	Conc. Spiked	Spiked Sample	% Rec.	Dup. Spiked Sample	Dup. % Rec.	RPD	Limits % Rec.
Benzene	<5.0	50.0	55.8	112	57.5	115	3	70-130
Chlorobenzene	<5.0	50.0	51.9	104	53.7	107	3	70-130
1,1-Dichloroethene	<5.0	50.0	58.9	118	61.2	122	4	70-130
Toluene	<5.0	50.0	51.9	104	53.8	108	4	70-130
Trichloroethene	<5.0	50.0	56.3	113	57.7	115	2	70-130

$$\% \text{ Recovery} = \frac{\text{Spiked Sample Result - Sample Result}}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{\text{Spiked Sample Result - Duplicate Spiked Sample Result}}{\text{Average of Spiked Samples}} \times 100$$

Tracey L. Hockett

Tracey ~~L.~~ Hockett, Organic Laboratory Supervisor

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McKENZIE LABORATORIES

37.. Pho... (602) 47.. FAX (602) 4..

Chain of Custody

DATE 4-29-96 PAGE 1 of ___

PROJECT MANAGER: Tim Francis

COMPANY: Malcolm Pirnie Inc (MPI)

ADDRESS: 432 N. 44th St. #400
Phoenix Az 85008

BILL TO: Bill Kozuh

COMPANY: Continental Waste

ADDRESS:

Derrik Spielman 231-0131 241-1770
SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	Organochlorine Pesticides (608/8080)	Chlorinated Herbicides (615/8150)	Organophosphate Pesticides (614/8140)	8260	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 TC Metals by TCLP (1311)	Metals Dissolved (filtered)	Metals Total	TDS & Misc. analysis *	Phenols	TOC	Nitrate / Nitrite	NUMBER OF CONTAINERS
MW-2S	-	-	4-29-96	10:30	H_2O	4091								X								X	X	X	X	X	X	8
MW-3S	-	-	4-29-96	12:00	H_2O	4092								X								X	X	X	X	X	X	8
MW-6S	-	-	4-29-96	14:00	H_2O	4093								X								X	X	X	X	X	X	8

PROJECT INFORMATION	
PROJECT NO:	2602-002
PROJECT NAME:	Gila Bend Land.
P.O. NO.:	
SHIPPED VIA:	Sampler
SAMPLE DISPOSAL INSTRUCTIONS*	
☒ McKENZIE ☐ RETURN	

SAMPLE RECEIPT	
TOTAL NO. OF CONTAINERS:	24
CHAIN OF CUSTODY SEALS:	No
RECEIVED INTACT:	Yes
TEMPERATURE:	AMBIENT / COLD
ICE:	PRESENT / ABSENT
	WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: * See Liz Cohen for list of miscellaneous analysis

	RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature:	Derrik Spielman		
Time:	1631		
Printed Name:	Derrik Spielman		
Date:	4-29-96		
Company:	Malcolm Pirnie Inc.		

	RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature:	[illegible]		
Time:	1631		
Printed Name:	Christina Delahanty		
Date:	29 Apr 96		
Company:	McKenzie		McKenzie Labs

* Sample ..iscarded / returned after 90 days

White, Canary: McKenzie Labs Pink: Originator

McKENZIE LABORATORIES

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled:	26 Apr 96
Date Received	26 Apr 96
Date Reported:	14 May 96
McKenzie I.D.:	E96-4007
Project No.:	2602-002
Project Name:	Gila Bend Landfill

Client Identification: MW-4S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	01 May 96
Arsenic	mg/L	<0.10	0.10	200.7	01 May 96
Barium	mg/L	<0.05	0.05	200.7	01 May 96
Beryllium	mg/L	<0.05	0.05	200.7	01 May 96
Cadmium	mg/L	<0.02	0.02	200.7	01 May 96
Chromium	mg/L	<0.05	0.05	200.7	01 May 96
Cobalt	mg/L	<0.20	0.20	219.1	07 May 96
Copper	mg/L	<0.05	0.05	200.7	01 May 96
Iron	mg/L	0.13	0.05	200.7	01 May 96
Lead	mg/L	<0.10	0.10	200.7	01 May 96
Manganese	mg/L	<0.05	0.05	200.7	01 May 96
Nickel	mg/L	<0.05	0.05	200.7	01 May 96
Selenium	mg/L	<0.10	0.10	200.7	01 May 96
Silver	mg/L	<0.05	0.05	200.7	30 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	01 May 96
Vanadium	mg/L	<0.50	0.50	200.7	01 May 96
Zinc	mg/L	<0.05	0.05	200.7	01 May 96
Non-Metals, Total					
Alkalinity	mg/L as $CaCO_3$	240	5.0	SM2320B*	01 May 96
Calcium	mg/L	37	0.10	200.7	01 May 96
Chloride	mg/L	1,400	5.0	325.2	07 May 96
Fluoride	mg/L	8.2	0.10	340.2	29 Apr 96
Magnesium	mg/L	16	0.20	200.7	01 May 96
Nitrate/Nitrite-N	mg/L	23	0.10	353.2	02 May 96
pH	S.U.	7.9	N/A	150.1	26 Apr 96
Phenol	mg/L	<0.005	0.005	420.1	01 May 96
Potassium	mg/L	6.4	1.0	200.7	01 May 96
Sodium	mg/L	1,200	0.50	200.7	01 May 96
Specific Conductance	µmhos/cm	5,380	1.0	120.1	29 Apr 96
Sulfate	mg/L	740	5.0	375.4	06 May 96
TDS	mg/L	3,500	5.0	160.1	29 Apr 96
TOC	mg/L	1.8	1.0	415.2	01 May 96

MRL = Minimum Reporting Limit
*Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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McKENZIE LABORATORIES

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled:	26 Apr 96
Date Received	26 Apr 96
Date Reported:	14 May 96
McKenzie I.D.:	E96-4008
Project No.:	2602-002
Project Name:	Gila Bend Landfill

Client Identification: MW-1S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	01 May 96
Arsenic	mg/L	<0.10	0.10	200.7	01 May 96
Barium	mg/L	0.11	0.05	200.7	01 May 96
Beryllium	mg/L	<0.05	0.05	200.7	01 May 96
Cadmium	mg/L	<0.02	0.02	200.7	01 May 96
Chromium	mg/L	<0.05	0.05	200.7	01 May 96
Cobalt	mg/L	<0.20	0.20	219.1	07 May 96
Copper	mg/L	0.25	0.05	200.7	01 May 96
Iron	mg/L	6.8	0.05	200.7	01 May 96
Lead	mg/L	<0.10	0.10	200.7	01 May 96
Manganese	mg/L	0.24	0.05	200.7	01 May 96
Nickel	mg/L	<0.05	0.05	200.7	01 May 96
Selenium	mg/L	<0.10	0.10	200.7	01 May 96
Silver	mg/L	<0.05	0.05	200.7	30 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	01 May 96
Vanadium	mg/L	<0.50	0.50	200.7	01 May 96
Zinc	mg/L	<0.05	0.05	200.7	01 May 96
Non-Metals, Total					
Alkalinity	mg/L as $CaCO_3$	240	5.0	SM2320B[a]	01 May 96
Calcium	mg/L	63	0.10	200.7	01 May 96
Chloride	mg/L	1,500	5.0	325.2	07 May 96
Fluoride	mg/L	6.2	0.10	340.2	29 Apr 96
Magnesium	mg/L	12	0.20	200.7	01 May 96
Nitrate/Nitrite-N	mg/L	27	0.10	353.2	02 May 96
pH	S.U.	7.9	N/A	150.1	26 Apr 96
Phenol	mg/L	<0.005	0.005	420.1	01 May 96
Potassium	mg/L	17	1.0	200.7	01 May 96
Sodium	mg/L	1,400	0.50	200.7	01 May 96
Specific Conductance	µmhos/cm	6,010	1.0	120.1	29 Apr 96
Sulfate	mg/L	990	5.0	375.4	09 May 96
TDS	mg/L	4,000	5.0	160.1	29 Apr 96
TOC	mg/L	2.0	1.0	415.2	01 May 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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FAX (602) 470-0756
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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled:	26 Apr 96
Date Received	26 Apr 96
Date Reported:	14 May 96
McKenzie I.D.:	E96-4009
Project No.:	2602-002
Project Name:	Gila Bend Landfill

Client Identification: MW-5S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	01 May 96
Arsenic	mg/L	<0.10	0.10	200.7	01 May 96
Barium	mg/L	<0.05	0.05	200.7	01 May 96
Beryllium	mg/L	<0.05	0.05	200.7	01 May 96
Cadmium	mg/L	<0.02	0.02	200.7	01 May 96
Chromium	mg/L	<0.05	0.05	200.7	01 May 96
Cobalt	mg/L	<0.20	0.20	219.1	07 May 96
Copper	mg/L	0.08	0.05	200.7	01 May 96
Iron	mg/L	<0.05	0.05	200.7	01 May 96
Lead	mg/L	<0.10	0.10	200.7	01 May 96
Manganese	mg/L	<0.05	0.05	200.7	01 May 96
Nickel	mg/L	<0.05	0.05	200.7	01 May 96
Selenium	mg/L	<0.10	0.10	200.7	01 May 96
Silver	mg/L	<0.05	0.05	200.7	30 Apr 96
Thallium	mg/L	<0.20	0.20	200.7	01 May 96
Vanadium	mg/L	<0.50	0.50	200.7	01 May 96
Zinc	mg/L	<0.05	0.05	200.7	01 May 96
Non-Metals, Total					
Alkalinity	mg/L as $CaCO_3$	240	5.0	SM2320B*	01 May 96
Calcium	mg/L	56	0.10	200.7	01 May 96
Chloride	mg/L	1,500	5.0	325.2	07 May 96
Fluoride	mg/L	8.0	0.10	340.2	29 Apr 96
Magnesium	mg/L	15	0.20	200.7	01 May 96
Nitrate/Nitrite-N	mg/L	26	0.10	353.2	02 May 96
pH	S.U.	7.8	N/A	150.1	26 Apr 96
Phenol	mg/L	<0.005	0.005	420.1	01 May 96
Potassium	mg/L	5.9	1.0	200.7	01 May 96
Sodium	mg/L	1,400	0.50	200.7	01 May 96
Specific Conductance	µmhos/cm	6,090	1.0	120.1	29 Apr 96
Sulfate	mg/L	1,100	5.0	375.4	09 May 96
TDS	mg/L	4,100	5.0	160.1	29 Apr 96
TOC	mg/L	1.1	1.0	415.2	01 May 96

MRL = Minimum Reporting Limit
*Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled:	26 Apr 96
Date Received	26 Apr 96
Date Reported:	14 May 96
McKenzie I.D.:	E96-4007
Project No.:	2602-002
Project Name:	Gila Bend Landfill

Client Identification: MW-4S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	01 May 96
Arsenic	mg/L	<0.10	0.10	200.7	01 May 96
Barium	mg/L	0.07	0.05	200.7	01 May 96
Beryllium	mg/L	<0.05	0.05	200.7	01 May 96
Cadmium	mg/L	<0.02	0.02	200.7	01 May 96
Chromium	mg/L	<0.05	0.05	200.7	01 May 96
Cobalt	mg/L	<0.20	0.20	219.1	07 May 96
Copper	mg/L	<0.05	0.05	200.7	01 May 96
Iron	mg/L	<0.05	0.05	200.7	01 May 96
Lead	mg/L	<0.10	0.10	200.7	01 May 96
Manganese	mg/L	<0.05	0.05	200.7	01 May 96
Nickel	mg/L	<0.05	0.05	200.7	01 May 96
Selenium	mg/L	<0.10	0.10	200.7	01 May 96
Silver	mg/L	<0.05	0.05	200.7	03 May 96
Thallium	mg/L	<0.20	0.20	200.7	01 May 96
Vanadium	mg/L	<0.50	0.50	200.7	01 May 96
Zinc	mg/L	<0.05	0.05	200.7	01 May 96
Non-Metals, Dissolved					
Calcium	mg/L	36	0.10	200.7	01 May 96
Magnesium	mg/L	16	0.20	200.7	01 May 96
Potassium	mg/L	6.7	1.0	200.7	01 May 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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McKENZIE LABORATORIES

3725 E. Atlanta Ave
Suite One
Phoenix, AZ 85040
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ADHS License AZ 0034

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled:	26 Apr 96
Date Received	26 Apr 96
Date Reported:	14 May 96
McKenzie I.D.:	E96-4008
Project No.:	2602-002
Project Name:	Gila Bend Landfill

Client Identification: MW-1S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	01 May 96
Arsenic	mg/L	<0.10	0.10	200.7	01 May 96
Barium	mg/L	0.07	0.05	200.7	01 May 96
Beryllium	mg/L	<0.05	0.05	200.7	01 May 96
Cadmium	mg/L	<0.02	0.02	200.7	01 May 96
Chromium	mg/L	<0.05	0.05	200.7	01 May 96
Cobalt	mg/L	<0.20	0.20	219.1	07 May 96
Copper	mg/L	<0.05	0.05	200.7	01 May 96
Iron	mg/L	<0.05	0.05	200.7	01 May 96
Lead	mg/L	<0.10	0.10	200.7	01 May 96
Manganese	mg/L	<0.05	0.05	200.7	01 May 96
Nickel	mg/L	<0.05	0.05	200.7	01 May 96
Selenium	mg/L	<0.10	0.10	200.7	01 May 96
Silver	mg/L	<0.05	0.05	200.7	03 May 96
Thallium	mg/L	<0.20	0.20	200.7	01 May 96
Vanadium	mg/L	<0.50	0.50	200.7	01 May 96
Zinc	mg/L	<0.05	0.05	200.7	01 May 96
Non-Metals, Dissolved					
Calcium	mg/L	42	0.10	200.7	01 May 96
Magnesium	mg/L	10	0.20	200.7	01 May 96
Potassium	mg/L	16	1.0	200.7	01 May 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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McKENZIE
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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Reported: 14 May 96
McKenzie I.D.: E96-4009
Project No.: 2602-002
Project Name: Gila Bend Landfill

Client Identification: MW-5S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Antimony	mg/L	<0.10	0.10	200.7	01 May 96
Arsenic	mg/L	<0.10	0.10	200.7	01 May 96
Barium	mg/L	0.06	0.05	200.7	01 May 96
Beryllium	mg/L	<0.05	0.05	200.7	01 May 96
Cadmium	mg/L	<0.02	0.02	200.7	01 May 96
Chromium	mg/L	<0.05	0.05	200.7	01 May 96
Cobalt	mg/L	<0.20	0.20	219.1	07 May 96
Copper	mg/L	<0.05	0.05	200.7	01 May 96
Iron	mg/L	<0.05	0.05	200.7	01 May 96
Lead	mg/L	<0.10	0.10	200.7	01 May 96
Manganese	mg/L	<0.05	0.05	200.7	01 May 96
Nickel	mg/L	<0.05	0.05	200.7	01 May 96
Selenium	mg/L	<0.10	0.10	200.7	01 May 96
Silver	mg/L	<0.05	0.05	200.7	03 May 96
Thallium	mg/L	<0.20	0.20	200.7	01 May 96
Vanadium	mg/L	<0.50	0.50	200.7	01 May 96
Zinc	mg/L	<0.05	0.05	200.7	01 May 96
Non-Metals, Dissolved					
Calcium	mg/L	55	0.10	200.7	01 May 96
Magnesium	mg/L	14	0.20	200.7	01 May 96
Potassium	mg/L	6.1	1.0	200.7	01 May 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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CONFIDENTIAL AND PRIVILEGED

MCKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4007
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill
Page 1 of 2
Corrected Report: 30 May 96

EPA 8260

Compound	MW-4S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

SUPERSEDED 7-8-96

MPI4007.DOC/sl

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MCKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4007
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 30 May 96

EPA 8260

Compound	MW-4S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	8.5	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	95	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

MPI4007.DOC/sl

CONFIDENTIAL AND PRIVILEGED

McKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4008
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 30 May 96

EPA 8260

Compound	MW-1S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

McKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4008
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 30 May 96

EPA 8260

Compound	MW-1S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	96	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hackett, Organic Laboratory Supervisor

MPI4007.DOC/sl

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McKENZIE
LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4009
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 30 May 96

EPA 8260

Compound	MW-5S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

McKENZIE
LABORATORIES

3725 E. Atlanta Ave.
Suite One
Phoenix, AZ 85040
AZ-DHS License AZ 0036

Malcolm Pirnie, Inc. (MPI)

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4009
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 30 May 96

EPA 8260

Compound	MW-5S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	5.8	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	95	86-115
Dibromofluoromethane	102	86-118
Toluene-d_8	97	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

MPI4007.DOC/sl

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McKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4010
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

EPA 8260

Compound	Travel Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

MCKENZIE
LABORATORIES

Malcolm Pirnie, Inc. (MPI)

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4010
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

EPA 8260

Compound	Travel Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	95	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	95	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

MPI4007.DOC/sl

MCKENZIE
LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.

EPA 8260

Quality Control Data

Client I.D.: Blank Spike

Compound	Sample Result	Conc. Spiked	Spiked Sample	% Rec.	Dup. Spiked Sample	Dup. % Rec.	RPD	Limits % Rec.
Benzene	<5.0	50.0	55.8	112	57.5	115	3	70-130
Chlorobenzene	<5.0	50.0	51.9	104	53.7	107	3	70-130
1,1-Dichloroethene	<5.0	50.0	58.9	118	61.2	122	4	70-130
Toluene	<5.0	50.0	51.9	104	53.8	108	4	70-130
Trichloroethene	<5.0	50.0	56.3	113	57.7	115	2	70-130

$$\% \text{ Recovery} = \frac{\text{Spiked Sample Result - Sample Result}}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{\text{Spiked Sample Result - Duplicate Spiked Sample Result}}{\text{Average of Spiked Samples}} \times 100$$

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

MPI4091.DOC/sl

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McKENZIE LABORATORIES

Chain of Custody

37… Pho… (602) 470… FAX (602) 4…

DATE 4-26-96 PAGE 1 of ___

PROJECT MANAGER: Tim Francis

COMPANY: Malcolm Pirnie Inc (MPI)

ADDRESS: 432 N. 44th St #400
Phoenix AZ 85008

BILL TO: Bill Kozub

COMPANY: Continental Waste

ADDRESS: ___

Derrik Sprekman 231-0131 241-1770
SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	Organochlorine Pesticides (608/8080)	Chlorinated Herbicides (615/8150)	Organophosphate Pesticides (614/8140)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 TC Metals by TCLP (1311)	Metals Dissolved (filtered)	Metals Total	TDS & misc. analysis (see Liz C)	Phenols	TOC	Nitrate/Nitrite	NUMBER OF CONTAINERS
MW-4S	*	*	4-26-96	10:00	H2O	4007										X						X	X	X	X	X	X	8
MW-1S	*	*	4-26-96	12:00	H2O	4008										X						X	X	X	X	X	X	8
MW-5S	*	*	4-26-96	14:00	H2O	4009										X						X	X	X	X	X	X	8
Travel Blank	HCL	VOA				4010										X												2

PROJECT INFORMATION

PROJECT NO: 2602 002

PROJECT NAME: Gila Bend Landfill

P.O. NO.:

SHIPPED VIA: Sampler

SAMPLE DISPOSAL INSTRUCTIONS*

☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS:	26
CHAIN OF CUSTODY SEALS:	NO
RECEIVED INTACT:	YES
TEMPERATURE:	AMBIENT / COLD
ICE:	PRESENT / ABSENT
	WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: * See container and check with Liz Calhoun for misc analysis

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Derrik Sprekman Time: 1620	Signature: Time:	Signature: Time:
Printed Name: Derrik Sprekman Date: 26APR96	Printed Name: Date:	Printed Name: Date:
Company: Malcolm Pirnie Inc	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature: Pete Bossert Time: 1620	Signature: Time:	Signature: Time:
Printed Name: Pete Bossert Date: 26APR96	Printed Name: Date:	Printed Name: Date:
Company: McKenzie	Company:	Company: McKenzie Labs

MCKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled:	N/A
Date Received:	N/A
Date Analyzed:	09 May 96
Date Reported:	23 May 96
McKenzie I.D.:	N/A
Units Reported:	µg/L (ppb)
Project No.:	2602-002
Project Name:	Gila Bend Land.

EPA 8260

Compound	Method Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<5.0	5.0
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroform	<5.0	5.0
Chloromethane	<5.0	5.0
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

MCKENZIE LABORATORIES

Malcolm Pirnie, Inc. (MPI)

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Land.

EPA 8260

Compound	Method Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<5.0	5.0
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	96	86-115
Dibromofluoromethane	101	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

MPI4091.DOC/sl

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4007
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-4S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc. (MPI)

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4007
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill
Page 2 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-4S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	8.5	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	95	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett
Tracey L. Hockett, Organic Laboratory Supervisor

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4008
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-1S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4008
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill
Page 2 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-1S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	96	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
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Phoenix, Z 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4009
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-5S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc. (MPI)

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4009
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-5S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	5.8	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	95	86-115
Dibromofluoromethane	102	86-118
Toluene-d_8	97	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett, Organic Laboratory Supervisor

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
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Phoenix, Z 85008

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4010
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Travel Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc. (MPI)

Date Sampled: 26 Apr 96
Date Received: 26 Apr 96
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: E96-4010
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 11 Jul 96

EPA 8260

Compound	Travel Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	95	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	95	88-110

MRL = Minimum Reporting Limit

Tracey L Hockett

Tracey L Hockett, Organic Laboratory Supervisor

MPI4007.DOC/sl

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Malcolm Pirnie, Inc. (MPI)
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, Z 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Method Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc. (MPI)

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 09 May 96
Date Reported: 23 May 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602-002
Project Name: Gila Bend Landfill

Corrected Report: 11 Jul 96

EPA 8260

Compound	Method Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	96	86-115
Dibromofluoromethane	101	86-118
Toluene-d_8	96	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

MPI4007.DOC/sl

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McKENZIE LABORATORIES

Chain of Custody

3… A…
Phoenix, AZ
(602) 470-02…
FAX (602) 470-…

DATE 4-26-96 PAGE 1 of ___

PROJECT MANAGER: Tim Francis

COMPANY: Malcolm Pirnie Inc (MPI)

ADDRESS: 432 N. 44th St #400
Phoenix AZ 85008

BILL TO: Bill Kozuch

COMPANY: Continental Waste

ADDRESS:

Derrik J. Spoelman 231-0131 241-1770

SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	Organochlorine Pesticides (608/8080)	Chlorinated Herbicides (615/8150)	Organophosphate Pesticides (614/8140)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 TC Metals by TCLP (1311)	Metals Dissolved (Filtered)	Metals Total	TDS + misc. analysis (see Liz)	Phenols	TOC	Nitrate/Nitrite	NUMBER OF CONTAINERS
MW-4S	*	*	4-26-96	10:00	H_2O	4007										X						X	X	X	X	X	X	8
MW-1S	*	*	4-26-96	12:00	H_2O	4008										X						X	X	X	X	X	X	8
MW-5S	*	*	4-26-96	14:00	H_2O	4009										X						X	X	X	X	X	X	8
Travel Blank	HCL	VOA				4010										X												2

PROJECT INFORMATION

PROJECT NO: 2602.002

PROJECT NAME: Gila Bend Landfill

P.O. NO.:

SHIPPED VIA: Sampler

SAMPLE DISPOSAL INSTRUCTIONS*

☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS: 26

CHAIN OF CUSTODY SEALS: NO

RECEIVED INTACT: Yes

TEMPERATURE: AMBIENT / COLD

ICE: PRESENT / ABSENT

WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: * See container and check with Liz Cahoon for misc analysis

	1.	2.	3.
RELINQUISHED BY: Signature:	Derrik Spoelman		
Time:	1620		
Printed Name:	Derrik Spoelman		
Date:	26APR96		
Company:	Malcolm Pirnie Inc		
RECEIVED BY: Signature:	Pete B…		
Time:	1620		
Printed Name:	Pete Bossert		
Date:	26 APR96		
Company:	McKenzie		McKenzie Labs

* Samples will be discarded / returned after 90 days

White, Canary: McKenzie Labs Pink: Originator

Round 4 ***(To be submitted at a later date)***

SUPERSEDED

Round 4 - June 6, 1996
(MW-1S, MW-2S, MW-3S, MW-4S, MW-5S, MW-6S)

McKENZIE LABORATORIES

Chain of Custody

McKenzie Labs
Atlanta Ave.
, AZ 85040
(602) 470-0288
FAX (602) 470-0756

DATE 6/5/96 PAGE 1 of ___

PROJECT MANAGER: Tim FRANCIS

COMPANY: Malcolm Pirnie, Inc
ADDRESS: 432 N. 44th St #400
Phoenix, AZ 85008

BILL TO: Bill Kozuh
COMPANY: Continental Waste
ADDRESS:

SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	Metals dissolved (filtered)	Metals total	TDS & misc analytes (see Liz)	Phenols	TOC	Nitrate / Nitrite	NUMBER OF CONTAINERS
MW-5S			6/5/96	1830	GW	5368										X						X	X	X	X	X	X	7
MW-4S			6/5/96	1720	GW	5369										X						X	X	X	X	X	X	7
MW-1S			6/5/96	1030	GW	5370										X						X	X	X	X	X	X	7
MW-2S			6/5/96	1230	GW	5371										X						X	X	X	X	X	X	7
MW 3S			6/5/96	1415	GW	5372										X						X	X	X	X	X	X	7
MW 6S			6/5/96	1615	GW	5373										X						X	X	X	X	X	X	7
equipment Field blank		VOA	6/5/96	730	GW	5374										X												2
trip blank	HCl	VOA	—	—	Water	5375										X												2

PROJECT INFORMATION	
PROJECT NO:	2602.002
PROJECT NAME:	Gila Bend
P.O. NO.:	-
SHIPPED VIA:	Sampler
SAMPLE DISPOSAL INSTRUCTIONS*	☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT	
TOTAL NO. OF CONTAINERS:	48
CHAIN OF CUSTODY SEALS:	N/C
RECEIVED INTACT:	Yes
TEMPERATURE:	~~AMBIENT~~ / COLD
ICE:	PRESENT / ABSENT
	WET / BLUE

	1.	2.	3.
RELINQUISHED BY: Signature:	David Swaten (signature) Time: 0732		
Printed Name: / Date:	DAVID SWATEN 6/6/96		
Company:			
RECEIVED BY: Signature:	(signature) Time: 0732		
Printed Name: / Date:	C. Delahunt 6/6/96		
Company:	McKenzie		

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: 1) see Liz C for misc analytes
2) Phenols & TOC in same bottle

* Samples will be discarded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

McKENZIE
LABORATORIES

3725 E. Atlanta Ave
Suite One
Phoenix, AZ 85040
Voice (602) 470-0262
FAX (602) 470-0756
ADHS License AZ 003-

Malcolm Pirnie, Inc.
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5121
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

EPA 8260

Quality Control Data

Client I.D.: N/A

Compound	Sample Result	Conc. Spiked	Spiked Sample	% Rec.	Dup. Spiked Sample	Dup. % Rec.	RPD	Limits % Rec.
Benzene	<5.0	25.0	31.4	126	31.4	126	0	70-130
Chlorobenzene	<5.0	25.0	26.5	106	26.3	105	1	70-130
1,1-Dichloroethene	<5.0	25.0	32.4	130	32.2	129	1	70-130
Toluene	<5.0	25.0	27.1	108	26.6	106	2	70-130
Trichloroethene	<5.0	25.0	31.8	127	31.7	127	<1	70-130

$$\% \text{ Recovery} = \frac{\text{Spiked Sample Result - Sample Result}}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{\text{Spiked Sample Result - Duplicate Spiked Sample Result}}{\text{Average of Spiked Samples}} \times 100$$

Maija Chadwick for Tracey Hockett
Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota
Peggy Cota, Quality Assurance Auditor

MPI5368.DOC/sl

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MCKENZIE LABORATORIES

3725 E. Atlanta Ave.
Suite One
Phoenix AZ 85040
Voice (602) 470-0288
FAX (602) 470-0756
ADHS License AZ 003-

Malcolm Pirnie, Inc.
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 12 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

EPA 8260

Quality Control Data

Client I.D.: Blank Spike

Compound	Sample Result	Conc. Spiked	Spiked Sample	% Rec.	Dup. Spiked Sample	Dup. % Rec.	RPD	Limits % Rec.
Benzene	<5.0	25.0	24.7	99	25.3	101	2	70-130
Chlorobenzene	<5.0	25.0	23.3	93	24.2	97	4	70-130
1,1-Dichloroethene	<5.0	25.0	24.9	100	26.1	104	5	70-130
Toluene	<5.0	25.0	23.7	95	24.6	98	4	70-130
Trichloroethene	<5.0	25.0	24.2	97	25.6	102	6	70-130

$$\% \text{ Recovery} = \frac{\text{Spiked Sample Result - Sample Result}}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{\text{Spiked Sample Result - Duplicate Spiked Sample Result}}{\text{Average of Spiked Samples}} \times 100$$

Maja Chadwick for Tracey Hockett
Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota
Peggy Cota, Quality Assurance Auditor

MPI5368.DOC/sl

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McKENZIE LABORATORIES

M[illegible]zie Labs
3[illegible] Atlanta Ave.
Ph[illegible] AZ 85040
(602) 470-0288
FAX (602) 470-0756

Chain of Custody

DATE 6/5/96 PAGE 1 of ____

PROJECT MANAGER: Tim Francis

COMPANY: Malcolm Pirnie, Inc.
ADDRESS: 432 N. 44th St. #400
Phoenix, AZ 85008

BILL TO: Bill Kozuh
COMPANY: Continental Waste
ADDRESS:

SAMPLERS: (Signature) FAX NUMBER PHONE NUMBER

ANALYSIS REQUEST

SAMPLE ID	PRES.	TYPE OF CONTAINER	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1 / 418.1 AZ)	BTXE (8021)	Chlorinated Hydrocarbons (601/8021)	Aromatic Hydrocarbons (602/8021)	Organochlorine Pesticides (608/8081)	Chlorinated Herbicides (615/8151)	Organophosphate Pesticides (614/8141)	Semi-Volatile Organics GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	8260	SDWA Primary Standards	SDWA Secondary Standards	SDWA Volatiles (502.1/503.1/502.2)	The 13 Priority Pollutant Metals	The 8 RCRA Metals by TCLP (1311)	Metals dissolved (Filtered)	Metals total	TDS & misc. analytes (see Liz C.)	Phenols	TOC	Nitrate / Nitrite	NUMBER OF CONTAINERS
MW-5S			6/5/96	18 30	GW	5368										X						X	X	X	X	X	X	7
MW-4S			6/5/96	17 20	GW	5369										X						X	X	X	X	X	X	7
MW-1S			6/5/96	10 30	GW	5370										X						X	X	X	X	X	X	7
MW-2S			6/5/96	12 30	GW	5371										X						X	X	X	X	X	X	7
MW-3S			6/5/96	14 15	GW	5372										X						X	X	X	X	X	X	7
MW-6S			6/5/96	16 15	GW	5373										X						X	X	X	X	X	X	7
equipment/ Fieldblank	Hcl	VOA	6/5/96	1730	GW	5374										X												2
trip blank	Hcl	VOA	—	—	Water	5375										X												2

PROJECT INFORMATION	
PROJECT NO:	2602.002
PROJECT NAME:	Gila Bend
P.O. NO.:	–
SHIPPED VIA:	Sampler
SAMPLE DISPOSAL INSTRUCTIONS*	☒ McKENZIE ☐ RETURN

SAMPLE RECEIPT	
TOTAL NO. OF CONTAINERS:	48
CHAIN OF CUSTODY SEALS:	NO
RECEIVED INTACT:	Yes
TEMPERATURE:	~~AMBIENT~~ / COLD
ICE:	PRESENT / ABSENT; WET / BLUE

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ (RUSH) ☐ 24 ☐ 48 ☐ 72 ☐ 1 WEEK

Comments: 1) see Liz C. for misc. analytes
2) Phenols & TOC in same bottle

	RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature:	David Sweeten		
Time:	0732		
Printed Name:	DAVID SWEETEN		
Date:	6/6/96		
Company:			

	RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: 3.
Signature:	[illegible]		
Time:	0732		
Printed Name:	C. Delahanty		
Date:	06Jun96		
Company:	McKenzie		

* Samples will be discarded / returned after 60 days

White, Canary: McKenzie Labs Pink: Originator

McKENZIE LABORATORIES

3725 E. Atlanta Ave.
Suite One
Phoenix, AZ 85040
Voice: (602) 470-0288
FAX: (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc.
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 12 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Method Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

MCKENZIE
LABORATORIES

3725 E. Atlanta Ave.
Suite One
Phoenix, AZ 85040
Voice (602) 470-0285
FAX (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc.

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 12 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	Method Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	100	86-115
Dibromofluoromethane	98	86-118
Toluene-d_8	98	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota

Peggy Cota, Quality Assurance Auditor

MPI5368.DOC/sl

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MCKENZIE
LABORATORIES

3725 E. Atlanta Ave
Suite One
Phoenix, AZ 85040
Voice: (602) 470-0289
FAX: (602) 470-0756
ADHS License AZ 0034

Malcolm Pirnie, Inc.
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Method Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

MCKENZIE LABORATORIES

3725 E. Atlanta Ave.
Suite One
Phoenix, AZ 85040
Voice (602) 470-0288
FAX: (602) 470-0755
ADHS License AZ 0034

Malcolm Pirnie, Inc.

Date Sampled: N/A
Date Received: N/A
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: N/A
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 2 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Method Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	103	86-115
Dibromofluoromethane	98	86-118
Toluene-d_8	100	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett
Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota
Peggy Cota, Quality Assurance Auditor

MPI5368.DOC/sl

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MCKENZIE
LABORATORIES

3725 E. Atlanta Ave
Suite One
Phoenix AZ 85040
Voice (602) 470-0288
FAX (602) 470-0756
ADHS License AZ 003-

Malcolm Pirnie, Inc.
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 12 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5375
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Trip Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

McKENZIE LABORATORIES

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Malcolm Pirnie, Inc.

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 12 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5375
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 2 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Trip Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	100	86-115
Dibromofluoromethane	101	86-118
Toluene-d_8	98	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota

Peggy Cota, Quality Assurance Auditor

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Malcolm Pirnie, Inc.
Attn: Tim Francis
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Phoenix, AZ 85008

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 12 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5374
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	Equipment/Field Blank	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 12 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5374
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	Equipment/Field Blank	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	101	86-115
Dibromofluoromethane	102	86-118
Toluene-d_8	99	88-110

MRL = Minimum Reporting Limit

Tracey L Hockett
Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota
Peggy Cota, Quality Assurance Auditor

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5373
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-6S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5373
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-6S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	107	86-115
Dibromofluoromethane	112	86-118
Toluene-d_8	93	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett
Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota
Peggy Cota, Quality Assurance Auditor

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Malcolm Pirnie, Inc.
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Phoenix, AZ 85008

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5372
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-3S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc.

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5372
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-3S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	107	86-115
Dibromofluoromethane	114	86-118
Toluene-d_8	92	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota

Peggy Cota, Quality Assurance Auditor

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Phoenix, AZ 85008

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5371
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-2S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5371
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-2S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	108	86-115
Dibromofluoromethane	116	86-118
Toluene-d_8	90	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota

Peggy Cota, Quality Assurance Auditor

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Phoenix, AZ 85008

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5370
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend
Page 1 of 2
Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-1S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc.

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5370
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-1S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	107	86-115
Dibromofluoromethane	116	86-118
Toluene-d_8	90	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett
Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota
Peggy Cota, Quality Assurance Auditor

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Malcolm Pirnie, Inc.
Attn: Tim Francis
432 N. 44th Street, #400
Phoenix, AZ 85008

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5369
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-4S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5369
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-4S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	108	86-115
Dibromofluoromethane	117	86-118
Toluene-d_8	89	88-110

MRL = Minimum Reporting Limit

Tracey L. Hockett

Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota

Peggy Cota, Quality Assurance Auditor

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Phoenix, AZ 85008

Date Sampled:	05 Jun 96
Date Received:	06 Jun 96
Date Analyzed:	10 Jun 96
Date Reported:	26 Jun 96
McKenzie I.D.:	E96-5368
Units Reported:	µg/L (ppb)
Project No.:	2602.002
Project Name:	Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-5S	MRL
Benzene	<5.0	5.0
Bromobenzene	<5.0	5.0
Bromochloromethane	<5.0	5.0
Bromodichloromethane	<5.0	5.0
Bromoform	<5.0	5.0
Bromomethane	<10	10
n-Butylbenzene	<5.0	5.0
sec-Butylbenzene	<5.0	5.0
tert-Butylbenzene	<5.0	5.0
Carbon tetrachloride	<5.0	5.0
Chlorobenzene	<5.0	5.0
Chloroethane	<10	10
Chloroform	<5.0	5.0
Chloromethane	<10	10
2-Chlorotoluene	<5.0	5.0
4-Chlorotoluene	<5.0	5.0
Dibromochloromethane	<5.0	5.0
1,2-Dibromo-3-chloropropane	<5.0	5.0
1,2-Dibromoethane	<5.0	5.0
Dibromomethane	<5.0	5.0
1,2-Dichlorobenzene	<5.0	5.0
1,3-Dichlorobenzene	<5.0	5.0
1,4-Dichlorobenzene	<5.0	5.0
Dichlorodifluoromethane	<5.0	5.0
1,1-Dichloroethane	<5.0	5.0
1,2-Dichloroethane	<5.0	5.0
1,1-Dichloroethene	<5.0	5.0
cis-1,2-Dichloroethene	<5.0	5.0
trans-1,2-Dichloroethene	<5.0	5.0
1,2-Dichloropropane	<5.0	5.0
1,3-Dichloropropane	<5.0	5.0
2,2-Dichloropropane	<5.0	5.0
1,1-Dichloropropene	<5.0	5.0
cis-1,3-Dichloropropene	<5.0	5.0
trans-1,3-Dichloropropene	<5.0	5.0

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Malcolm Pirnie, Inc.

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Analyzed: 10 Jun 96
Date Reported: 26 Jun 96
McKenzie I.D.: E96-5368
Units Reported: µg/L (ppb)
Project No.: 2602.002
Project Name: Gila Bend

Corrected Report: 11 Jul 96

EPA 8260

Compound	MW-5S	MRL
Ethylbenzene	<5.0	5.0
Hexachlorobutadiene	<5.0	5.0
Isopropylbenzene	<5.0	5.0
Methylene chloride	<5.0	5.0
Naphthalene	<5.0	5.0
n-Propylbenzene	<5.0	5.0
Styrene	<5.0	5.0
Tetrachloroethene	<5.0	5.0
1,1,1,2-Tetrachloroethane	<5.0	5.0
1,1,2,2-Tetrachloroethane	<5.0	5.0
Toluene	<5.0	5.0
1,2,3-Trichlorobenzene	<5.0	5.0
1,2,4-Trichlorobenzene	<5.0	5.0
1,1,1-Trichloroethane	<5.0	5.0
1,1,2-Trichloroethane	<5.0	5.0
Trichloroethene	<5.0	5.0
Trichlorofluoromethane	<5.0	5.0
1,2,4-Trimethylbenzene	<5.0	5.0
1,3,5-Trimethylbenzene	<5.0	5.0
Vinyl chloride	<10	10
Xylene (total)	<5.0	5.0

Surrogate Percent Recoveries	% Recovery	Recovery Limits
4-Bromofluorobenzene	104	86-115
Dibromofluoromethane	103	86-118
Toluene-d_8	97	88-110

MRL = Minimum Reporting Limit

Tracey L Hockett
Tracey L. Hockett, Organic Laboratory Supervisor

Peggy Cota
Peggy Cota, Quality Assurance Auditor

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Attn: Tim Francis
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Phoenix, AZ 85008

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Reported: 24 Jun 96
McKenzie I.D.: E96-5372
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW-3S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	17 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	17 Jun 96
Barium	mg/L	0.07	0.05	200.7	17 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	17 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	12 Jun 96
Copper	mg/L	<0.05	0.05	200.7	17 Jun 96
Iron	mg/L	<0.05	0.05	200.7	17 Jun 96
Lead	mg/L	<0.10	0.10	200.7	17 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	17 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	17 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	17 Jun 96
Silver	mg/L	<0.05	0.05	200.7	17 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	17 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	17 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	17 Jun 96
Non-Metals, Dissolved					
Calcium	mg/L	42	0.10	200.7	17 Jun 96
Magnesium	mg/L	10	0.20	200.7	17 Jun 96
Potassium	mg/L	9.1	1.0	200.7	17 Jun 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Reported: 24 Jun 96
McKenzie I.D.: E96-5373
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW-6S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	17 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	17 Jun 96
Barium	mg/L	0.06	0.05	200.7	17 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	17 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	12 Jun 96
Copper	mg/L	<0.05	0.05	200.7	17 Jun 96
Iron	mg/L	<0.05	0.05	200.7	17 Jun 96
Lead	mg/L	<0.10	0.10	200.7	17 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	17 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	17 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	17 Jun 96
Silver	mg/L	<0.05	0.05	200.7	17 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	17 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	17 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	17 Jun 96
Non-Metals, Dissolved					
Calcium	mg/L	93	0.10	200.7	17 Jun 96
Magnesium	mg/L	37	0.20	200.7	17 Jun 96
Potassium	mg/L	7.5	1.0	200.7	17 Jun 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Date Sampled:	05 Jun 96
Date Received:	06 Jun 96
Date Reported:	24 Jun 96
McKenzie I.D.:	E96-5370
Project No.:	2602-002
Project Name:	Gila Bend

Client Identification: MW-1S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	17 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	17 Jun 96
Barium	mg/L	0.09	0.05	200.7	17 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	17 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	12 Jun 96
Copper	mg/L	<0.05	0.05	200.7	17 Jun 96
Iron	mg/L	<0.05	0.05	200.7	17 Jun 96
Lead	mg/L	<0.10	0.10	200.7	17 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	17 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	17 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	17 Jun 96
Silver	mg/L	<0.05	0.05	200.7	17 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	17 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	17 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	17 Jun 96
Non-Metals, Dissolved					
Calcium	mg/L	37	0.10	200.7	17 Jun 96
Magnesium	mg/L	9.8	0.20	200.7	17 Jun 96
Potassium	mg/L	17	1.0	200.7	17 Jun 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Date Sampled:	05 Jun 96
Date Received:	06 Jun 96
Date Reported:	24 Jun 96
McKenzie I.D.:	E96-5371
Project No.:	2602-002
Project Name:	Gila Bend

Client Identification: MW-2S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	17 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	17 Jun 96
Barium	mg/L	0.06	0.05	200.7	17 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	17 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	12 Jun 96
Copper	mg/L	<0.05	0.05	200.7	17 Jun 96
Iron	mg/L	<0.05	0.05	200.7	17 Jun 96
Lead	mg/L	<0.10	0.10	200.7	17 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	17 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	17 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	17 Jun 96
Silver	mg/L	<0.05	0.05	200.7	17 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	17 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	17 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	17 Jun 96
Non-Metals, Dissolved					
Calcium	mg/L	46	0.10	200.7	17 Jun 96
Magnesium	mg/L	17	0.20	200.7	17 Jun 96
Potassium	mg/L	6.1	1.0	200.7	17 Jun 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Reported: 24 Jun 96
McKenzie I.D.: E96-5368
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW-5S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	17 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	17 Jun 96
Barium	mg/L	0.05	0.05	200.7	17 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	17 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	12 Jun 96
Copper	mg/L	<0.05	0.05	200.7	17 Jun 96
Iron	mg/L	<0.05	0.05	200.7	17 Jun 96
Lead	mg/L	<0.10	0.10	200.7	17 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	17 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	17 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	17 Jun 96
Silver	mg/L	<0.05	0.05	200.7	17 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	17 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	17 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	17 Jun 96
Non-Metals, Dissolved					
Calcium	mg/L	52	0.10	200.7	17 Jun 96
Magnesium	mg/L	15	0.20	200.7	17 Jun 96
Potassium	mg/L	5.4	1.0	200.7	17 Jun 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Attn: Tim Francis
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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Reported: 24 Jun 96
McKenzie I.D.: E96-5369
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW-4S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Dissolved					
Antimony	mg/L	<0.10	0.10	200.7	17 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	17 Jun 96
Barium	mg/L	0.07	0.05	200.7	17 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	17 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	17 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	12 Jun 96
Copper	mg/L	<0.05	0.05	200.7	17 Jun 96
Iron	mg/L	<0.05	0.05	200.7	17 Jun 96
Lead	mg/L	<0.10	0.10	200.7	17 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	17 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	17 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	17 Jun 96
Silver	mg/L	<0.05	0.05	200.7	17 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	17 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	17 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	17 Jun 96
Non-Metals, Dissolved					
Calcium	mg/L	33	0.10	200.7	17 Jun 96
Magnesium	mg/L	16	0.20	200.7	17 Jun 96
Potassium	mg/L	6.6	1.0	200.7	17 Jun 96

MRL = Minimum Reporting Limit

Maja Chadwick

Maja Chadwick, Inorganic Lab Manager

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Attn: Tim Francis
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Phoenix, AZ 85008

Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Reported: 25 Jun 96
McKenzie I.D.: E96-5372
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW-3S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	18 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	18 Jun 96
Barium	mg/L	0.07	0.05	200.7	18 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	18 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	24 Jun 96
Copper	mg/L	<0.05	0.05	200.7	18 Jun 96
Iron	mg/L	2.4	0.05	200.7	19 Jun 96
Lead	mg/L	<0.10	0.10	200.7	18 Jun 96
Manganese	mg/L	0.06	0.05	200.7	18 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	18 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	18 Jun 96
Silver	mg/L	<0.05	0.05	200.7	18 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	18 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	18 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	18 Jun 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	240	5.0	SM2320B[a]	07 Jun 96
Calcium	mg/L	56	0.10	200.7	18 Jun 96
Chloride	mg/L	1,600	5.0	325.2	13 Jun 96
Fluoride	mg/L	5.8	0.10	340.2	07 Jun 96
Magnesium	mg/L	11	0.20	200.7	18 Jun 96
Nitrate/Nitrite-N	mg/L	29	0.10	353.2	11 Jun 96
pH	S.U.	7.8	N/A	150.1	06 Jun 96
Phenol	mg/L	<0.005	0.005	420.1	12 Jun 96
Potassium	mg/L	10	1.0	200.7	18 Jun 96
Sodium	mg/L	1,300	0.50	200.7	18 Jun 96
Specific Conductance	µmhos/cm	6,270	1.0	120.1	07 Jun 96
Sulfate	mg/L	1,200	5.0	375.4	21 Jun 96
TDS	mg/L	4,300	5.0	160.1	07 Jun 96
TOC	mg/L	1.0	1.0	415.2	10 Jun 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

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Date Sampled:	05 Jun 96
Date Received:	06 Jun 96
Date Reported:	25 Jun 96
McKenzie I.D.:	E96-5373
Project No.:	2602-002
Project Name:	Gila Bend

Client Identification: MW-6S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	18 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	18 Jun 96
Barium	mg/L	<0.05	0.05	200.7	18 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	18 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	24 Jun 96
Copper	mg/L	<0.05	0.05	200.7	18 Jun 96
Iron	mg/L	1.5	0.05	200.7	19 Jun 96
Lead	mg/L	<0.10	0.10	200.7	18 Jun 96
Manganese	mg/L	0.10	0.05	200.7	18 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	18 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	18 Jun 96
Silver	mg/L	<0.05	0.05	200.7	18 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	18 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	18 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	18 Jun 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	240	5.0	SM2320B[a]	07 Jun 96
Calcium	mg/L	120	0.10	200.7	18 Jun 96
Chloride	mg/L	1,700	5.0	325.2	13 Jun 96
Fluoride	mg/L	4.8	0.10	340.2	07 Jun 96
Magnesium	mg/L	41	0.20	200.7	18 Jun 96
Nitrate/Nitrite-N	mg/L	29	0.10	353.2	11 Jun 96
pH	S.U.	7.5	N/A	150.1	06 Jun 96
Phenol	mg/L	0.006	0.005	420.1	12 Jun 96
Potassium	mg/L	8.5	1.0	200.7	18 Jun 96
Sodium	mg/L	1,300	0.50	200.7	18 Jun 96
Specific Conductance	µmhos/cm	6,640	1.0	120.1	07 Jun 96
Sulfate	mg/L	1,400	5.0	375.4	21 Jun 96
TDS	mg/L	4,800	5.0	160.1	07 Jun 96
TOC	mg/L	1.2	1.0	415.2	10 Jun 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Reported: 25 Jun 96
McKenzie I.D.: E96-5370
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW-1S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	18 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	18 Jun 96
Barium	mg/L	<0.05	0.05	200.7	18 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	18 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	24 Jun 96
Copper	mg/L	<0.05	0.05	200.7	18 Jun 96
Iron	mg/L	0.55	0.05	200.7	19 Jun 96
Lead	mg/L	<0.10	0.10	200.7	18 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	18 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	18 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	18 Jun 96
Silver	mg/L	<0.05	0.05	200.7	18 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	18 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	18 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	18 Jun 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	240	5.0	SM2320B[a]	07 Jun 96
Calcium	mg/L	37	0.10	200.7	18 Jun 96
Chloride	mg/L	1.500	5.0	325.2	13 Jun 96
Fluoride	mg/L	5.7	0.10	340.2	07 Jun 96
Magnesium	mg/L	9.5	0.20	200.7	18 Jun 96
Nitrate/Nitrite-N	mg/L	30	0.10	353.2	11 Jun 96
pH	S.U.	7.9	N/A	150.1	06 Jun 96
Phenol	mg/L	<0.005	0.005	420.1	12 Jun 96
Potassium	mg/L	16	1.0	200.7	18 Jun 96
Sodium	mg/L	1,100	0.50	200.7	18 Jun 96
Specific Conductance	µmhos/cm	5,800	1.0	120.1	07 Jun 96
Sulfate	mg/L	1,000	5.0	375.4	21 Jun 96
TDS	mg/L	3,900	5.0	160.1	07 Jun 96
TOC	mg/L	1.5	1.0	415.2	10 Jun 96

MRL = Minimum Reporting Limit
[a]Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Reported: 25 Jun 96
McKenzie I.D.: E96-5371
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW-2S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	18 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	18 Jun 96
Barium	mg/L	0.16	0.05	200.7	18 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	18 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	24 Jun 96
Copper	mg/L	<0.05	0.05	200.7	18 Jun 96
Iron	mg/L	8.6	0.05	200.7	19 Jun 96
Lead	mg/L	<0.10	0.10	200.7	18 Jun 96
Manganese	mg/L	0.15	0.05	200.7	18 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	18 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	18 Jun 96
Silver	mg/L	<0.05	0.05	200.7	18 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	18 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	18 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	18 Jun 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	280	5.0	SM2320B[a]	07 Jun 96
Calcium	mg/L	71	0.10	200.7	18 Jun 96
Chloride	mg/L	1,700	5.0	325.2	13 Jun 96
Fluoride	mg/L	6.8	0.10	340.2	07 Jun 96
Magnesium	mg/L	20	0.20	200.7	18 Jun 96
Nitrate/Nitrite-N	mg/L	29	0.10	353.2	11 Jun 96
pH	S.U.	7.8	N/A	150.1	06 Jun 96
Phenol	mg/L	<0.005	0.005	420.1	12 Jun 96
Potassium	mg/L	7.8	1.0	200.7	18 Jun 96
Sodium	mg/L	1,300	0.50	200.7	18 Jun 96
Specific Conductance	µmhos/cm	6,250	1.0	120.1	07 Jun 96
Sulfate	mg/L	1,100	5.0	375.4	21 Jun 96
TDS	mg/L	4,300	5.0	160.1	07 Jun 96
TOC	mg/L	1.3	1.0	415.2	10 Jun 96

MRL = Minimum Reporting Limit
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NOTED
ROUTE

Date Sampled:	05 Jun 96
Date Received:	06 Jun 96
Date Reported:	25 Jun 96
McKenzie I.D.:	E96-5368
Project No.:	2602-002
Project Name:	Gila Bend

Client Identification: MW-5S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	18 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	18 Jun 96
Barium	mg/L	<0.05	0.05	200.7	18 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	18 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	24 Jun 96
Copper	mg/L	<0.05	0.05	200.7	18 Jun 96
Iron	mg/L	<0.05	0.05	200.7	19 Jun 96
Lead	mg/L	<0.10	0.10	200.7	18 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	18 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	18 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	18 Jun 96
Silver	mg/L	<0.05	0.05	200.7	18 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	18 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	18 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	18 Jun 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	240	5.0	SM2320B[a]	07 Jun 96
Calcium	mg/L	54	0.10	200.7	18 Jun 96
Chloride	mg/L	1,500	5.0	325.2	13 Jun 96
Fluoride	mg/L	7.4	0.10	340.2	07 Jun 96
Magnesium	mg/L	15	0.20	200.7	18 Jun 96
Nitrate/Nitrite-N	mg/L	26	0.10	353.2	11 Jun 96
pH	S.U.	7.7	N/A	150.1	06 Jun 96
Phenol	mg/L	<0.005	0.005	420.1	12 Jun 96
Potassium	mg/L	5.6	1.0	200.7	18 Jun 96
Sodium	mg/L	1,300	0.50	200.7	18 Jun 96
Specific Conductance	µmhos/cm	5,790	1.0	120.1	07 Jun 96
Sulfate	mg/L	1,000	5.0	375.4	21 Jun 96
TDS	mg/L	4,100	5.0	160.1	07 Jun 96
TOC	mg/L	2.4	1.0	415.2	10 Jun 96

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Date Sampled: 05 Jun 96
Date Received: 06 Jun 96
Date Reported: 25 Jun 96
McKenzie I.D.: E96-5369
Project No.: 2602-002
Project Name: Gila Bend

Client Identification: MW-4S

Parameter	Units	Result	MRL	EPA Method	Date Analyzed
Metals, Total					
Antimony	mg/L	<0.10	0.10	200.7	18 Jun 96
Arsenic	mg/L	<0.10	0.10	200.7	18 Jun 96
Barium	mg/L	<0.05	0.05	200.7	18 Jun 96
Beryllium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cadmium	mg/L	<0.02	0.02	200.7	18 Jun 96
Chromium	mg/L	<0.05	0.05	200.7	18 Jun 96
Cobalt	mg/L	<0.20	0.20	219.1	24 Jun 96
Copper	mg/L	<0.05	0.05	200.7	18 Jun 96
Iron	mg/L	1.4	0.05	200.7	19 Jun 96
Lead	mg/L	<0.10	0.10	200.7	18 Jun 96
Manganese	mg/L	<0.05	0.05	200.7	18 Jun 96
Nickel	mg/L	<0.05	0.05	200.7	18 Jun 96
Selenium	mg/L	<0.10	0.10	200.7	18 Jun 96
Silver	mg/L	<0.05	0.05	200.7	18 Jun 96
Thallium	mg/L	<0.20	0.20	200.7	18 Jun 96
Vanadium	mg/L	<0.50	0.50	200.7	18 Jun 96
Zinc	mg/L	<0.05	0.05	200.7	18 Jun 96
Non-Metals					
Alkalinity	mg/L as $CaCO_3$	260	5.0	SM2320B*	07 Jun 96
Calcium	mg/L	38	0.10	200.7	18 Jun 96
Chloride	mg/L	1,300	5.0	325.2	17 Jun 96
Fluoride	mg/L	7.6	0.10	340.2	07 Jun 96
Magnesium	mg/L	17	0.20	200.7	18 Jun 96
Nitrate/Nitrite-N	mg/L	22	0.10	353.2	11 Jun 96
pH	S.U.	7.9	N/A	150.1	06 Jun 96
Phenol	mg/L	<0.005	0.005	420.1	12 Jun 96
Potassium	mg/L	7.2	1.0	200.7	18 Jun 96
Sodium	mg/L	1,100	0.50	200.7	18 Jun 96
Specific Conductance	µmhos/cm	5.160	1.0	120.1	07 Jun 96
Sulfate	mg/L	770	5.0	375.4	07 Jun 96
TDS	mg/L	3,400	5.0	160.1	21 Jun 96
TOC	mg/L	1.2	1.0	415.2	10 Jun 96

MRL = Minimum Reporting Limit
*Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992.

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Maja Chadwick, Inorganic Lab Manager

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APPENDIX J

DRAFT APP

DRAFT

EXPEDITED IMPOUNDMENT PERMIT

Applies to surface impoundments
constructed according to the design parameters established for a
geomembrane/composite double-liner system.

GILA BEND GENERATING STATION

August 21, 1998

ADEQ TB 98-6

Arizona Department of Environmental Quality

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WATER QUALITY DIVISION - WATER PERMITS SECTION
Water Permits Section Manager: Charles G. Graf
Aquifer Protection Industrial Permits Supervisor: William Engstrom

Arizona Department of Environmental Quality
Publications Number: TB 98-6

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State of Arizona
Aquifer Protection Permit No. P-________

Facility Name: Gila Bend Generating Station

This Aquifer Protection Permit authorizes the discharge of industrial wastewater to an on site surface impoundment in accordance with the discharge limitations, monitoring requirements, and other permit terms and conditions set forth in this permit and in the attachment entitled, "Standard Aquifer Protection Permit Conditions."

Table of Contents **Page**

A.	Permittee	4.
B.	Contact Person	4.
C.	Facility Information	4.
D.	Compliance with Aquifer Water Quality Standards/Point of Compliance	6.
E.	Best Available Demonstrated Control Technology	7.
F.	Monitoring Requirements	9.
G.	Discharge Limitations, and Contingency Plans	11.
H.	Reporting Requirements	14.
I.	Record Keeping Requirements	15.
J.	Temporary Cessation, Closure, and Post-Closure Requirements	15.
K.	Compliance Schedule	16.
L.	Annual Registration Fees	16.
M.	Standard Aquifer Protection Permit Conditions	17.
N.	Permit Effective Date and Director's Authorization	21.

Tables **Page**

1.	Impoundment Identification	5.
2.	Point(s) of Compliance	6.
3.	Liner Specifications	8.
4.	Operational Monitoring	9.
5.	Leak Detection/Collection Sump Location	9.
6.	Sump Fluid Monitoring	10.
7.	Impoundment Freeboard	11.

Appendices **Page**

I.	Liner Leakage Rate Calculation		I.1.
II.	Discharge Characterization Tables for Active Response Level Monitoring		II.1.
	a.	Natural Gas Compressor Stations	II.2.
	b.	Fire Training Facility	II.4.
	c.	Cement Manufacturing	II.6.
	d.	Vehicle Washing	II.8.
	e.	Steam Electric Power Generating Stations	II.10.

A. Permittee

The person(s) responsible for compliance with the terms and conditions of this permit are:

1. Name of owner: Gila Bend Power Partners, L.L.C

   Mailing address: 5949 Sherry Lane, Suite 1880
   Dallas, TX 75225

   Telephone Number: 214-210-5080

2. Name of operator: Gila Bend Power Partners, L.L.C

   Mailing address: 5949 Sherry Lane, Suite 1880
   Dallas, TX 75225

3. Telephone Number: 214-210-5080

B. Contact person

1. Name: Bob Walther

2. Mailing address: 5949 Sherry Lane, Suite 1880
   Dallas, TX 75225

3. Telephone Number: 214-210-5080

C. Facility information

1. Facility name Gila Bend Generating Station

2. Address: Gila Bend, AZ

3. **Legal description:**

   a. Township: 5S
   b. Range: 5W
   c. Section: 19
   d. Quarters: SW 1/4

4. **County:** Maricopa

5. **Coordinate Location (Center of entire facility):**

   a. Latitude: 32° 58' 18.3"
   b. Longitude: 112°48' 49.8"

6. Discharging Facilities

The impoundment(s), identified as the discharge locations, have the following number of cells, capacities (gallons), and coordinates:

Table 1. Impoundment Identification

Impoundment Number	Number of Cells	Latitude	Longitude	Capacity (gallons)
1	1	32°58' 33.6"	112°48' 50.1"	47.5 million
2	1	32°58' 33.6"	112°48' 58.1"	47.5 million
3	1	32°58' 33.6"	112°49' 12.5"	47.5 million
4	1	32°58' 18.3"	112°49' 12.5"	47.5 million
5	1	32°58' 18.2"	112°48' 40.2"	12 million

7. Wastestream Description:

1. The proposed Gila Bend Generating Station consists of a natural gas-powered, 750-gross megawatt electric generating facility. The proposed facility footprint consists of approximately 175 acres, with 87 acres of evapaoration ponds. The evaporation ponds will be doubled lined with a leak detection and collection system. Construction of the GBGS is proposed to begin in the third quarter of 2001, and operations are expected to commence in 2003. The operational lifetime of the GBGS is expected to be approximately 40 years.

2. It is anticipated that the Gila Bend Generating Station will generate a wastewater stream at an average annual rate of 725 gallons per minute (gpm), or approximately 382 million gallons per year. The inflow rate to the evaporation impoundments will vary over the course of the year. Flow rates are anticipated to vary from 650 gpm to 800 gpm.

The wastewater will consist predominantly of cooling tower blowdown.
The wastewater will consist of approximately 1,600 mg/L total dissolved solids.
Wastewater will be contained on-site in five double-lined evaporation impoundments.

D. Compliance with Aquifer Water Quality Standards and Point(s) of Compliance

Compliance with Aquifer Water Quality Standards shall be achieved by maintaining liner integrity. Routine monitoring of groundwater is not specified in this permit. Should groundwater monitoring become necessary, the following point(s) of compliance are designated for hazardous (Haz.) and/or non-hazardous (Non-Haz.) substances:

Table 2. Point(s) of Compliance (POC)

Impoundment Number	Latitude of POC	Longitude of POC	Haz.	Non-Haz.
1	32° 58' 37"	112° 48' 50.5"	X	X
2	32°58' 37"	112° 48' 50.5"	X	X
3	32°58' 36"	112° 49' 10"	X	X
4	32° 58' 25"	112° 49' 10"	X	X
5	32° 58' 26"	112°48' 52"	X	X

The director may designate additional points of compliance if information concerning groundwater gradients indicates the need

E. Best Available Demonstrated Control Technology (BADCT)

The surface impoundment(s) shall be designed, constructed, and operated so as to ensure the greatest degree of discharge reduction achievable through the application of BADCT processes, operating methods, or other alternatives, including, where practicable, a technology permitting no discharge of pollutants. Construction, operation and maintenance of the impoundment(s) according to the following specifications shall be considered to be in compliance with BADCT requirements.

1. Surface Impoundment Specifications

The surface impoundment shall be constructed according to the following design parameters established for a geomembrane/composite double liner system:

a. The subgrade shall consist of, at a minimum six inches of native, or natural materials compacted to 95% maximum dry density (Standard Proctor).

b. The lower geomembrane/soil composite liner shall be at least 30 mil thickness [exception - at least 60 mil, if High Density Polyethylene (HDPE)] over a minimum six inches of 3/8" minus native or natural materials compacted to achieve a saturated hydraulic conductivity no greater than 10^{-6} cm/sec.

c. The lower and upper liners shall be separated by a leak detection/collection system consisting of a geonet or minimum 12 inch thick drainage layer of sand, gravel, or other permeable material which achieves a hydraulic conductivity of at least 10^{-2} cm/sec. This drainage layer shall have a minimum 3% slope and be connected to a sump for solution monitoring and extraction. The system shall be designed to receive a pump capable of pumping the necessary volume in order to maintain less than one foot of head on the bottom liner.

d. The upper flexible membrane liner shall be at least 30 mil thickness [exception - at least 60 mil, if HDPE], and UV resistant for areas exposed to sunlight.

e. Both liners shall be secured by an engineered trench.

f. Quality Assurance/Quality Control shall be demonstrated for installation of the liner system.

g. All materials used in the construction of the impoundment shall be compatible with the solutions discharged into it.

The liner materials to be used in the construction of the surface impoundment(s) shall be as follows:

Table 3. Liner Specifications

Impoundment Number	Liner	Liner Type[1]	Liner Thickness	Hydraulic Conductivity
1	Upper Geomembrane Lower Geomembrane Lower Soil	HDPE HDPE GCL	80 mils 60 mils 6 inches	n/a n/a 1x 10^{-6} cm/sec
2	Upper Geomembrane Lower Geomembrane Lower Soil	HDPE HDPE GCL	80 mils 60 mils 6 inches	n/a n/a 1x 10^{-6} cm/sec
3	Upper Geomembrane Lower Geomembrane Lower Soil	HDPE HDPE GCL	80 mils 60 mils 6 inches	n/a n/a 1x 10^{-6} cm/sec
4	Upper Geomembrane Lower Geomembrane Lower Soil	HDPE HDPE GCL	80 mils 60 mils 6 inches	n/a n/a 1x 10^{-6} cm/sec
5	Upper Geomembrane Lower Geomembrane Lower Soil	HDPE HDPE GCL	80 mils 60 mils 6 inches	n/a n/a 1x 10^{-6} cm/sec
___	Upper Geomembrane Lower Geomembrane Lower Soil	______ ______ ______	______mils ______mils ___ inches	n/a n/a ______cm/sec

[1] Liner Type Abbreviations:
HDPE = High Density Polyethylene
LDPE = Low Density Polyethylene
PVC = Polyvinyl Chloride
native soil (ns), bentonite (b), kaolinite (k) = Soil Component
Specify any other type(s)

[2] n/a = not applicable

2. Operational Requirements

The permittee shall properly operate and maintain all facilities, treatment processes, and discharge control systems to achieve compliance with the terms and conditions of the permit and with the objective of achieving a non-discharging condition.

F. Monitoring Requirements

All monitoring required by this permit shall be continued for the duration of the permit, regardless of the discharge or operational status of the facility, unless otherwise designated in this permit, specified in an approved contingency plan, or approved in writing by ADEQ.

1. Operational Monitoring

Table 4. Leak Detection/Collection Sump Location

Impoundment Number	Sump Number	Latitude of Sump	Longitude of Sump
1	1	32° 58' 33.6"	112° 48' 50.1"
2	2	32° 58' 33.6"	112° 48' 58.1"
3	3	32° 58' 33.6"	112° 49' 12.5"
4	4	32° 58' 18.3"	112° 49' 12.5"
5	5	32° 58' 18.2"	112° 48' 40.2"

Table 5. Operational Monitoring

Parameter	Performance Levels	Monitoring Frequency[1, 2]	Reporting Frequency[3, 4]
Upper Liner Integrity	No visible tears or leaks	Weekly	As required
Berm Integrity	No visible erosion or seepage	Weekly	As required
Leak Detection Sump	No obstructions to access, pumps and detection devices operational	Weekly	As required
Cooling Water Circulation Sump (if applicable)	No visible cracks or leaks	Weekly	As required
Flow Control, Flow Sensor, and Chart Recorder (if applicable)	Maintained to be in continual operational condition	Weekly	As required

[1] Inspections shall also be completed after a significant rainstorm or other natural disaster.

[2] If the impoundment is located at an unmanned facility and used seasonally, then inspections shall be required at the beginning of the operational season, monthly when liquid is present in the impoundment, and at the end of the operational season.

[3] Refer to Part H for notification requirements in the event of a violation of any permit condition.
[4] Refer to Record Keeping Requirements of Part I.

2. Groundwater Monitoring

Monitor wells are not required at this time. If groundwater monitoring is required in the future, the wells shall be installed and located at the designated Point(s) of Compliance

3. Sump Fluid Monitoring

a. The leak detection sump(s) identified in Table 4 shall be monitored to determine compliance with the Action Response Levels (serving as Alert Levels). If liquids are present in the sump, the liquids shall be removed, contained, and properly disposed of. The amount of liquid pumped shall be determined and recorded.

Action Response Levels 1 and 2 pertain to leakage through the upper liner, as determined through monitoring of the leak detection/collection sump. The permittee shall monitor the leak detection sump(s) as indicated in the following table:

Table 6. Sump Fluid Monitoring

Sump No.	Parameter	Action Response Level #1 [1] gpd	Action Response Level #2 [2] gpd	Monitoring Method	Monitoring Frequency[3]	Reporting Frequency[4]
1, 2	Liquid Pumped[5]	5,369	1,9573	Meter/Calc.	Weekly	As Required
3, 4	Liquid Pumped	5,369	1,9573	Meter/Calc.	Weekly	As Required
5	Liquid Pumped	1,934	7,049	Meter/Calc.	Weekly	As Required
	Liquid Pumped			Meter/Calc.	Weekly	As Required

1 Action Response Level #1 is the threshold value at which the permittee must place into action the appropriate requirements presented in **Section G.2.a.** The method to be used to calculate this value is presented in Appendix E.

2 Action Response Level #2 is the threshold value at which the permittee must place into action the appropriate requirements presented in **Section G.2.b.** The method to be used to calculate this value is presented in Appendix E.

3 Liquid monitoring shall be performed only when solution is present in the impoundment.

4 The Liquid Pumped reported is that amount pumped from the leak detection sump in gallons per day (gpd).

4. Sump Fluid Analyses

Routine analysis of sump fluids is not required. However, analysis of sump fluids is included as a contingency action in Part G.

5. Freeboard Monitoring

b. The permittee shall monitor the amount of freeboard as indicated on a staff gauge contained in the impoundment(s), or other method that provides similar measurement accuracy and approved by ADEQ, according to the following table:

Table 7. Impoundment Freeboard

Impoundment Number	Freeboard feet	Monitoring Frequency[1]	Reporting Frequency[2,3]
1	2	Weekly	As required
2	2	Weekly	As required
3	2	Weekly	As required
4	2	Weekly	As required
5	2	Weekly	As required
		Weekly	As required

[1] If the impoundment is located at an unmanned facility and used seasonally, then monitoring shall be required monthly when liquid is present in the impoundment.

[2] Reports including notification of violation of any permit condition shall be submitted within 5 days of Permittee becoming aware of the existence of each such violation.

[3] Refer to Record Keeping Requirements of Part I.

G. Discharge Limitations, and Contingency Plans

The permittee shall maintain at least one copy of the contingency plan at the location where the day-to-day decisions regarding the operation of the impoundment are made. The permittee shall advise all employees responsible for the operation of the facility of the location of copies of the contingency plan. Reporting requirements are outlined in Section H of this permit.

1. Discharge Limitations

a. The impoundment(s) is (are) restricted to the capacities specified in Table 1.

b. A discharge limit violation shall occur if both the upper and lower liners are compromised as evidenced by a drop in water level (not attributable to evaporation and/or reflected by the amount of water in the sump) or when a catastrophic or other event occurs that compromises the integrity of both liners.

c. Overtopping of the impoundment or a breach of its berm shall constitute exceedance of a discharge limit.

2. Contingency Plan Requirements

The appropriate contingency plan, based on the nature of the exceedance, shall be placed into action as follows.

a. If there is an exceedance of Action Response Level #1, the permittee shall take the following actions:

1. Notify ADEQ according to Part H.

2. Assess the condition of the liner system.

3. Submit for approval by ADEQ, a corrective action plan to address problems identified from the assessment of the liner system, and at the direction of ADEQ, implement the approved plan.

b. If there is an exceedance of Action Response Level #2, the permittee shall take the following actions:

1. Notify ADEQ according to Part H.

2. Initiate actions to identify the location(s) of the leak(s) within 3 days of becoming aware of the exceedance(s).

3. If practicable, cease all disposal to the impoundment.

4. Submit for approval by ADEQ, a plan to repair or replace the liner system in an expeditious manner, and at the direction of ADEQ, implement the approved plan.

5. Collect samples from the liquid contained in the leak detection sump within 5 days of becoming aware of the exceedance and analyze the samples for the parameters specified in Appendix II, according to your facility type. A copy of the analytical results shall be submitted to Aquifer Protection Permit Compliance as soon as it is available.

6. Submit a report to ADEQ Aquifer Protection Permit Compliance describing the remedial actions taken to repair the liner system.

c. If there is leakage through both the upper and lower liners into the vadose zone, in such a manner that the leak collection system is unable to contain the loss of fluid, the permittee shall take the following actions:

1. Notify ADEQ Aquifer Protection Program Compliance within 24 hours of becoming aware of the leakage.

2. Immediately cease all disposal to the impoundment.

3. Contain the remaining liquid in the impoundment within 5 days.

4. Collect samples from the liquid contained in the impoundment within 5 days of becoming aware of the exceedance and analyze the samples for the parameters specified in Appendix II, according to your facility type. A copy of the analytical results shall be submitted to Aquifer Protection Permit Compliance as soon as it is available.

5. Assess the condition of the liner system and conduct a contamination assessment of the release to the subsoil and/or groundwater.

6. Submit for approval by ADEQ a corrective action plan to address problems identified from the assessment of the liner system and the release of contaminants to the subsoil and/or groundwater, and, at the direction of ADEQ, implement the approved plan.

7. Monitor groundwater at the Point of Compliance, if deemed appropriate and required by the ADEQ.

d. If there is overtopping of the impoundment(s), the permittee shall take the following actions.

1. Notify ADEQ Aquifer Protection Program Compliance within 24 hours of becoming aware of the overtopping of the impoundment.

2. Immediately cease all disposal to the impoundment.

3. Remove and properly dispose of wastewater from the impoundment until the water level is at or below the freeboard limit (the amount of wastewater removed, a description of the removal method, and the disposal arrangements shall be noted in the facility log).

4. Collect samples from the liquid contained in the impoundment within 5 days of becoming aware of the exceedance and analyze the samples for the parameters specified in Appendix II, according to your facility type. A copy of the analytical results shall be submitted to Aquifer Protection Permit Compliance as soon as it is available.

5. Assess the circumstances that resulted in the overtopping of the impoundment and implement a corrective action plan to address the problems identified.

6. Initiate and complete a contamination assessment of the impacted soil and groundwater resulting from the overtopping.

7. Monitor groundwater at the Point of Compliance, if deemed appropriate and required by the ADEQ.

8. Implement remedial activities for treating, storing, or disposing of contaminated soil and groundwater.

e. Emergency response:

1. The emergency response coordinator for the facility shall be designated in the contingency plan. This coordinator is responsible for activation of emergency response measures.

2. In the event of an emergency which results in an imminent and substantial endangerment to public health or the environment, the emergency response coordinator shall implement the emergency response measures of the contingency plan.

3. The emergency response coordinator shall notify ADEQ within 24 hours of the occurrence of an emergency. ADEQ's Emergency Response Hotline telephone number is (602)207-2330.

4. The permittee shall review and update the emergency response measures in the contingency plan annually.

H. Reporting Requirements

1. Notification of a violation of any permit condition, a discharge limitation or an exceedance of an alert level, including action response levels, to ADEQ Aquifer Protection Permit Compliance is required in writing within five days of the occurrence. Analytical reports for the parameters listed in Table 5 shall also be provided within 60 days of the Action Response Level exceedance. The analytical reports shall be submitted to the following address:

Arizona Department of Environmental Quality
Aquifer Protection Permit Compliance
3033 N. Central Avenue
Phoenix, Arizona 85012

2. The permittee shall submit a report to ADEQ Aquifer Protection Permit Compliance within 30 days of becoming aware of a violation of any permit condition. The report shall include all of the following:

   a. Identification of the permit condition for which there has been a violation;

   b. The period of violation, including date and time, if known, and the anticipated time period during which the violation or exceedance is expected to continue;

   c. Description of corrective action taken or planned to mitigate the effects of the violation or exceedance, or to eliminate or prevent a recurrence of the violation or exceedance;

   d. A schedule of any increased monitoring; and

   e. A description of any malfunction or failure of discharge control devices or other treatment processes or equipment.

3. The permittee shall give written notice to ADEQ 180 days before any major modification of any impoundment(s).

4. The permittee shall notify ADEQ, within 5 days after the occurrence, of the filing of bankruptcy by the permittee or the entry or any order of judgment against the permittee for the enforcement of any environmental protection statute in which monetary damages or civil penalties are imposed.

I. Record Keeping Requirements

All records, books, correspondence, reports, and any and all information relating to monitoring, sampling, and chemical analysis made by or on behalf of the Permittee in connection with the discharge shall be retained and preserved for ten years. The monitoring record for each sample collected shall include all of the following information:

1. The date, time, and place that the sample was taken;

2. The name of the person who took the sample or made the measurement;

3. The procedures used to collect the sample or measurement;

4. The date on which sample analysis was completed by the laboratory;

5. The name of each person or laboratory who performed the analysis;

6. The analytical method used to perform the analysis;

7. The chain of custody records; and

8. Any field notes relating to the information described in paragraphs (1) through (7).

J. Temporary Cessation, Closure, and Post-Closure Requirements

1. Temporary Cessation

The permittee shall notify ADEQ Aquifer Protection Permit Compliance before any temporary cessation of use of the impoundment(s). Prior to temporary cessation, the permittee shall submit a plan identifying measures to be taken by the permittee to reduce or control discharge, to maintain environmental controls, and to maintain and operate monitoring equipment during the period of temporary cessation. Seasonal use of impoundments shall not be considered as a temporary cessation. ADEQ may modify this permit to incorporate measures to be taken during temporary cessation.

2. Closure

The permittee shall notify ADEQ Water Quality Compliance of an intent to permanently ceaseuse of the impoundment(s) and shall submit a closure plan for approval by ADEQ within 90 days of the date that notice of intent to cease operations is given to ADEQ. Within 60 days of the submittal of a complete closure plan, ADEQ shall determine whether the closure plan is for a clean closure. If ADEQ determines that the closure plan is not for a clean closure, then this permit may be modified to address closure, post-closure monitoring, and post-closure maintenance at the facility. The permittee may request or ADEQ may require revisions to the closure plan for the impoundment. The permittee shall give written notice that the closure plan has been fully implemented to ADEQ.

K. Compliance Schedule

The Gila Bend Generating Station will submit the following information within 3 months following commencement of plant operations:

1. Material Safety Data Sheets (MSDS) for treatment chemicals added to process water.

2. Analytical results for wastewater samples.

3. Final CQA report for surface impoundments.

L. Annual Registration Fees

The permittee shall pay an annual registration fee to ADEQ. The annual registration fee is based upon the amount of influent wastewater to the impoundments in gallons per day as established by A.R.S. § 49-242.D.

Based on the estimated daily influent (between 100,000 and 999,999 gpd), the annual registration fee is $1000.

M. Standard Aquifer Protection Permit Conditions

1. Aquifer Water Quality Standards
[A.R.S. §§ 49-221, 223, A.A.C. R18-11-401 through 407]

The permittee shall not cause or contribute to a violation of an aquifer water quality standard at the applicable point of compliance for the facility.

2. Antidegradation
[A.R.S. § 49-243, A.A.C. R18-11-107]

The permittee shall not discharge a pollutant which will further degrade, at the applicable p-oint of compliance for the facility, the quality of any aquifer that already is in violation of an aquifer water quality standard for that pollutant.

3. Financial Capability
[A.A.C. R18-9-108, 117, 121]

The permittee must have and maintain the technical and financial capability necessary to fully carry out the terms and conditions of this permit. Any bond, insurance policy, or trust fund provided as a demonstration of financial capability in the permit application, pursuant to R18-9-108(B)(8)(c)(3)(iii) or R18-9-121(A), shall be in effect prior to any discharge authorized by this permit and shall remain in effect for the duration of the permit.

4. Permit Action: Modification, Transfer, Suspension & Revocation
[A.R.S. §§ 49-201, 241-251, A.A.C. R18-9-113, 121, 123]

a. This permit may be modified, transferred, renewed or revoked under the rules of the Department. The filing of a request by the permittee for a permit action does not stay any existing permit condition.

b. The Director shall issue a public notice of all proposed permit actions pursuant to R18-9-124 except as described in C.(2).

c. Permit Modifications

1) Major Modification:

The permittee shall give written notice to the Director before any major modification to the facility, as described in § 49-201(19). The permittee shall identify the specific item(s) to be considered for modification and the facts and reasons which justify modification. The permittee may be required to submit additional information, pursuant to R18-9-108, including an updated permit application. The permittee shall remit the permit modification fee specified in R18-14-103 prior to modification of the permit.

2) Minor Modification:

With the written concurrence of the permittee, the Director may modify this permit for any of the following reasons without giving public notice or conducting a public hearing:

a) To correct typographical errors;

b) Increase the frequency of monitoring or reporting or to reduce monitoring frequency in accordance with the terms of this permit;

c) Change an analytical method, provided that the analytical method is approved by the Director of the Arizona Department of Health Services;

d) Change an interim date in a schedule of compliance if the permittee can show just cause and that the new date does not interfere with the attainment of a final compliance date requirement;

e) Change construction requirements, if the alteration complies with the requirements of the Aquifer Protection Permit statues and rules and provides equal or better performance;

f) Replace monitoring equipment, including wells, if such replacement results in equal or greater monitoring effectiveness; and

g) Change the contact person for the facility;

3) Permit Reopen

The Director may reopen this permit and modify it if the Director determines any one or more of the following:

a) Material and substantial alterations or additions to the permitted facility justify a change in permit conditions;

b) The discharge from the facility violates or could reasonably be expected to violate an aquifer water quality standard;

c) Rule or statutory changes have occurred which require a change in the permit;

d) There has been a change of an applicable point of compliance for the facility.

e) There has been an exceedance of an alert level or a violation of a discharge limitation;

f) Changed conditions justify an increase or decrease in monitoring requirements;

g) A closure plan does not achieve clean closure and the permit must be modified to incorporate additional closure, post-closure monitoring, or post-closure maintenance requirements.

4) Permit Transfer

a) The Director may transfer the permit if the Director determines that the proposed transferee will comply with Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes and Title 18, Chapter 9, Article 1 of the Arizona Administrative Code.

b) The proposed transferee shall submit the information required in R18-9-108(A)(1), (2), and (3), and (6); R18-9-108(B)(7) and (8); and R18-9-108(D) prior to the transfer of the permit.

c) The permittee shall remain responsible for complying with the terms and conditions of this permit, regardless of whether the permittee has sold or otherwise disposed of the permitted facility, until the Director transfers the permit.

d) The permittee shall remit the permit transfer fee specified in R18-14-103 prior to transfer of the permit.

5) Permit Suspension and Revocation

The Director may suspend or revoke this permit for any one of the following reasons:

a) Noncompliance by the permittee with any applicable provision of Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes; Title 18, Chapter 9, Article 1 of the Arizona Administrative Code; or with the terms and conditions of this permit;

b) The permittee's misrepresentation or omission of any fact, information, or data related to the permit application or this permit;

c) The Director determines that the discharge from the permitted facility is causing or may cause a violation of an aquifer water quality standard; and

d) The Director determines that the discharge from the permitted facility has the potential to cause or will cause imminent and substantial endangerment to the public health or the environment.

5. Preservation of Rights
[ARS § 49-206]

This permit shall not be construed to abridge or alter causes of action or remedies under the common law or statutory law, criminal or civil, nor shall any provision of this permit, or any act done by virtue of this permit, be construed so as to stop any person, this state or any political subdivision of this state or owners of land having groundwater or surface rights or otherwise, from exercising their rights or, under the common law or statutory law, from suppressing nuisances or preventing injury due to discharges.

6. Inspection and Entry
[ARS § 49-203.B]

a. Upon presentation of proper credentials, an authorized Department representative may enter into, on, or through any public or private property, permittee's premises, from which a discharge has occurred, is occurring, or may occur as is reasonably necessary to verify information submitted in the permit application to ensure compliance with Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes; Title 18, Chapter 9, Article 1 of the Arizona Administrative Code; the terms and conditions of this permit; or to verify information submitted in the permit application. The Department representative may:

1) Obtain samples;

2) Inspect and copy any records required to be maintained by this permit;

3) Inspect facilities, equipment, equipment, activities, and monitoring equipment or methods of monitoring; or

4) Take photographs.

5) Take other actions reasonably necessary to determine compliance with Aquifer Protection Permit statutes or rules or the terms and conditions of this permit.

b. The owner or operator of the facility shall be afforded the opportunity to accompany the Department representative during any inspection.

c. Prior notice of entry is not required if reasonable grounds exist to believe that prior notice would frustrate enforcement.

d. If a Department employee obtains any samples, before leaving the premises, he/she will give the owner or operator a receipt which describes the samples obtained and a portion of each sample equal in volume or weight to the portion retained by the Department. If an analysis is made of a sample or monitoring or testing is performed, a copy of the results shall be furnished promptly to the owner or operator of the facility.

7. **Duty to Comply**
[A.R.S. §§ 49-221 through 263]

The permittee shall comply with all conditions of this permit. Any permit non-compliance constitutes a violation of the provisions of Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes and is grounds for an enforcement action pursuant to Title 49, Chapter 2, Article 4 or permit modification, suspension, or revocation.

STATE OF ARIZONA
AQUIFER PROTECTION PERMIT

This permit is effective on the date that it is signed by the Director of the Water Quality Division. This permit shall remain effective for the operational life of the impoundment(s) and any period during which the wastewater treatment plant is subject to a post-closure plan.

Signed this _______ day of _____________, _____________.

____

Karen L. Smith,
Director, Water Quality Division
Arizona Department of Environmental Quality

Appendix I.

Liner Leakage Rate Calculations

The purpose of the following calculation method is to provide a means to evaluate leakage through the upper liner of a geomembrane/composite double-liner system. The method can be used to determine the action response levels to be entered in Table 6, of the permit. As stated in the permit, Action Response Levels 1 and 2 are based on the leakage rate through the top liner of a double liner system. This amount of leakage is determined through use of the between liners leak detection/collection system.

The basic equation to be used for the calculation of the leakage rate through a hole in a geomembrane is Bernoulli's equation [1] for free flow through an opening, which is as follows:

$$Q = C_B \; a \sqrt{2gh_w}$$

where: Q = leakage rate through a geomembrane hole (m^3/s)
C_B = dimensionless coefficient, related to the shape of the edges of the hole; for sharp edges $C_B = 0.6$
a = hole area (m^2)
g = acceleration due to gravity (m/s^2)
h_w = liquid depth on top of the geomembrane (m)

Action Response Level Calculation Examples

The following parameters shall be used to calculate the Action Response Levels:

- A 3.1 mm^2 (0.012 in^2) area hole size, which allows for seam defects that may exist after intensive quality assurance resulting from fabrication or installation factors including excessive moisture or humidity, improper ambient or sealing temperature, contamination by dust or dirt. This size hole will be used to establish Action Response Level 1.
- A 11.3 mm^2 (0.445 in^2) area hole size, which may account for failure of the geomembrane due to poor design, damage incurred during placement of overlying materials, or accidental punctures. This size hole will be used to calculate Action Response Level 2.
- A frequency of one hole per 4,000 m^2 (1 acre) will be used in calculating all Action Response Levels. This frequency requires that intensive quality assurance monitoring be completed during installation of the liner. A frequency of 10 holes or more is typical when quality assurance is limited to an engineer spot checking the work completed by the geomembrane installer.

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[1] J.P. Giroud and R. Bonaparte, 1989, Geotextiles and Geomembranes 0266-1144/89/303.5, Elsevier Science Publishers Ltd., England, pp 27-67

The following example, which utilizes the above equation and constraints, is provided for a 5 acre area impoundment containing a maximum liquid depth of 10 feet.

Conversion factors: 1 ft = 0.3048 ft/m
$1 m^3 = 2.642 * 10^2$ gal
1 sec = 86,400 sec/day

Action Response Level #1:

$$Q=C_R\ a\ \sqrt{2gh_w}$$

$$Q=(0.6)(3.1mm)(\frac{1m^2}{1*10^{-6}mm})\sqrt{2(9.8\frac{m}{s^2})(3.1m)}$$

$$Q=(0.6)(3.1*10^{-6}m^2)\sqrt{60.76\frac{m^2}{s^2}}$$

$$Q=(1.86*10^{-6}m^2)(7.80\frac{m}{s})$$

$$Q=1.45*10^{-5}\frac{m^3}{s}$$

$$Q=(1.45*10^{-5}\frac{m^2}{s})(2.642*10^2\frac{gal}{m^3})(86,400\frac{s}{day})$$

$$Q=331\frac{gal}{day}$$

For a five acre impoundment:
$Q=5*331\frac{gal}{day}=1,655\frac{gal}{day}$

Action Response Level #2:

$$Q=C_R\,a\ \sqrt{2gh_w}$$

$$Q=(0.6)(11.3mm)(\frac{1m^2}{1*10^{-6}mm})\sqrt{2(9.8\frac{m}{s^2})(3.1m)}$$

$$Q=(0.6)(11.3*10^{-6}m^2)\sqrt{60.76\frac{m^2}{s^2}}$$

$$Q=(6.78*10^{-6}m^2)(7.80\frac{m}{s})$$

$$Q=5.29*10^{-5}\frac{m^3}{s}$$

$$Q=(5.29*10^{-5}\frac{m^2}{s})(2.642*10^2\frac{gal}{m^3})(86,400\frac{s}{day})$$

$$Q=1,207\frac{gal}{day}$$

For a 5 acre area impoundment:
$Q=5*1,207\frac{gal}{day}=6,035\frac{gal}{day}$

As all impoundments vary in size, and it is necessary to calculate the Action Response Levels for each impoundment. **Please include a copy of all calculations with the completed model permit application.**

Appendix II.

Discharge Characterization Tables for Action Response Level Monitoring

Attached are the monitoring tables to be used by the permit writer and the permittee to develop the expedited Aquifer Protection Permit (APP) for qualifying double lined surface impoundments. The discharge characterization tables are based on typical chemical pollutants generated from industry specific operations. The parameters in the tables have been streamlined to include only the primary contaminants of concern that are likely to be found in the wastewater. The tables are to be utilized as a contingency plan requirement if action response level number 2 is exceeded for leakage through the primary liner, or a discharge limit violation occurs. Under this contingency plan requirement, the permit holder is required to sample and analyze the parameters listed in the table provided for that specific operation. The monitoring results will be used as a general reference in the decision making process to determine environmental risk and the potential for violating Aquifer Water Quality Standards if a release occurs outside the surface impoundment, and to implement a groundwater monitoring program, if necessary.

This contingency monitoring allows the applicant to satisfy the chemical, biological and physical properties evaluation for the "characterization of discharge " required to obtain an APP. If one of the baseline monitoring tables applies to the facility and is used as is, only basic information must be submitted to obtain the expedited permit. Otherwise, a list of applicable contingency monitoring parameters must be agreed upon between ADEQ and the applicant. This may significantly increase the time it takes to issue the permit.

It should be noted that the discharge characterization tables provided here do not take into account every plant operation within that industry; rather these tables present a general list of parameters for each specific industry category. The list of parameters for the specific operations included herein have been selected based on available data. References are located on the final page of APPENDIX B. Data from these references provided the foundation for the selection process resulting in the list of parameters incorporated in the tables.

Appendix II, Table 1. Discharge Characterization Constituent List
Gila Bend Generating Station
Gila Bend, Arizona

Conventional Pollutants and Inorganic Parameters:

Parameter	Analytical Method [1]	Monitoring Frequency	Reporting Frequency
pH	ADHS or EPA Approved Method	One, initial sampling round within compliance schedule	Submitted to ADEQ within 90 days after plant operations commence
Temperature	"	"	"
Conductance	"	"	"
Total Dissolved Solids	"	"	"
Alkalinity	"	"	"
Calcium	"	"	"
Magnesium	"	"	"
Sodium	"	"	"
Potassium	"	"	"
Total Nitrogen	"	"	"
Chloride	"	"	"
Sulfate	"	"	"
Fluoride	"	"	"
Antimony	"	"	"
Arsenic	"	"	"
Barium	"	"	"
Cadmium	"	"	"
Chromium	"	"	"
Lead	"	"	"
Mercury	"	"	"
Nickel	"	"	"
Selenium	"	"	"
Zinc	"	"	"

Organic Parameters:

Parameter	Analytical Method [1]	Monitoring Frequency	Reporting Frequency
Volatile Organics	EPA Method 8260	One, initial sampling round within compliance schedule	Submitted to ADEQ within 90 days after plant operations commence
Semi-volatile Organics	EPA Method 8270	"	"
Total Petroleum Hydrocarbons	ADHS or EPA Approved Method	"	"

Explanation to Footnotes:

[1] The permittee may use any approved analytical method for each parameter required under this permit as long as the method provides the capability of achieving the lowest method detection limit or most precisely and accurately the quantitative demonstration of the parameter listed. In addition, the utilized test method must be recognized as being applicable in the ADHS Laboratory Licensure Rules (Arizona Administrative Code R9-14-608). ADEQ reserves the right to determine the adequacy of laboratory test results based upon the achieved detection limits.

Appendix II, Table 2. Discharge Monitoring Constituent List
Gila Bend Generating Station
Gila Bend, Arizona

Conventional Pollutants and Inorganic Parameters:

Parameter	Analytical Method[1]	Monitoring Frequency[2]	Reporting Frequency[3]
pH	ADHS or EPA Approved Method	If Action Response Level #2 is Exceeded	If Action Response Level #2 is Exceeded
Temperature	"	"	"
Conductance	"	"	"
Total Dissolved Solids	"	"	"
Alkalinity	"	"	"
Calcium	"	"	"
Magnesium	"	"	"
Sodium	"	"	"
Potassium	"	"	"
Total Nitrogen	"	"	"
Chloride	"	"	"
Sulfate	"	"	"
Fluoride	"	"	"
Antimony	"	"	"
Arsenic	"	"	"
Barium	"	"	"
Cadmium	"	"	"
Chromium	"	"	"
Lead	"	"	"
Mercury	"	"	"
Nickel	"	"	"
Selenium	"	"	"
Zinc	"	"	"

Organic Parameters:

Parameter	Analytical Method[1]	Monitoring Frequency	Reporting Frequency
Total Petroleum Hydrocarbons	ADHS or EPA Approved Method	If Action Response Level #2 is Exceeded	If Action Response Level #2 is Exceeded

Explanation to Footnotes:

[1] The permittee may use any approved analytical method for each parameter required under this permit as long as the method provides the capability of achieving the lowest method detection limit or most precisely and accurately the quantitative demonstration of the parameter listed. In addition, the utilized test method must be recognized as being applicable in the ADHS Laboratory Licensure Rules (Arizona Administrative Code R9-14-608). ADEQ reserves the right to determine the adequacy of laboratory test results based upon the achieved detection limits.

[2] If the Action Response Level #2 is exceeded for the leak detection & collection system or a Discharge Limit violation occurs where liquid escapes the impoundment containment, the permittee shall sample and analyze the liquid for the parameters listed in the dishcarge characterization table.

[3] Reporting is required if Action Response Level #2 is exceeded and/or a Discharge Limit violation occurs where the liquid escapes the impoundment containment.

APPENDIX K

RESUMES

ROBERT C. WALTHER, P.E., President

Industrial Power Technology
2227 Capricorn Way, Suit 101
Santa Rosa, CA 95407
(707) 528-8900 Fax: (707) 528-8901
Email: RCWalther@aol.com

Bob Walther has been President and CEO of Industrial Power Technology (IPT) from its inception in 1983 to the present. As a professional engineer and certified plant engineer, he is responsible for the strategic planning, design, and construction of power generation and control systems. Mr. Walther has demonstrated a unique talent and inherent ability in project siting, regulatory, and permitting activities, which extends to design, construction management, and plant operations. In addition, Mr. Walther directs IPT's independent engineering services and owners' representative services for lending institutions and plant owners.

EDUCATION: La Sierra College, Arlington, CA
University of the Pacific, Stockton, CA
San Francisco State, San Francisco, CA
Bell Laboratories, Brooklyn, NY & Murray Hill, NJ

ADVANCED STUDIES: A total of 4 years advanced engineering study with 1.5 years of automated circuit and power control.

LICENSES: Professional Engineer/Control Systems - Certificate No. 4233
Certified Plant Engineer - Certificate No. 15114

PUBLICATIONS: Standard Handbook Of Plant Engineering (1994) Electric Systems Management"
Electrical Consultant (May, 1996) "Combustion Turbine Installation"

EXPERT WITNESS: Mr. Walther has provided expert services in investigation, analysis and testimony in a variety of high-voltage equipment failures and electrical related accidents involving personal injury.

EXPERIENCE SUMMARY:

Over the last 25 years, Bob Walther has been the team leader in the development and construction of numerous utility and private sector power generating stations and transmission systems. Combining this leadership role with an in depth understanding of fuel and its availability, he has developed programs of effective fuel utilization and energy optimization, as well as cost-effective long-term fuel acquisition.

Mr. Walther has been involved in numerous U.S. projects and his international experience has included Great Britain, the Philippines, India and the People's Republic of China, where he was instrumental in the development of several projects in the 33 - 350 mW range. He has provided engineering services to major investment houses in Europe and the U.S., including, Banque Paribas, Credit Suisse, Kansallis-Osake-Pankki Bank, Morgan Stanley, Drexel Burnham Lambert, E.F. Hutton, and Aetna Insurance Funds. He is experienced in the challenges of developing, financing and constructing international projects.

His projects have utilized a wide variety of fuels and energy conversion systems. Representative fuels include: natural gas, coal, wellhead residual gas, digester gas, urban waste, scrap tires, biomass fuels, agricultural waste and hydropower. Project responsibilities included specifying and ordering heavy equipment including gas turbines, and all facets of procurement, including shipping, customs, and installation for such equipment. He has also had extensive experience in planning, engineering and construction of roads, utilities, environmental systems, including zero discharge, liquid waste streams, and air quality clean-up systems.

PROJECT EXPERIENCE:

Gila Bend Power Project (2000)
Type: 833 mW Natural Gas Combined-cycle Power Plant

Tangshan Huaao Thermal Power Plant, Tangshan, Heibei, Peoples Republic of China (1999)
Type: 350 mW Coal Thermal Power Station

Texaco Sunrise Power Plant, Fellows, CA (1999)
Type: 262 mW Combined Cycle Power Project

American Samoa Government (1997)
Type: Fuel Storage Facility Expansion

Monterey Regional Water Pollution Control Agency &
Monterey Regional Waste Management District, Monterey, CA (1996)
Type: Wastewater Treatment Plant/Waste Management Treatment

Ruzhou Thermal Power Generating Station, Henan Province, China (1996)
Type: 300mW Coal Thermal Power Station

Continental Resources, Enid, OK (1996)
Type: 90 mW Simple Cycle Gas Turbine utilizing wellhead gas

Exxon Billings Refinery, Billings, MT (1996)
Type: 7 mW Condensing Steam Turbine Facility

Napacor, Minanao, Republic of the Phillipines (1995)
Type: 200 mW Coal thermal Power Station

Funing City Thermal Power Station; Qinhuangdao, China (1995)
Type: 100 mW Coal Thermal Power Station

Pinole Point Steel, Richmond, CA (1994)
Type: 115 kV sub-station & 12.47 kV metering and switchgear.

Stockton Regional Wastewater Control Facility (1993)
Type: Wastewater Treatment Plant

Sonoma Landfill Gas Project - Cotati, CA (1992)
Type: 6 mW from gas engines using landfill gas recovery

Overton REA High Voltage Transmission Line, Overton, NV (1991)
Type: 138 kV Transmission Line

Moapa Energy Project - Moapa, NV (1991)
Type: 60 mW Tires-to-Energy Facility

CBS Cogeneration Project - Television City, Burbank, CA (1990)
Type: 1.4 mW Cogeneration/Natural Gas/Residual Gas

PROJECT EXPERIENCE: (CONT'D)

City of Redding Peaking Plant, Redding, CA (1989)

Type: 71.3 mW Simple Cycle Gas Turbine Peaking Power Plant

Xerox Corporation, Webster, NY (1988)
Type: 3.5 mile, 15,000 ton pumped industrial cooling loop

Southwest Project - Southwest United Kingdom (1988)
Type: 400 mW Coal Fired Steam Generating Station

Wadham Energy Company Project - Williams, CA (1987)
Type: 29 mW Rice Hulls-to-Energy Project

Modesto Energy Company Project - Westley, CA (1986)
Type: 15.6 mW Tires-to-Energy Project

Monterey Regional Water Pollution Control Agency, Monterey, CA (1986)
Type: Wastewater Treatment Plant

Box Canyon Dam Hydro Power Plant - Lake Siskiyou, CA (1986)
Type: 7.0 mW Hydro Project

Williams Air Force Base - Chandler, AZ
Type: Jet fuel distribution & cathodic protection system.

Cortez County Hydro Penstock (13-mile), Cortez County, CO
Type: Controls design & corrosion protection.

MALCOLM PIRNIE

Ms. Alter is a project hydrogeologist specializing in solid waste facility permitting, subsurface contamination investigations, groundwater monitoring, aquifer protection permitting, and environmental field work, including well installation, soil sampling, and subcontractor management.

Detailed Experience

- **Abitibi Consolidated Sales: Sampling Plan for a Paper Fiber Waste Lagoon / Snowflake, AZ.** Used U.S. EPA Method SW-846 to develop a sampling plan, which was conducted per aquifer protection permit requirements and included a statistical analysis of existing data.
- **CALMAT: Alternative Liner Demonstration for Calmat Landfill / Tucson, AZ.** Completed the demonstration, which included a comparison of a Subtitle D final cover system, an Arizona Department of Environmental Quality-approved final cover system, and an alternative final cover system. The demonstration also included the use of HELP modeling. Following the demonstration, requested a minor modification to the landfill's aquifer protection permit.
- **City of Tucson: Aquifer Protection Permit for Irvington Landfill / Tucson, AZ.** Responsible for permitting activities, including reviewing site geology/ hydrogeology and water quality data, conducting a borrow source evaluation, and negotiating permit requirements. Performed regulatory review of ordinances or permit requirements associated with various end uses of the site. The regulatory review included the examination of Section 404 requirements, the WASH/ERZ ordinances, the native plant ordinance, zoning and development standards for the site, the availability of utilities in the area, restrictive covenant requirements, air quality permit requirements, endangered species clearance, NPDES requirements, and state historic preservation clearance.
- **City of Tucson: Groundwater Remediation at Los Reales Landfill / Tucson, AZ.** Conducted field work associated with the design of a groundwater remediation system at the landfill site. The fieldwork included conducting aquifer tests and collecting groundwater samples to determine the degree of hydrologic connection (and related impact of contaminant transport) between two aquifers. Subsequent fieldwork included grouting wells that were screened across two water-bearing units to mitigate cross-contamination.
- **City of Tucson: Aquifer Protection Permit for Speedway Landfill / Tucson, AZ.** Assisted with permitting procedures, including HELP modeling, a hydrogeologic study, obtaining necessary clearances from state and federal agencies, calculating Alert Levels, and preparing a compliance schedule.

Title/Firm
Project Hydrogeologist,
Malcolm Pirnie, Inc.

Years of Experience
6

Education
Studies in Geology Arizona State University
BA Geology Vassar College 1994
MS Hydrology University of Arizona 2000; Tucson

Registration and Certifications
2000 Geologist-in-Training

Health and Safety Training
Hazardous Waste Operations Eight (8) hour refresher
Bloodborne Pathogens Exposure Control
Cardiopulmonary Resuscitation
First Aid
Medical

Societies
Arizona Hydrological Society (Member)

Employment History
Malcolm Pirnie, Inc. 2000 to present
IT/EMCON 1996 to 2000
Delta Environmental 1995 to 1996
Basin & Range 1994 to 1995

- **Glenn Weinberger: Landfill Slope Stability Modeling, Weinberger Rainbow Valley Landfill / Mobile, AZ.** Modeling performed to determine factor of safety values for a waste tire monofill.

- **Glenn Weinberger: Slope Stability Modeling at Weinberger 43rd Avenue Landfill / Phoenix, AZ.** Performed modeling using PCSTABL to determine factor of safety values for the landfill's slopes. Also, performed HELP modeling to determine the potential of leachate migration from the base of the landfill. The HELP modeling was performed as part of the aquifer protection permitting activities.

- **Tucson Electric Power Company: Aquifer Protection Permit for Springerville Generating Station / Tucson, AZ.** Prepared closure plans for an inactive landfill located adjacent to an active ash disposal area. Performed HELP modeling to determine the viability of using fly ash and bottom ash as cover material on the inactive landfill. Compiled historical landfill use data and prepared a closure report for Arizona Department of Environmental Quality submittal.

- **USA Waste of Arizona, Inc.: Aquifer Protection Permit for Deer Valley Landfill / Maricopa County, AZ.** Prepared the permit and an SWFP, including HELP modeling, endangered species clearance, State Historic Preservation clearance, closure and postclosure plans, a hydrogeologic study, and a demonstration of compliance with standards.

- **Arizona Army National Guard: Site Characterization Activities / AZ.** Supervised geophysical team as part of site characterization activities. Also supervised well construction and conducted subsequent groundwater monitoring.

- **Confidential Client, ITT, and F&B Manufacturing: Site Characterization Activities / Phoenix, AZ.** Conducted groundwater monitoring for chlorinated solvent contamination at Water Quality Assurance Revolving Fund sites in Phoenix. Collected quarterly groundwater samples and monthly water levels, and prepared reports for agency submittal.

- **Yellow Cab: Site Characterization Activities / AZ.** Monitored BTEX concentrations, alkalinity, pH, redox potential, dissolved oxygen, nitrate, dissolved iron, and carbon dioxide.

MALCOLM PIRNIE

Mr. Bacon has been involved in engineering, design, procurement, and permitting for all types of industrial and municipal projects. He is currently involved in regulatory applicability determinations, compliance audits, air emissions inventories, stack testing oversight, continuous emission monitoring development, and air quality permitting at municipal and industrial facilities located in Arizona, California, and Texas. His background also includes design, quantity and cost estimating, contract negotiating, and planning and managing various phases of air quality, hazardous waste, and solid waste programs.

Mr. Bacon is a key member of the Arizona Industrial Services business development team. He also manages Arizona's Environmental Restoration Team.

Detailed Experience

- **Ciba Specialty Chemicals Corporation: Regulatory Compliance Evaluation / Ardsley, NY.** Project Manager for conducting regulatory (air, wastewater, hazardous and solid waste, storm water, etc.) compliance evaluations for a new R&D facility with respect to federal, state and local regulations. Also, prepared air permit applications for the relocation of the R&D facility.
- **City of Glendale: Glendale water Reclamation Facility / Glendale, AZ.** Project Manager responsible for preparing an air quality permit application for odor control systems and combustion equipment at a new water reclamation facility.
- **City of Phoenix: 91st Avenue Wastewater Treatment Facility: Synthetic Minor Air Permit Application / Phoenix, AZ.** Project manager for the evaluation of 91st Avenue Wastewater Treatment Plant's digester gas flare controls to maintain the emissions from the 87-mgd facility below the major source and Title V thresholds. Managed numerous air quality permitting and compliance projects for the 91st Avenue WWTP. Projects have included annual emission inventories, compliance audits, stack testing, permit modifications, O&M plan development, odor control equipment design, and permit negotiations.
- **City of Phoenix: 91st Avenue Interceptor Odor Control Study / Phoenix, AZ.** Project Manager responsible for planning and implementing an odor characterization and odor control evaluation for a 40-mile wastewater pipeline. The characterization phase was conducted during a 12-month period to account for seasonal variations. The odor control evaluation consisted of studying the effects of adding chemicals to the wastewater as well as implementing active odor control systems throughtout the sewer line.
- **City of Phoenix: 91st Avenue Interceptor Odor Control Study / Phoenix, AZ.** Project Manager responsible for planning and implementing

Title/Firm
Senior Project Engineer, Malcolm Pirnie, Inc.

Years of Experience
16

Education
BS Chemical Engineering Bucknell University 1986
MBA Quality Management Fordham University 1995

Registration and Certifications
1995 Professional Engineer
Hazardous Materials Health and Safety Certificate

Societies
Air and Waste Management Association
American Institute of Chemical Engineers
Beta Gamma Sigma, Member of the MBA Honor Society

Employment History
Malcolm Pirnie, Inc. 1987 to present
U.S. Army Corps of Engineers 1986 to 1987
Pennsylvania Department of Transportation 1984 to 1985

an odor characterization and odor control evaluation for a 40-mile wastewater pipeline. The characterization phase was conducted during a 12-month period to account for seasonal variations. The odor control evaluation consisted of studying the effects of adding chemicals to the wastewater as well as implementing active odor control systems throughout the sewer line.

- **City of Phoenix: 23rd Avenue Wastewater Treatment Plant / Phoenix, AZ.** Project Manager responsible for preparing a compliation of historical improvements constructed at the plant as well as conducting a neighborhood odor survey around the plant. The study served to summarize the plant improvements made by the City to reduce wastewater related odors. The results of the odor survey also indicated the odor control improvements have reduced plant-related odors in the community.

- **City of Phoenix: 23rd Avenue Wastewater Treatment Plant / Phoenix, AZ.** Project Manager responsible for preparing a compliation of historical improvements constructed at the plant as well as conducting a neighborhood odor survey around the plant. The study served to summarize the plant improvements made by the City to reduce wastewater related odors. The results of the odor survey also indicated the odor control improvements have reduced plant-related odors in the community.

- **City of Phoenix: 23rd Avenue Wastewater Treatment Plant Odor Remedial Measures Project / Phoenix, AZ.** Project Manager responsible for coordinating and conducting the following activities to further improve plant related odors:
  - Implement odor panel programs
  - Evaluate existing odor control equipment
  - Design and construct aluminum covers over influent channels to convey foul air to existing odor control system
  - Conduct manhole odor survey
  - Develop sludge drying bed closure plans

- **City of Phoenix: 91st Avenue Wastewater Treatment Plant Odor Control system Design / Phoenix, AZ.** Project Manager responsible for coordinating and completing the design of an odor control system at the 87-mgd wastewater treatment plant. The odor control system consisted of four 60,000cfm dual-stage wet scrubbers designed to treat foul air from the facility's headworks area. The system also included design for covering the plant's processes and constructing all chemical and auxiliary facilities associated with the odor control equipment.

- **City of Phoenix: 91st Avenue Wastewater Treatment Plant Odor Control system Design / Phoenix, AZ.** Project Manager responsible for coordinating and completing the design of an odor control system at the 87-mgd wastewater treatment plant. The odor control system consisted of four 60,000cfm dual-stage wet scrubbers designed to treat foul air from the facility's headworks area. The system also included design for covering the plant's processes and constructing all chemical and auxiliary facilities associated with the odor control equipment.

- **City of Scottsdale: Central Arizona Project Water Treatment Plant: Hazardous Materials Management Planning Project (HMMP) / Scottsdale, AZ.** As Project Manager, prepared a HMMP document for a 27-mgd water treatment plant that handled chemicals such as sulfuric acid, aluminum sulfate, chlorine, potassium permanganate, sodium hydroxide, and miscellaneous polymers. The HMMP included information such as emergency response plans, incident reporting documentation, employee training, inspection policies, monitoring and labeling program, waste disposal, chemical compatibility and handling evaluations, and vulnerability analyses.

- **Coleman Spas: Title V Air Permit Application / Chandler, AZ.** Project manager responsible for conducting regulatory applicability analyses, compliance evaluations, emissions inventories, alternative operating scenario development, and compliance program preparation. In addition, lead engineer in developing and implementing an odor evaluation program for the manufacturer.

- **Commercial Intertech: Orange County Metal Works: Tank Head Manufacturing Plant Title V and Regulatory Compliance Determination Project / Orange, CA.** Project Manager, responsible for identifying all emission sources (point and fugitive), quantifying annual emissions (actual and PTE) for the plant, evaluating the Title V applicability criteria, and identifying regulatory compliance issues. Following the air quality requirements of the South Coast Air Quality Management District, determined the facility's major / minor source classification.

- **Communities Southwest, Inc.: Tolleson Community Odor Impact Evaluation / Tolleson , AZ.** Project Manager resposible for evaluating the potential odor impacts on a proposed residential community from the nearby Tolleson Wastewater Treatment Plant. Sampled and collected air and liquid-phase data to estimate potential odor related emissions from the plant. Conducted air dispersion modeling based on estimated H2S emissions to estimate probate odor impacts at the proposed community receptors.

- **Continental Waste Industries: Gila Bend Regional Landfill Title V Air Permit Application / Gila Bend, AZ.** Project manager for the preparation of a Title V air permit application under the regulatory agencies 'accelerated' permitting rules. The project included regulatory evaluations, emission inventories, compliance program development, and operating scenario assessments. The project required extensive meetings with Maricopa County and U.S. EPA Region IX staff to expedite the issuance of the Title V permit. This was the first project to receive a Title V permit from the Maricopa County Environmental Services Department.

- **Creative Friction, LLC: Creative Friction Brake Plant Air Quality Permitting / Phoenix, AZ.** Project Manager responsible for preparing all documentation required for an air quality permit application to allow the construction and operation of a brake manufacutring facility. Sucessfully megotiated the "expidited" issuance of the air permit with Maricopa County.
- **CRSS Capital, Inc.: Cogeneration Facility Environmental and Air Quality Compliance Audit / Ripon, CA.** Project Manager, responsible for reviewing regulatory and permitting requirements affecting the cogeneration plant and determining its compliance status with respect to each regulation. Some of the regulations included Air Toxics 'Hot Spots,' Title V program (San Joaquin Valley Unified Air Pollution Control District, SJVUAPCD, Rule 2520), operating permits (SJVUAPCD Rule 2010), federal and state CEMS requirements, Accidental Chemical Reliance Rule (Clean Air Act Section 112 [r]), and other California programs related to risk management and prevention, spill prevention, and hazardous materials management.
- **Gila Bend Power Partners, LLC: Gila Bend Power Generation Station / Gila Bend, AZ.** Project Manager responsible for multi-media permitting of a new 845-MW natural gas-fired combined cycle electric generation facility. Permitting activities included PSD and Title V permits, Aquifer Protection Permit, biological resources evaluation, archaeological and cultural resources assessment, wetlands delineation, Section 404 and 401 permitting, water resources assessment, and Phase I Environmental Site Assessments. Assisted our client with successfully negotiating a Certificate of Environmental Compatibility with the Arizona Corporation Commissions Siting Committee.
- **Gulf Coast Water Authority: Risk Management Plan / Texas City, TX.** Project Manager for the preparation of a Process Safety Management and Risk Management Plan at the Gulf Coast Water Authority Water Treatment Plant.
- **Hughes Missile Systems Company: Concentrated Waste Treatment System (CWTS): Air Emissions Study / Tucson, AZ.** Project Engineer responsible for reviewing and quantifying potential chemical constituent combinations that result in air emissions. Also, evaluated and recommended an appropriate air pollution control technology for the CWTS.

- **Nassau County Department of Public Works: Stack Testing Plan and Protocol Project / Nassau County, NY.** Project Engineer assigned to develop stack testing plan and protocol to demonstrate compliance with permit requirements for a NOx control system for diesel engines at the Cedar Creek and Bay Park Wastewater Treatment Plants. Assisted in permit preparation and follow-up for the stack testing program as well as the continuous emission monitoring systems (CEMS) at both plants. In addition, prepared air permit applications for new hot water boilers for the Cedar Creek plant. Currently evaluating NOX RACT compliance for combustion sources located at Cedar Creek and Bay Park.

- **New York City Department of Environmental Protection: Air Permitting of Odor Control Systems / New York, NY.** Project Engineer for permitting of systems including wet chemical scrubbers and carbon adsorbers for the Coney Island and North River Wastewater Treatment Plants. Prepared emissions estimates, impact assessment, and permit application packages. In addition, conducted NOx and VOC RACT evaluations for all of the NYCDEP's 14 POTWs.

- **Northeast Ohio Regional Sewer District: Sludge Incinerators Permitting Assistance / Cleveland, OH.** Project Engineer responsible for permitting assistance related to new sludge incinerators. Work includes developing emissions inventory, conducting regulatory assessment and developing public relations program.

- **Penn Racquet Sports: Title V Operating Permit Applications / Phoenix, AZ.** Project manager. Preparation included emission inventories, regulatory applicability analysis, compliance status evaluation, compliance program development, and operating scenario evaluation. This was the second project to receive a Title V permit from Maricopa County. In addition, project manager for a process safety management project as required by OSHA. Conducted process hazard analysis for affected plant processes. Activities included training plant personnel, evaluating process and safety hazards, preparing operating procedures, developing contractor safety programs, compiling incident investigation reports, and developing process hazard analysis report and process safety management plan.

- **Pima County Wastewater Management Department: Roger Road Wastewater Treatment Plant Title V Operating Permit Application / Tucson, AZ.** Senior project engineer. Activities included quantifying air emissions, evaluating regulatory applicability, compliance status, and operating scenarios, as well as developing regulatory compliance plans.

- **Refined Sugars, Inc.: NOx Emissions Testing / Yonkers, NY.** Lead Engineer in overseeing testing from a steam boiler, gas-fired cogeneration turbine, and diesel engine. Responsible for developing

MALCOLM PIRNIE

NOx RACT compliance plans for the above sources and permitting of these sources.

- **Revere Copper Products, Inc.: Air Quality Services: Stack Test Program / Rome, NY.** Lead Engineer responsible for developing and coordinating a stack test program for furnaces used to melt metal. The test program was required for permitting compliance purposes.
- **Revlon: Synthetic Minor Permit Application / Phoenix, AZ.** Project manager responsible for conducting a regulatory applicability analyses, regulatory compliance evaluations, emissions inventories, alternative operating scenario development, and compliance program preparation.
- **Scrap Tire Management Council: Air Emissions Assessment of Tire-Derived Fuel Combustion: Air Emissions Estimating / Nationwide,** Lead Engineer in estimating from more than 30 facilities (cement, paper and pulp, and electric utilities) across the country, using scrap tires as a source of fuel. Developed a database to evaluate the emission rate differences when the facilities used standard fuel types compared to tire-derived fuel.
- **Sterling Organics, Inc.: VOC RACT Compliance Evaluation and Plan Development / Rensselaer, NY.** Lead Engineer. Prepared equipment specifications and construction bid documents for a condenser system to remove VOCs.
- **Confidential Client: Air Permitting Assistance / Mesa, AZ.** Project manager for developing proposed permit conditions for the Site I and Site II air quality permits. Responsible for assisting TRW in negotiating the final permit conditions with Maricopa County.
- **Confidential Client: Process Hazards Analysis / Mesa, AZ.** Project Manager. Analysis conducted on an industrial wastewater treatment system and chemical storage facility. Facilitated the PHA team to identify process deviations, causes of process variations, consequences, and recommendations.
- **Various Clients: Comprehensive Recycling Analyses** / Prepared analyses for major counties and towns in several states. These recycling analyses addressed waste reduction and recycling plans including infrastructure requirements, privatization, funding sources, and implementation approaches.
- **Various Clients: Clean Fill Feasibility Reports** / Prepared feasibility reports which addressed classification of clean fill and its codisposal capabilities with treated incinerator ash. Designed bench- and pilot-scale leaching test programs for composite mixtures of clean fill and treated incinerator ash. Conducted concrete optimization programs and reuse studies for treated incinerator ash.
- **Various Clients: Hazardous Waste and Superfund Projects** / Assisted with planning and coordinating various projects that included conduct-

ing equipment and drum inventories, sampling contaminated soil, and training contractors for hazardous communication programs.

- **Various Clients: Solid and Medical Waste Management Plans** / Developed solid and medical waste management plans in the forms of program planning reports and environmental impact statements which comply with state regulations and guidelines. Evaluated waste processing technologies such as waste-to-energy, composting, pyrolysis, and mechanical processing; and studied environmental and socioeconomic impacts for project development and permitting purposes. Conducted economic and feasibility analyses to evaluate project financing alternatives and institutional arrangements. Developed and managed solid waste characterization and quantification programs which provide baseline data for program planning.
- **Various Clients: Final Closure and Capping of Solid Waste Landfills** / Performed resident engineering functions for ensuring compliance with contract drawings and specifications. Conducted landfill investigations of leachate collection and removal systems. Prepared landfill construction certification reports and contingency plan reports that included all aspects of landfill management, equipment operations, and personnel health and safety.
- **Various Clients: Preparation of RFP and Bid Documents** / Prepared request for proposals and bid documents and evaluated vendor proposals to implement solid waste management facilities. Interacted with legal and financial consultants of municipalities to provide technical input for development of solid waste management contracts. Projects have included procurement of long-haul disposal services, composting systems, recycling facilities, waste-to-energy facilities, and landfills.
- **Various Clients: Firmwide Air Quality Permitting, Emissions Inventory and Assessment, Control Technology Evaluation, and Design Projects** / Evaluated numerous compliance plans targeting OSHA's Process Safety Management regulations and USEPA's Risk Management Plan Rule 112(r); Title V, Prevention of Significant Deterioration (PSD), and New Source Review (NSR) permitting; Best Available Control Technology (BACT), Reasonably Available Control Technology (RACT), and Lowest Achievable Emission Rate (LAER) analysis and evaluations. Prepared process safety and risk management plans, process hazards analyses, hazardous materials management plans, Title V permits, emissions inventories, regulatory compliance assessments, and control technology evaluations.
- **Various Clients: Air Quality Permitting, Emissions Inventory and Assessment, Control Technology Evaluation, and Design Projects** / As Project Engineer, evaluated numerous compliance plans targeting Prevention of Significant Deterioration (PSD) and New Source Review (NSR) permitting, Best Available Control Technology (BACT), Reason-

ably Available Control Technology (RACT), and Lowest Achievable Emission Rate (LAER) analysis and evaluations.

- **U.S. Army : U.S. Army Industrial and Housing Construction Projects** / As Specifying Engineer: Reviewed drawings, technical specifications, and contract submittals. Developed pricing schedules, contract amendments, and work changes for similar projects.
- **Pennsylvania Department of Transportation: Pennsylvania Department of Transportation, Roadway System Examination / PA.** As Engineer Intern, responsible for examining Pennsylvania's roadway system in detail. This included mathematical computations in order to determine the severity of each road. Responsible for the computer input of this data for future study and review.
- **Pennsylvania Department of Transportation: Pennsylvania Department of Transportation, Roadway Resurfacing and Replacement of Drainage Systems / PA.** As Project Engineer, responsible for contractor activities associated with resurfacing 60 miles of state roadways and the replacement of the drainage systems on these roads. Responsible for giving direction to the contractor in accordance with Pennsylvania's requirements; performing tests and calculations to ensure optimum durability and quality of work; and keeping daily records and organizing daily reports for supervising engineers.

Publications

Bacon, G.H., Kozuh, W.J., Linder, M.G.,**"Expediting a Landfill Title V Permit,"** *Proceedings*, Third Annual Landfill Symposium of the Solid Waste Association of North America, Palm Beach Gardens FL, June 23, 1998.

Bacon, G.H.,**"Risk Management Program and Process Safety Management,"** presented at the 71st Annual Conference of the Arizona Water and Pollution Control Association, Chandler AZ, May 6-8, 1998.

Bacon, G.H., Liang, K.Y., Li, R. .,**"Controlling Particulate Matter and Metal HAPs,"** *Chemical Engineering Progress*, pp. 59-67, December 1997.

Bacon, G.H., Frillici, P.W.,**"Evaluation of Mercury Emission Reduction Alternatives for the Fort Dix Resource Recovery Facility,"** presented at the Annual Meeting of the Air and Waste Management Association, Denver CO, June 1993.

Ms. Heeter has participated extensively in remedial investigations and the remediation of hazardous waste remnants at the Davis-Monthan Air Force Base near Tucson, including basewide groundwater monitoring to identify contaminants of concern and evaluate their impact on regional groundwater quality. To support data collection for the groundwater monitoring program, she established an Environmental Resource Program Information Management System for Malcolm Pirnie. She also participated in the implementation of partial closure plans for contaminated areas at the base. For the City of Tucson, Ms. Heeter helped develop a reclaimed water system master plan, including identification of potential new customers. Other experience includes the evaluation of potential problem areas in an interceptor sewer and laboratory testing of soils and concrete.

Detailed Experience

- **City of Tucson: Tucson Water Reclaimed Water System Master Plan / Tucson, AZ.** Engineer involved in development of Geographical Information System (GIS) database used to assist identification and prioritization of potential future reclaimed water customers for the City of Tucson. Approximately 1,500 potential new customers were identified with an estimated total annual demand of 33,000 acre-feet. The resulting database was crucial in the typical master planning activities of identifying and evaluating system expansion alternatives.
- **Pima County, Wastewater Management Division: North Rillito Interceptor Evaluation / Tucson, AZ.** Engineer involved with evaluation of the North Rillito interceptor sewer to identify structural and capacity deficiencies. Evaluation included determining the physical condition of the sewer pipe, developing alternative proposals for providing required capacity and structural integrity, and performing inflow study to identify possible problem areas. Closed circuit television of sewer and flow/odor measurement services were implemented in this project.
- **U.S. Army Corps of Engineers, Omaha District: Compliance/Closure Support / Davis-Monthan Air Force Base, AZ.** Engineer involved in revision and implementation of partial closure plans for the DRMO-Tucson Hazardous Waste Container Storage Facility and Explosive Ordnance Disposal Range at Davis-Monthan AFB. Involved in preparation of the revised closure plan for the DRMO-Tucson facility, a RCRA treatment, storage, and disposal facility used from 1982 to the present for hazardous material and hazardous waste storage.
- **U.S. Army Corps of Engineers, Omaha District: Basewide Groundwater Monitoring / Davis-Monthan Air Force Base, AZ.** Engineer involved with implementing the basewide groundwater monitoring program under the United States Air Force Installation Restoration Program

Title/Firm
Engineer,
Malcolm Pirnie, Inc.

Years of Experience
6

Education
BS Civil Engineering University of Arizona 1998

Registration and Certifications
1999 Engineer in Training

Health and Safety Training
Hazardous Waste Operations Eight (8) hour refresher
Bloodborne Pathogens Exposure Control
Cardiopulmonary Resuscitation
Hazardous Materials Transportation Training
First Aid
Hazard Communications
Medical
Hazardous Waste Operations Site Supervisor

Special Recognition
Jane H. Rider Scholarship for Women in Engineering

Societies
American Society of Civil Engineers
Society of Civil Engineers
Society of Women Engineers

Employment History
Malcolm Pirnie, Inc. 1998 to present
Arizona Department of Transportation 1997 to 1997
Hughes Missile Systems 1996 to 1997
University of Arizona 1995 to 1998
Motorola, Inc. 1994 to 1994

at Davis-Monthan AFB, including quarterly to annual monitoring at 11 wells to assess annual regional groundwater quality using a suite of analyses to identify potential contaminants of concern. Site-specific depth to groundwater and groundwater quality data were utilized to evaluate the direction of groundwater flow, quality of groundwater beneath the base, and to verify effectiveness of soil vapor extraction and groundwater treatment at the flight line pumphouse. In addition, data from base production wells and City of Tucson municipal production wells were evaluated to assess the impact of basewide activities on regional groundwater quality.

- **U.S. Army Corps of Engineers, Omaha District: Basewide Groundwater Monitoring Program: Program Information Management System / Davis-Monthan Air Force Base, AZ.** Engineer responsible for establishing Environmental Resources Program Information Management System (ERPIMS) data capabilities within Malcolm Pirnie. Responsible for coordinating input of data for nine quarterly groundwater monitoring rounds. Coordinated efforts with laboratory, Army Corps of Engineers, and the Air Force Center for Environmental Excellence (AFCEE) to ensure validation and ease of submission.
- **Arizona Department of Transportation, Laboratory Technician for Southern Region Materials Lab / Tucson, AZ.** Performed soil and aggregate tests: gradation, sand equivalents, fractured faces, pH, resistivity, and plasticity index. Performed asphaltic concrete analysis: gradation, rice density, bulk density (Marshall). Performed concrete strength testing.

Publications

Arn, T.E., Heeter, C.N.,**"Odor Control Strategies: Managing the 'Third Effluent' to Remain a Good Neighbor,"** *Proceedings*, Annual Conference of the Arizona Water and Pollution Control Association, Mesa AZ, May 3, 2000.

APPENDIX L

ZONING DOCUMENTATION

NOTICE OF PUBLIC HEARING

A Public Hearing will be held before the Planning Commissioin of The Town of Gila Bend on:

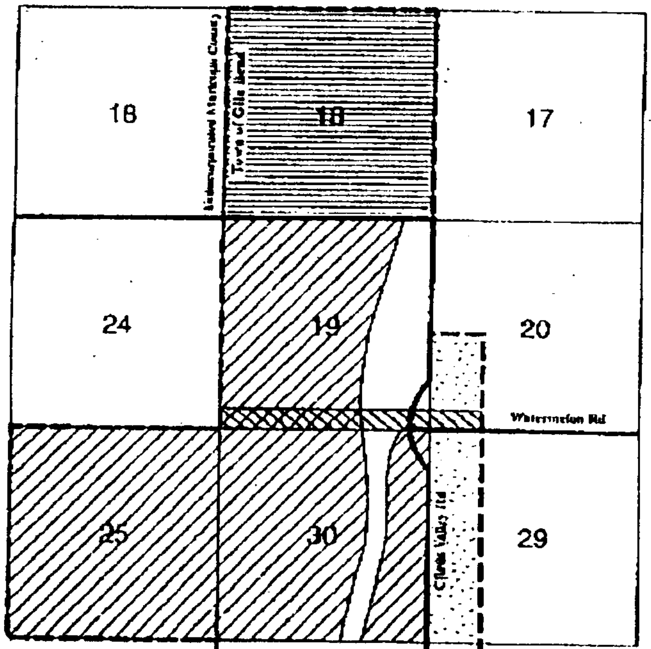
DATE: Thursday, November 9, 2000

TIME: 7:00 pm

PLACE: Gila Bend Town Hall, 644 West Pima Street
Gila Bend, AZ 85337

CASE: GPA-00-05

GPA-00-05, to consider a proposed General Plan Amendment to the Town of Gila Bend General Plan to change the land use designation on Section 19 Township 5 South Range 5 West from unplanned to Heavy Industrial and open space.



Proposed General Plan Amendment

- Town Boundary
- Heavy Industrial
- Light Industrial
- Parks/Open Space
- Utility Corridor (500')
- Unplanned

Interested persons may file written comments concerning the proposed amendments and/or appear and be heard at the public meeting. Copies of the proposed amendments will be available at the Town Hall.

Accessibility for all persons with disabilities will be provided upon request. Please telephone your accommodation request (683-2255 or 1-800-367-8939 ADD Arizona Relay Service) 72 hours in advance if you need a sign language interpreter or alternate materials for a visual or hearing impairment.

Number of Publications two: Dates of Publication, October 19 & 26, 2000

NOTICE OF PUBLIC HEARING

A Public Hearing will be held before the Planning Commissioin of The Town of Gila Bend on:

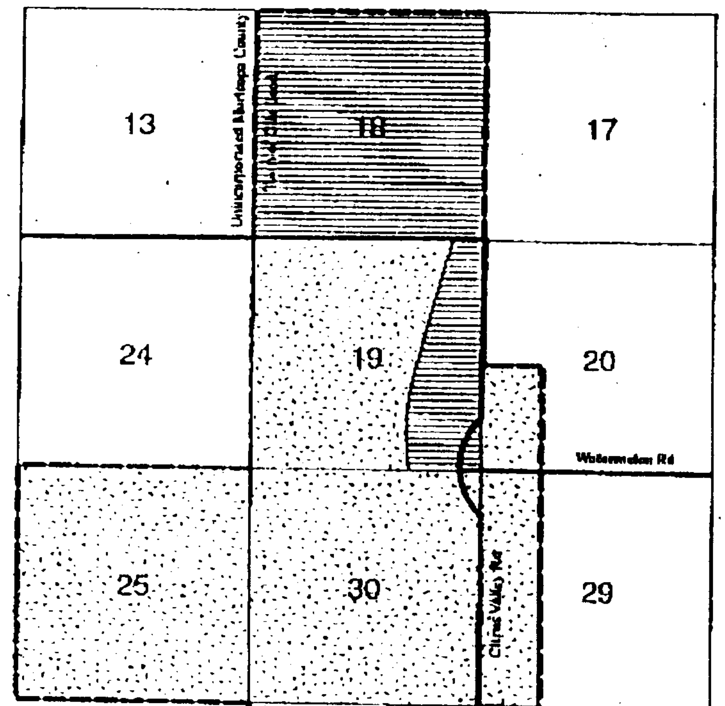
DATE: Thursday, November 9, 2000

TIME: 7:00 pm

PLACE: Gila Bend Town Hall, 644 West Pima Street
Gila Bend, AZ 85337

CASE: Z-00-26

Z-00-26, to consider a proposed amendment to the Zoning Ordinance to change the zoning on Section 19 Township 5 South Range 5 West from AG to Heavy Industry.



Proposed Zoning Change

- Town Boundary
- Agriculture
- I-3

Interested persons may file written comments concerning the proposed amendments and/or appear and be heard at the public meeting. Copies of the proposed amendments will be available at the Town Hall.

Accessibility for all persons with disabilities will be provided upon request. Please telephone your accommodation request (683-2255 or 1-800-367-8939 ADD Arizona Relay Service) 72 hours in advance if you need a sign language interpreter or alternate materials for a visual or hearing impairment.

Number of Publications two: Dates of Publication, October 19 & 26, 2000

MEMORANDUM

To: Town of Gila Bend Planning Commission and Town Manager

From: EPG

Date: October 27, 2000

RE: Proposed General Plan Amendment and Proposed Zoning Change

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The proponents are requesting that the proposed plan amendment and zoning change for Section 19, Township 5S, Range 5W be modified as follows:

1. The southeast corner of Section 19, east of Citrus Valley Road further described in Maricopa County Assessor's Book 403, Map 15 Parcel 49E will be designated "I-3" and "Light Industrial." The parcel is currently shown as "AG" and "Parks/Open Space" in the proposed zoning change and plan amendment, respectively. Maps are attached which represent the modified boundaries for these changes. As modified, this is an appropriate use because of the parcel's location between a paved road and adjacent to an area shown in the existing plan as "Light Industry" and zoned "I-3."

2. The alignment shown in the maps for Section 19, Township 5S, Range 5W be modified to reflect the East ½ of the East ½ of Section 19 to be designated "AG" and "Parks/Open Space" in the proposed zoning change and plan amendment respectively. This will more accurately define the property intended for the "Parks/Open Space" and "AG" designations and offset the removal of the above mentioned parcel 49E from the existing proposed change.

The proponents assert that there is no intent to diminish the overall amount of land reserved for "Open Space," but believe that the above requested designations would be more consistent with planned uses and zoning.

TOWN OF GILA BEND

APPLICATION FOR A CHANGE IN ZONING

DATE FILED:____________________

APPLICATION FEE PAID: __**$0**__ DEPOSIT PAID: ____**$0**__ CHECK NO:__________

BANK:________________________ RECEIVED BY:________

General Plan Designation: __**Unplanned**________________________________

Property Legal Description, Assessor's Parcel Number, and Address:

__**Assessor's Parcel Number: 403-15-049H, 049J, 049K, 049L, 049M, 049N, 048**______

T&R, Sec: T5S, R5W, Section 19, except a portion of the E ½ of the E ½ of Section 19.

____

NUMBER OF ACRES ___**480**___ ZONING: Existing __**AG**_ Proposed ___**I-3**_____

Applicant Name: __**Gila Bend Planning Commission**_________________________

Address (mailing and physical): ____

Telephone: _______________________ FAX: _______________________

Owner's Name (If other than petitioner): __**S&P Farms, Paloma Ranch, and US Government**

Address: __**See Section 3 for full addresses**_____________________________

Telephone:__ ____

INSTRUCTIONS

The following items must be submitted with the application at the time of filing:

____ Assessor's Parcel Map(s) showing all properties within 100 feet.

____ A description of the impact of the proposed use will have in relation to the health, safety, and general welfare of the occupants of surrounding lands, and consistency with the Town's General Plan.

____ Vicinity map showing all property within 300 feet by name of owner, a set of mailing labels for each property owner within 300 feet, and a copy of the vicinity map in an 8½" X 11" format on white paper and on a transparency

Certification:

I certify that the information I have given on this application is true and accurate to the best of my knowledge.

_________________ _________________

Applicant's Signature

SECTION 3: MAILING ADDRESSES OF LANDOWNERS

S&P Farms
205 W. Sonoma Dr.
Litchfield Park, AZ 85340

Paloma Ranch
1999 Avenue of the Stars, Suite 1200,
Los Angeles, CA 90067

United States Government
PO Box 81169
Phoenix, AZ 85068

San Lucy Division, Tohono O'Odham Nation

520 683 2343

TOWN OF GILA BEND

APPLICATION FOR AN AMENDMENT TO THE GENERAL PLAN

DATE FILED:__________ APPLICATION FEE PAID: __$0__ DEPOSIT PAID: __$0____

CHECK NO:__________ BANK:____________________ RECEIVED BY:____________

ZONING: Existing __*AG*____ Proposed __I-3 and AG__ Number of Acres __640____

GENERAL PLAN DESIGNATION: Existing: __Unplanned__ Proposed __Open Space and Heavy Industrial__

Property Legal Description, Assessor's Parcel Number, and Address:

Assessor's Parcel Number: 403-15-049E, 049H, 049J, 049K, 049L, 049M, 049N, 048

T&R, Sec: Township 5S, Range 5W, Section 19

Applicant Name: __**Gila Bend Planning Commission**__

Address (mailing and physical): ______________________________

Telephone: ______________________ FAX: ______________________

Owner's Name (If other than petitioner): __**S&P Farms and Paloma Ranch**__

Address: __**See Section 3 for full addresses**__

Telephone:__ ____

INSTRUCTIONS
The following items must be submitted with the application at the time of filing:

____ Assessor's Parcel Map(s) showing all properties within 100 feet

____ A description of the impact of the proposed use will have in relation to the health, safety, and general welfare of the occupants of surrounding lands, and consistency of the proposed amendment with the General Plan outside of the proposed amendment area.

____ Vicinity map showing all property within 300 feet by name of owner, a set of mailing labels for each property owner within 300 feet, and a copy of the vicinity map in an 8½" X 11" format on white paper and on a transparency

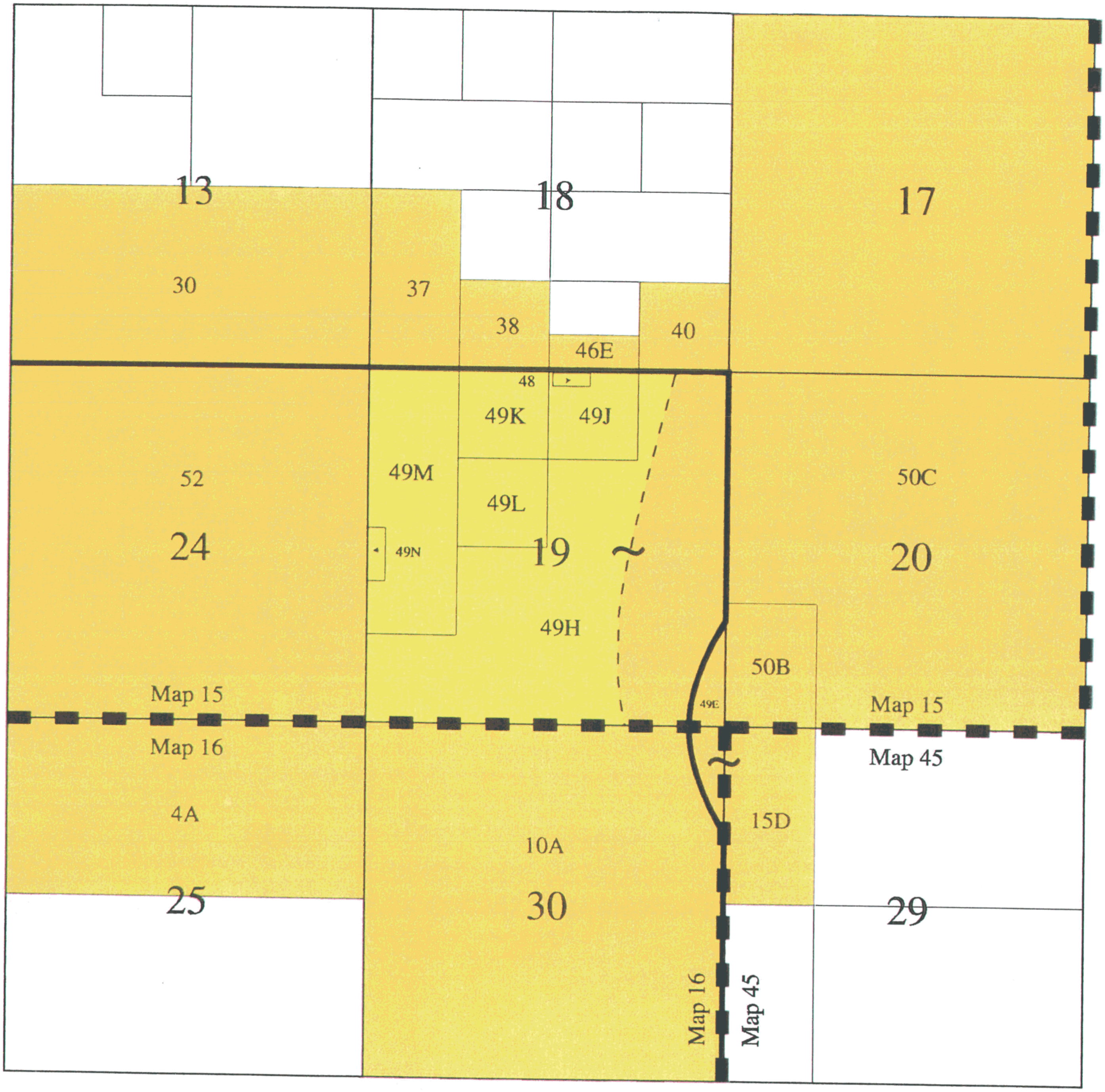
Certification:
I certify that the information I have given on this application is true and accurate to the best of my knowledge.

________________ ________________
Applicant's Signature

SECTION 2: IMPACT ASSESSMENT

The site is located on the west side of Citrus Valley Road immediately north of approximately 1,500 acres of land in Section 30, T5S, R5W, that is planned for heavy industrial use, specifically a commercial landfill. The surrounding lands include a mixture of agricultural and desert lands. The proposed use of the parcel, Heavy Industrial, is consistent with the General Plan designation for the adjacent properties within the town limits, which are Heavy Industrial to the south and Light Industrial to the east.

The site is intended to be developed for a combined cycle power generating facility. There are no occupants on surrounding lands within 300 feet of the subject parcel and, therefore, impacts to residents will be minimal. Additional information regarding health, safety, and welfare is included in the Application for a Certificate of Environmental Compatibility (Gila Bend Power Partners, LLC, September 2000).

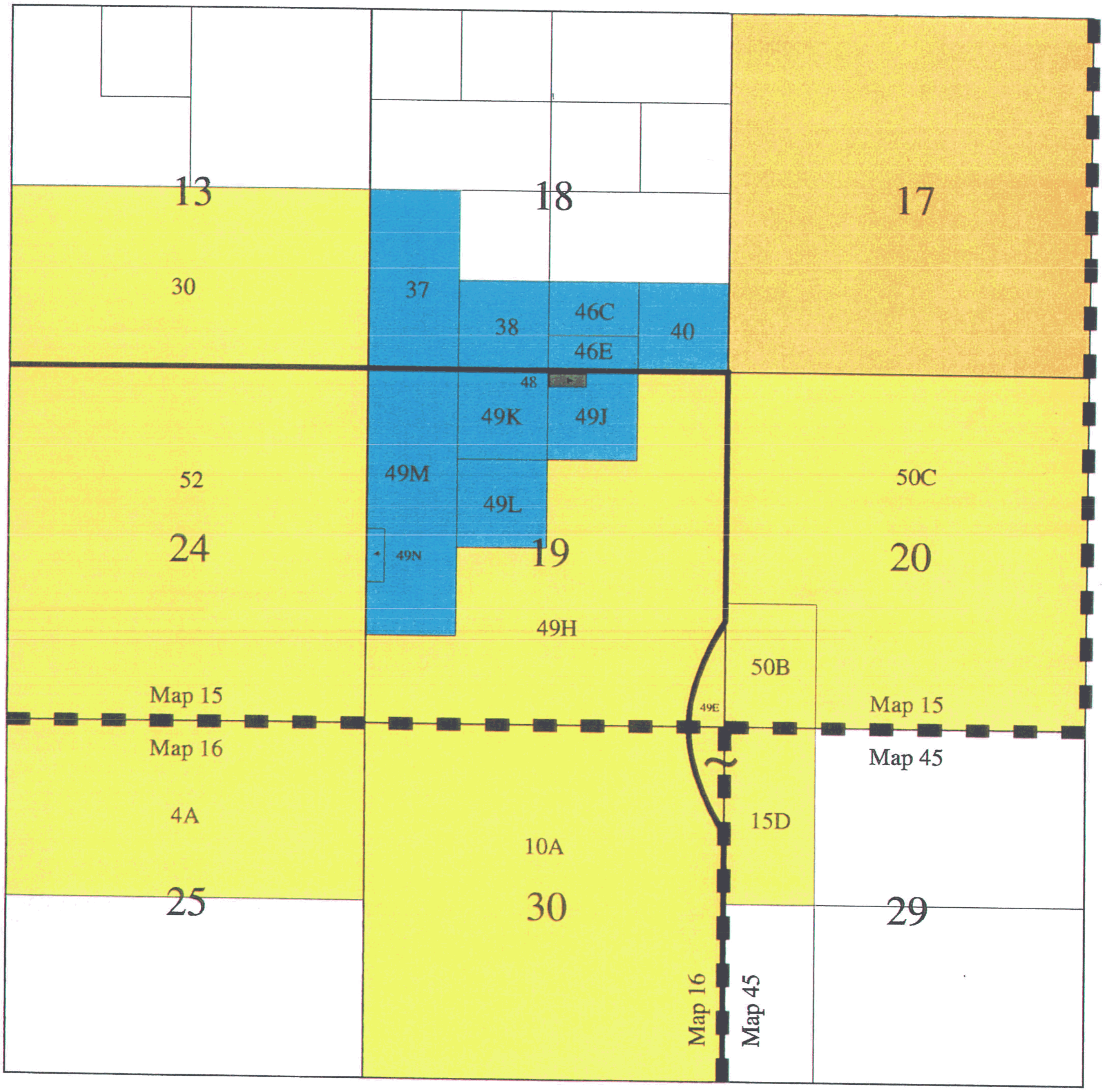


Properties Within 100' of Site

Properties Within 100'

Area Subject to Zoning Change

Figure 1
Township 5S, Range 5W
Section 19

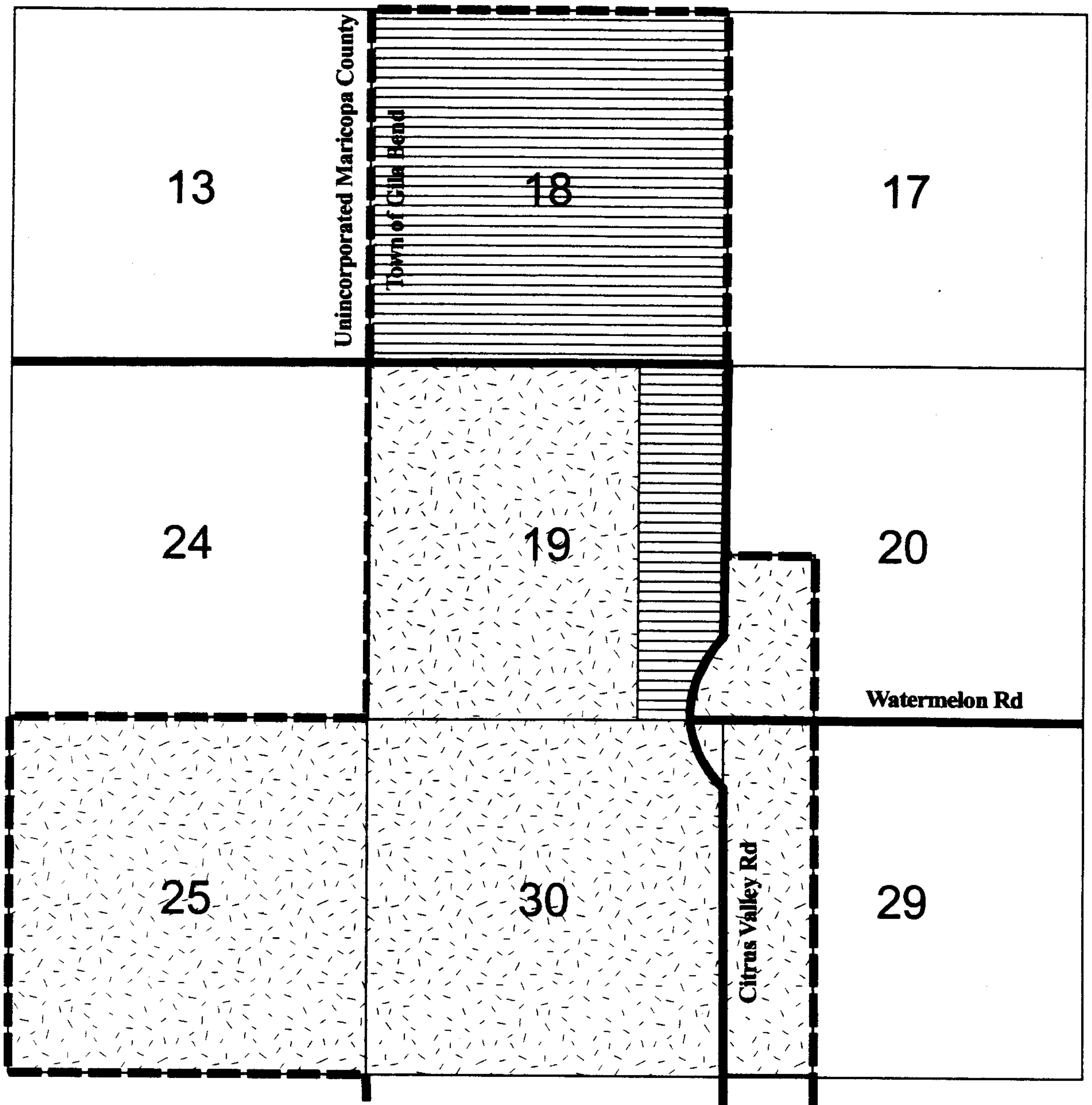


Parcels and Landowners Within 300' of Site*

*See Attachment for Addresses

- Paloma Ranch
- S&P Farms
- San Lucy District, Tohono O'Odham Nation
- United States Government

Figure 2
Township 5S, Range 5W
Section 19



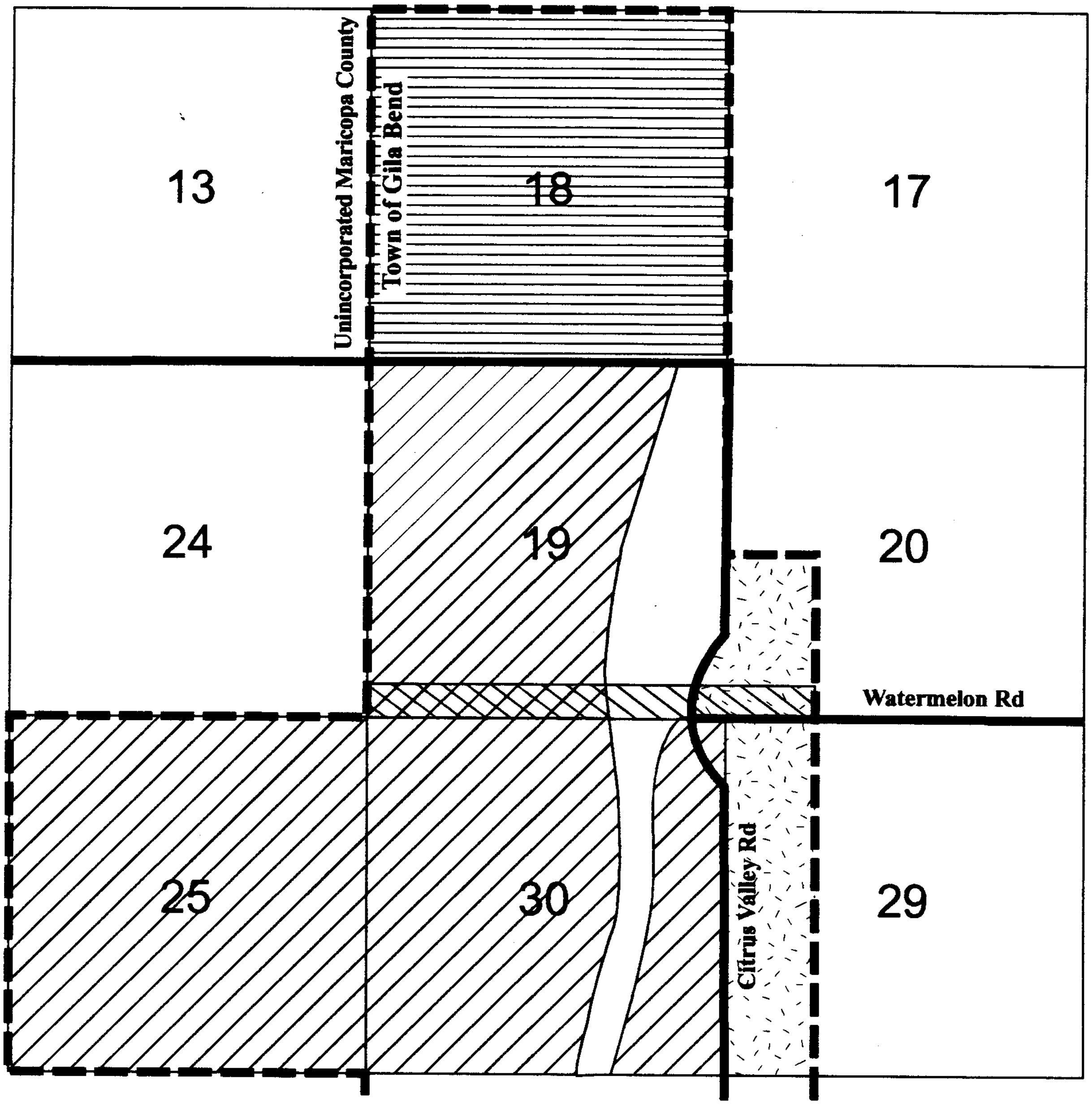
Proposed Zoning Change

Town Boundary

Agriculture

I-3

Section 19, Township 5S
Range 5W



Proposed General Plan Amendment

- Town Boundary
- Heavy Industrial
- Light Industrial
- Parks/Open Space
- Utility Corridor (500')
- Unplanned

Section 19, Township 5S
Range 5W

APPENDIX M

CERTIFICATION STATEMENT

CERTIFICATION STATEMENT

I certify under penalty of law, that I have personally examined and am familiar with the information submitted in this application and all attachments, and that based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true and accurate to the best of my knowledge. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Signature of Responsible Official of Organization Robert A. [signature]

Official Title of Signer:

Gila Bend Power Partners, L.L.C.

By: PowerDevelopment Gila Bend, L.P., Member

By: PowerDevelopment Enterprises, L.P., G.P.

By: Robert A. Innamorati & Co., Inc., G.P.

By: Robert A. [signature]
Robert A. Innamorati
Its: President

Typed or Printed Name of Signer: Robert A. Innamorati

Date: 11-13-00 Phone Number: (214) 210-5080

Please check the box that applies:

☐ Owner ☐ Operator ☒ Both owner and operator