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# REPORTS

DATE:
APRIL 1993

# ENVIROTECH INC.

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OIL CONSERVATION DIV.
SANTA FE

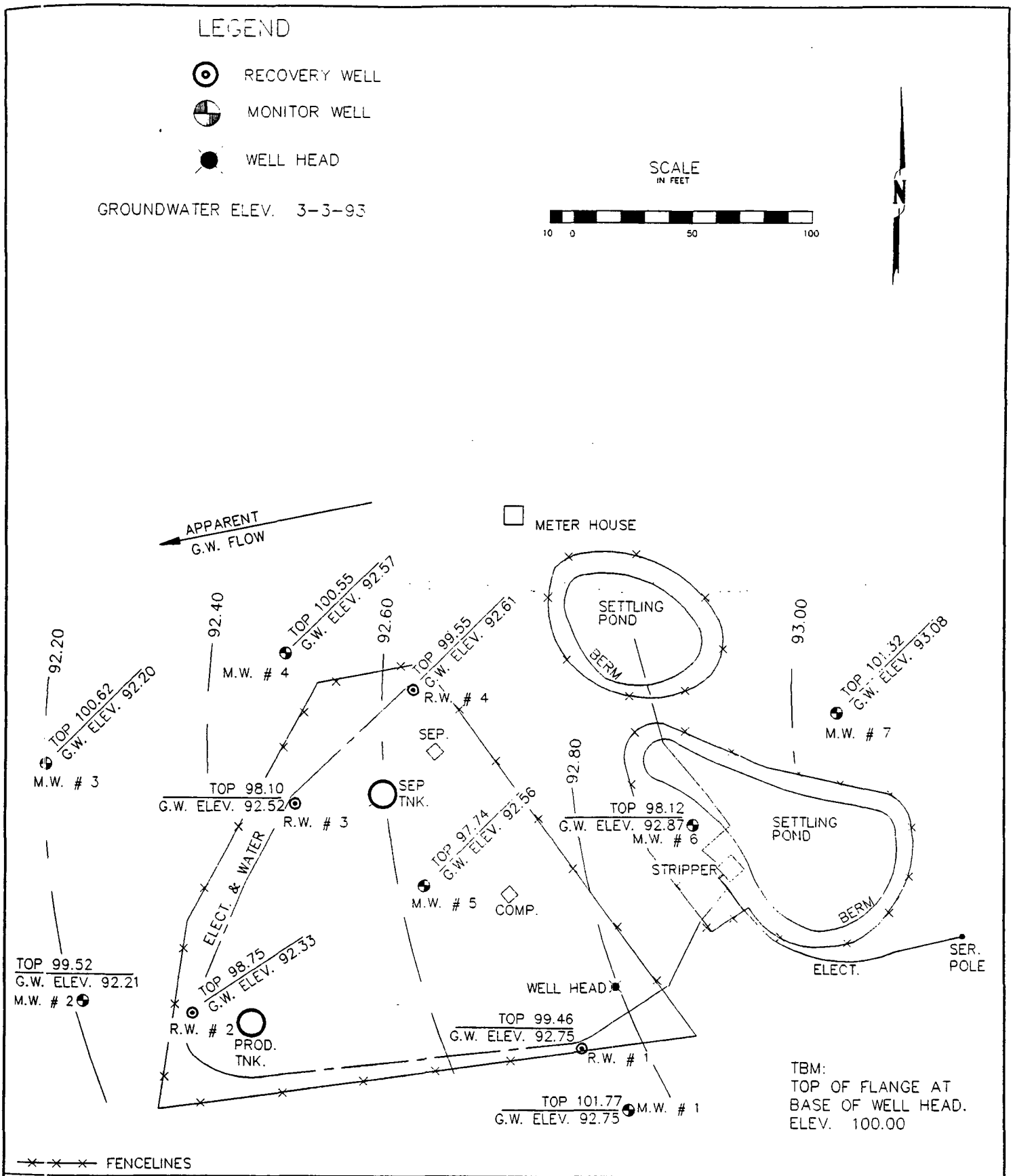
# PROPOSED REMEDIAL ACTION PLAN
# AMOCO PRODUCTION COMPANY
# SAN JUAN GRAVEL TANK BATTERY A #1
# PRODUCTION TANK PIT AREA
# FARMINGTON, SAN JUAN COUNTY
# NEW MEXICO

**PREPARED FOR:**
MR. BUDDY SHAW
ENVIRONMENTAL COORDINATOR
AMOCO PRODUCTION COMPANY

APRIL 1993

## PROJECT/PIT NO.: 92140/C4028-29

*5796 U.S. HIGHWAY 64 - 3014 • FARMINGTON, NEW MEXICO 87401 • PHONE: (505) 632-0615*



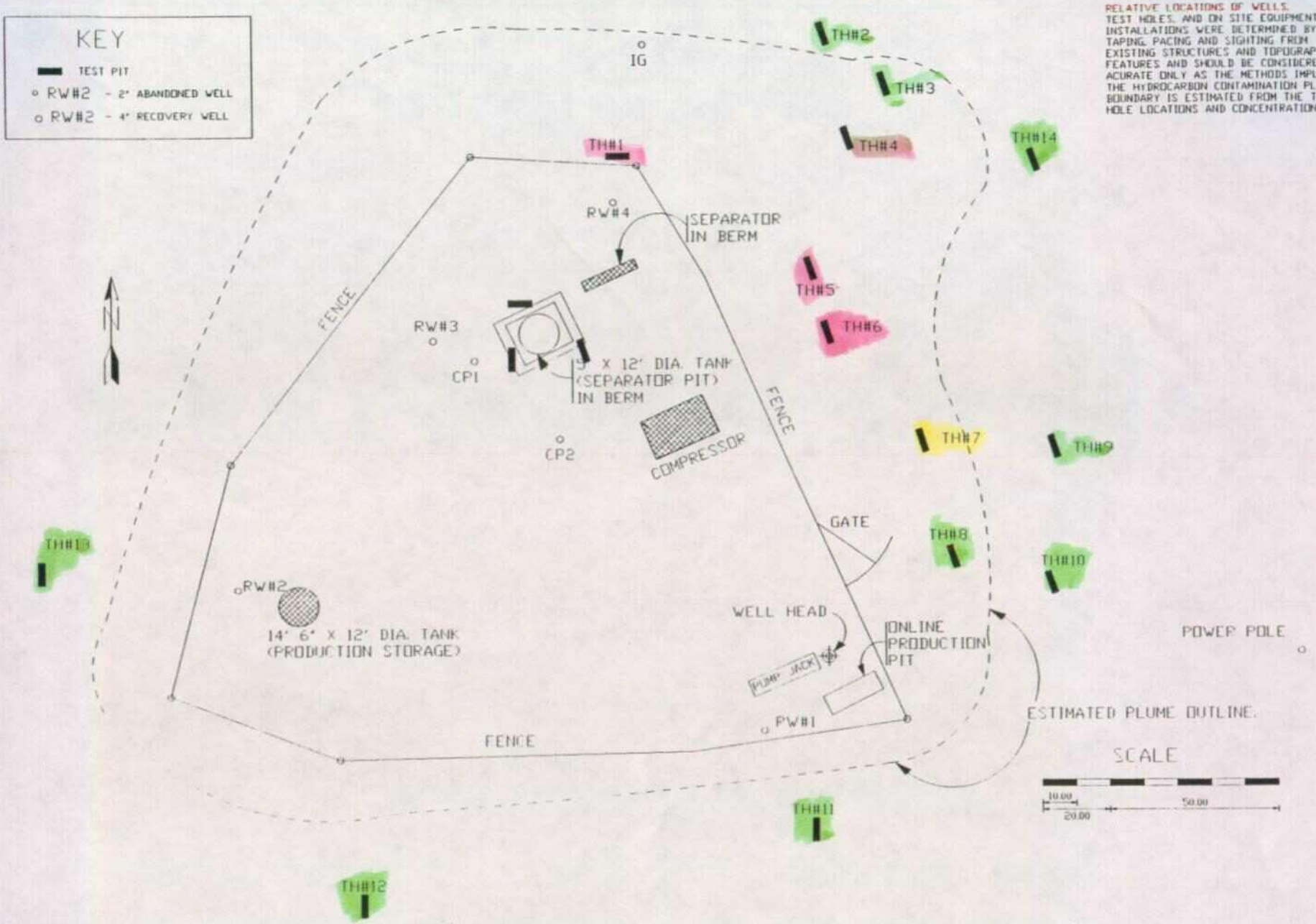

SITE DIAGRAM
AMOCO PRODUCTION CO
SAN JUAN GRAVEL
TANK BATTERY A-1

PROJECT NO. 92140/94028


ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615


ENGINEERED BY: DEF
DRAWN BY: DEF
PROJECT MGR.: JW
DATE SURVEYED: 2-24-93
DATE DRAWN: 3-2-93

SHEET: #3




SAN JUAN GRAVEL TANK BATTERY #1
NE 4, SE/4, SEC 21, T29, R13W
PRODUCTION TANK PIT AREA
REMEDIATION PLAN PROJECT NO: 92140/94028-29

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

SITE PLAN
SHEET 2
9/4/92

# PROPOSED REMEDIAL ACTION PLAN
# AMOCO PRODUCTION COMPANY
# SAN JUAN GRAVEL TANK BATTERY A #1
# PRODUCTION TANK PIT AREA
# SE¼, SE¼ (P) SECTION 21, T29N, R13W, NMPM
# FARMINGTON, SAN JUAN COUNTY, NEW MEXICO

PREPARED FOR:
MR. BUDDY SHAW
ENVIRONMENTAL COORDINATOR
AMOCO PRODUCTION COMPANY

PROJECT/PIT NO.: 92140/C4028-29

APRIL 1993

ENVIROTECH, INC.
Environmental Scientists & Engineers
5796 U.S. Highway 64-3014
Farmington, New Mexico
(505) 632-0615

PROJECT NO: 92140/C4028-29 APRIL 1993

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AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A #1

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AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A #1

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April 1993 PROJECT/PIT NO: 92140/C4028-29

PROPOSED REMEDIAL ACTION PLAN
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A #1
PRODUCTION TANK PIT AREA
SE¼, SE¼ (P) SECTION 21, T29N, R13W, NMPM
FARMINGTON, SAN JUAN COUNTY, NEW MEXICO

Amoco Production Company proposes to remediate soil and groundwater contamination resulting from the production equipment and storage system associated with the subject well located in the Southeast ¼ of the Southeast ¼ of Section 21, Township 29N, Range 13W, NMPM, San Juan County, New Mexico. This remedial action plan was developed by Amoco Production Company and Envirotech, Inc. based on the findings of field pit assessments of a production overflow pit and an abandoned separator pit at the site. This remedial Action Plan has been prepared pursuant to draft "Guidelines to Surface Impoundment Closure" (February 1993), State of New Mexico, Oil Conservation Division (NMOCD).

Full implementation of this Remedial Action Plan will be contingent on the approval of NMOCD.

## PURPOSE & SCOPE OF SERVICES

The purpose of the proposed remediation is to abate soil and groundwater contamination caused by discharge during the normal operation of the subject oil/gas production well. This well was previously operated by Tenneco Oil and is presently operated by Amoco Production. The New Mexico Oil Conservation Division's guidelines and protocol will be followed.

The proposed scope of work for this remediation and abatement will consist of:

A. Notification of the NMOCD and any other appropriate authorities of the intent to remediate the referenced site.

B. Abatement of the contaminated areas by installation, operation, and maintenance of a groundwater treatment system.

C. Reclamation assessment by testing groundwater monitor wells during abatement to monitor the success of the clean up system.

D. Supplemental site assessment to determine the successful abatement and for closure of the site.

E. Documentation of the abatement and closure.

## SITE DESCRIPTION

The San Juan Gravel Tank Battery A #1 well site is located in the Southeast 1/4 of the Southeast 1/4 of Section 21, Township 29N, Range 13W. Access to the site is from South Butler Street, Farmington and into the Bolack Game Refuge. Unpaved roads follow the river to approximately ¼ mile west of the west Game Refuge fence. Refer to the attached vicinity map (Sheet 1).

The site is an active crude oil and natural gas well, producing from the Dakota Formation. Surface equipment at the site consists of a sucker rod pumping unit, an above ground production storage tank (approximately 300 bbl) an above ground steel production overflow pit (approximately 100 bbl), a separator, and a natural gas compressor pump. Refer to the attached site plan for the approximate location of the referenced well site processing equipment (Sheet 2).

The site was originally constructed and the well drilled by Tenneco Oil Company. The date of completion was not available as of this writing. The site appeared to be built using normal cut/fill methods. The entire site appears to be have been built at ground level on the original floodplain. The soils appear to be dense, well graded gravels and sands with large cobbles and minor silt and clay lenses.

The depth to groundwater is approximately seven feet (7') below ground surface with a gradient toward the southwest.

## SITE ASSESSMENT SUMMARY

In 1992 Amoco Production Company retained Envirotech Inc. to perform preliminary assessments of unlined impoundments (pits) on numerous well locations throughout the San Juan Basin. The preliminary pit assessments were to screen those areas suspect as having hydrocarbon contamination from previous unlined earthen pits. Due to the findings of the preliminary assessments for the subject location, additional field exploration was conducted subsequently to; 1) establish the vertical and horizontal extent of contamination, 2) characterize the site soil and groundwater conditions, and 3) develop a remedial action plan to reclaim the site.

### Field Exploration

On the San Juan Gravel Tank Battery A-1 site there were two (2) active pits; one associated with the compressor and separator, and another associated with the wellhead.

All site assessment was performed by advancing test holes with a backhoe in areas where spills or soil and/or groundwater contamination was suspected.

Grab soil and groundwater samples were collected from the test holes following US EPA SW-846 protocol. Soil samples were field screened for volatile hydrocarbons following the Headspace Field Method [Guidelines For Surface Impoundment Closure, New Mexico Oil Conservation Division, Part 1 (IA.2a) October 29, 1991] using a photoionization detector (PID). To characterize any hydrocarbon contamination, additional soil and groundwater samples were collected and submitted for laboratory analysis. Laboratory analyses included aromatic hydrocarbons [specifically, Benzene, Toluene, Ethyl-benzene and Xylene (BTEX)] per EPA Methods 8020 and 3810 and Total Recoverable Petroleum Hydrocarbons (TPH) per US EPA Method 418.1.

### Site Assessment

Two preliminary pit assessments were initiated in April 1992. For the compressor/separator pit, three test holes were advanced around pit and one test hole in a down gradient location. For the wellhead overflow pit, one test hole was advance in the center of the pit. Significant soil and groundwater contamination was identified during the initial assessments.

Following the pit assessments in August through September 1992, fourteen additional test holes were advanced in and around the entire well location to fully characterize the extent of contamination.

The site diagram (Appendix A: Sheet 2) shows the location of the test holes and the attached field assessment reports summarize the field findings of the assessments.

Based on the assessments, the subsurface soils in the area of the tank battery area typical alluvial sediments consisting primarily of well graded sands and gravel with variable amounts of silt and clay in lenses and stringers. There is significant hydrocarbon contamination of soil and groundwater throughout the site. The plume encompasses the entire fenced area of the storage complex, and extends east of the separator approximately 90 feet (up gradient). In all other directions, the plume extends 10 to 50 feet beyond the location fence.

Soil contamination extends from the surface to the groundwater interface in the areas of the compressor/separator and well head pits, and around some of the piping. In other areas the soil contamination is limited to the vadoze zone one to two feet above the groundwater. Soil TPH ranged from 500 to 3000 ppm with total BTEX on the order of 1 to 3 ppm.

A small amount of free product was observed on the groundwater, and dissolved phase BTEX contamination exceeded the regulatory action levels. Significant groundwater contamination is believed to be limited to within the storage location fence.

The source of the contamination is suspected to be from the two unlined pits, piping leaks and other activities that Tenneco may have done during the drilling and production (eg. abandoned reserve pits) east of the location.

Groundwater Assessment

Monitor wells were installed during the field assessment and placed at locations around the site to monitor the groundwater contamination, and the progress of the anticipated cleanup effort.

Monitor wells were drilled using a CME-55 truck mounted drill, with eight inch (8") hollow-stem augers. The monitor wells were typically constructed using two inch (2") diameter threaded-coupling schedule 40 PVC casing. A ten foot screen section (0.020" slot size) was set with the top of screen a minimum of two feet (2') above the groundwater level encountered during drilling. The screened interval was gravel packed to a minimum of one foot (1') above the slotted interval with 8-12 gradation silica sand and sealed with 200 mesh bentonite. Blank PVC casing was used to

complete the wells to eighteen inches (18") above site grade. Each monitor well is secured with a locking cap. Refer to Appendix B for the monitor well details.

The depth to groundwater was measured during the development and sampling of the wells. As previously noted the depth to groundwater was observed to be on the order of six to eight feet below the site ground surface. This water level fluctuated significantly due to season recharge. The groundwater gradient is calculated to be to the southwest, flowing toward the San Juan River. Groundwater contours are plotted on a skeleton site plan (Appendix A: Sheet 3) with relative water levels given for each monitor well.

## PROPOSED RECLAMATION PLAN

It is proposed to abate the site by installation of a groundwater collection and treatment system. Due to the relative proximity of the site to the San Juan River and free product on the groundwater, AMOCO elected to initiate installation of the system to minimize offsite migration of contamination. The pump and treat system consists of; a collection gallery of four recovery wells, water treatment system with an oil/water separator and air stripper, water disposal in percolation/infiltration ponds, and groundwater monitoring. Sheet 4 Appendix B is a flow-chart of the pump and treat system.

Following completion of the initial installation, a pilot test of the system was conducted from March to April of 1993. The pilot was to fine tune the system, check flow rates, verify the treated water quality and complete a pump test of the recovery well collection gallery. Effluent was routed to the steel pit on location and disposed of at an approved NMOCD water treatment facility. No effluent was placed in the infiltration ponds.

Full implementation of the reclamation system is pending NMOCD review and approval of this RAP.

### Collection Gallery

The collection gallery consists of four recovery wells located within the AMOCO location and down gradient of the contamination source. Due to deep gravel and cobble subsurface soil conditions, the wells were installed using a cable tool rig driving slotted 8" steel casing. The wells were advanced to bedrock, a "blue" shale or siltstone at a depth of 18 to 28 feet below the site surface. Following drilling, the recovery wells were constructed with 4 1/2" PVC casing placed in the steel casing. The wells consisted of a screened interval (0.020" slot size) from approximately 6' to total depth, and sand filter packed with 8-12 gradation silica sand between the steel and PVC casing annulus. Four inch submersible water pumps have been placed in each recovery well, designed for an output for one to sixteen gallons per minute (gpm). Recovered groundwater from all four wells is commingled and piped to the water treatment system.

### Water Treatment System

The collected hydrocarbon contaminated groundwater will be initially treated by skimming free product in a 100 bbl settling tank. Recovered free product will be routed to the oil storage vessels at the tank battery. The water will then be routed through an air stripper to remove any dissolved phase hydrocarbons. The water treatment system has been design for an influent rate of 5 to 15 gpm. Refer to the Air Stripper Detail in Appendix B.

Based on similar air stripping systems of waters contaminated with produced crude, air emissions from the air stripper will be substantially below 10 pounds per day. Therefore, no air emission permits for air quality are anticipated.

Water Disposal

Once treated and below the New Mexico Groundwater Standards for hydrocarbons, the effluent will be pumped into two infiltration ponds. Both ponds are up-gradient of the contamination plume, with surface areas of approximately 3000 square feet (sf) and 1900 sf. The infiltration ponds were located up-gradient of the plume and constructed by shallow excavation, with berms to retain effluent and fenced to minimize livestock access. Infiltration tests in the ponds indicated a percolation rate on the order of 135 gpd/sf, indicating an infiltration capability on the order of 600,000 gpd. No additional gravel percolation galleries are anticipated to be required.

Monitor Wells

Seven groundwater recovery wells were installed to monitor the site and will be used to evaluate and monitor the clean-up. Four wells are located down and cross gradient (MW#1, MW#2, MW#3, and MW#4). Monitor well MW#5 is located near the center of the plume, and wells MW #6 and MW#7 are located up gradient.

Sheet 3 Appendix A is a site diagram showing the location of the recovery wells, treatment system, infiltration ponds and monitor wells.

Pilot Test

During the pilot test, a limited pump test was conducted in April 1993 to project the anticipated effective capture of the collection gallery. Recovery well #3 was used for the pump test. Based on the findings of the pump test and the earlier site assessments, the shallow aquifer is believed to be unconfined, with a transmissivity of approximately 3,000 gpd/foot, storativity of 0.25, and gradient of 0.003 feet/foot. The effective capture radius per well at a pump rate of one (1) to three (3) gpm is anticipated to be on the order of 50 to 100 feet with a drawdown on the order of 0.25 feet at the capture radius. Therefore, the four recovery wells are anticipated to effectively capture and collect any groundwater contamination from the site, assuming a sustained pump rate of 15 to 25 gpm. If groundwater monitoring indicates that contamination is continuing to migrate down gradient, additional evaluation of the collection system may be needed as noted in the pump test evaluation (Appendix D).

Recovery rates for the four wells indicated that RW #1 could only sustain a production of 1 to 1.5 gpm, while RW #2, RW #3, and RW#4

will produce between 5 to 8 gpm.

A groundwater sample from MW #5 indicates relatively fresh water with a TDS of 1,310 ppm. During the pilot start-up in March 1993, a water sample of the commingled influent to the air stripper indicated a benzene concentration of 280 ppb; well above the NMWQCC standard for groundwater of 10 ppb. Following the pump test and pilot shut-down, the effluent from the air stripper was sampled. Laboratory analytical results of the effluent indicated a benzene concentration of 4.7 ppb, total BTEX of 7.2 ppb, and TPH below a detection limit of 0.1 ppm. Therefore the water treatment system appeared to affectively treat the water to below the NMWQCC standards.

Operation & Maintenance

Based on the pilot, the system is anticipated to remove and treat approximately 15 to 25 gpm of contaminated groundwater. The addition of nutrients and/or biotreatments to the water in the infiltration ponds will be considered if substantial decreases in soil and groundwater contamination are not realized within the first quarter of system operation.

Successful reclamation is anticipated to take approximately one year (1). A site assessment similar in scope to the initial assessments may be necessary to verify completion and closure for the subject site.

Once in operation the following schedule will be followed to maintain the system and verify the success of the reclamation.

- Weekly inspection of the system to check and adjust flow rates, verify infiltration, and servicing as necessary. At this time no adjustment of the water pH is anticipated to minimize scaling of the water treatment system. However, pH adjustment will be provided if scaling becomes a problem.

- During the weekly inspections the concentration of off gasses from the air stripper will be tested with an organic vapor meter (OVM) and air flow meter to assure air quality standards are not exceeded.

- Initial sampling and analysis of the groundwater, recovered water and treated effluent from the air stripper and prior to placement in the infiltration ponds will follow Table 1.

- Following the initial water sampling and analysis, groundwater from the monitor wells and effluent will be collected quarterly following the schedule outlined in Table 2. All collected water samples will be analyzed for BTEX constituents.

TABLE 1
INITIAL WATER ANALYSIS
GROUNDWATER RECLAMATION SYSTEM
SAN JUAN GRAVEL TANK BATTERY A-1
AMOCO PRODUCTION COMPANY

| Sample Pt. | PAH | BTEX | TPH | A/C |
|---|---|---|---|---|
| All MW's | | X | X | |
| Influent | X | X | | |
| Effluent | X | X | X | X |

Notes: PAH - Polynuclear Aromatic Hydrocarbons analyzed per EPA Method 8100.

BTEX - Aromatic Hydrocarbons per EPA Method 8020.

TPH - Total Petroleum Hydrocarbons per EPA Method 8015.

A/C - major anions and cations analyzed following EPA 600 Standard Methods.

TABLE 2
QUARTERLY WATER SAMPLING SCHEDULE
GROUNDWATER RECLAMATION SYSTEM
SAN JUAN GRAVEL TANK BATTERY A-1
AMOCO PRODUCTION COMPANY

| MW - 1 | JUL.-SEPT. 93 | OCT.-DEC. 93 | JAN.-MAR. 93 | APR.-JUN. 93 |
|---|---|---|---|---|
| MW - 1 | | X | | X |
| MW - 2 | X | | X | |
| MW - 3 | | X | | X |
| MW - 4 | X | | X | |
| MW - 5 | X | X | X | X |
| MW - 6 | X | | X | |
| MW - 7 | | X | | X |
| EFFLUENT | X | X | X | X |

## CLOSURE & LIMITATIONS

Based on the performance of the water reclamation system on similar sites, successful reclamation is anticipated to take approximately one year (1). A site assessment similar in scope to the initial assessments may be necessary to verify completion and closure for the subject site.

This remedial action plan is based on the preliminary site assessments, laboratory analysis, information provided by Amoco Production Company, and previously approved RAP at similar sites.

NMOCD review and approval of this RAP is assumed to be the only regulatory approval required to implement and maintain this reclamation.

All services to be performed in the execution of this RAP and the development of this RAP are in accordance with generally accepted professional practices in construction/excavation and geotechnical/environmental/petroleum engineering.

This remedial action plan has been prepared for the exclusive use of Amoco Production Company as it pertains to their San Juan Gravel Tank Battery A #1 facility located on the Southeast ¼ of the Southeast ¼ of Section 21, Township 29N, Range 13W, NMPM, San Juan County, New Mexico.

Respectfully Submitted,
**ENVIROTECH, INC.**

Jim Weahkee
Civil Engineer

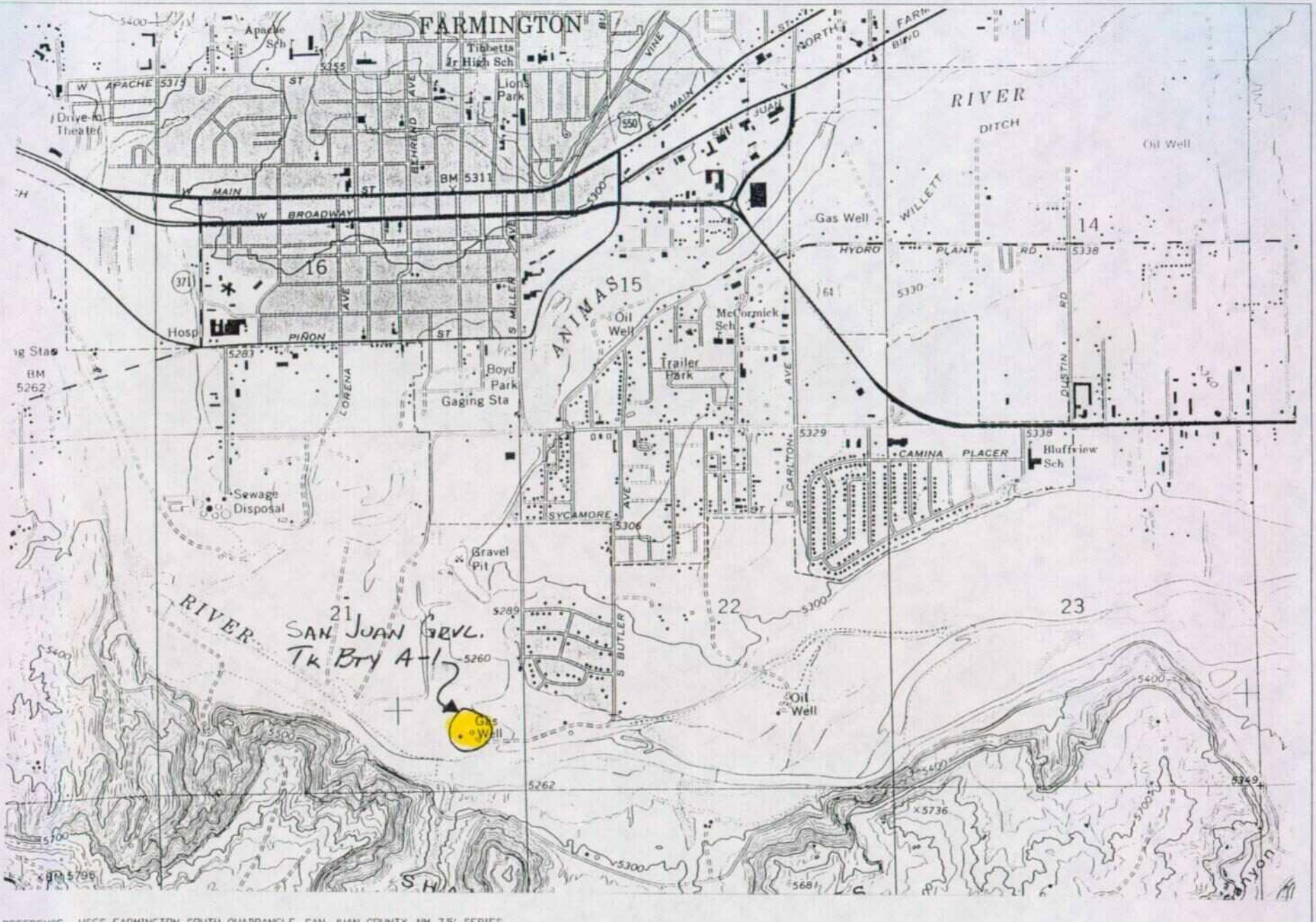
Reviewed by:

Michael K. Lane, P.E.
Geological Engineer

APPENDICES

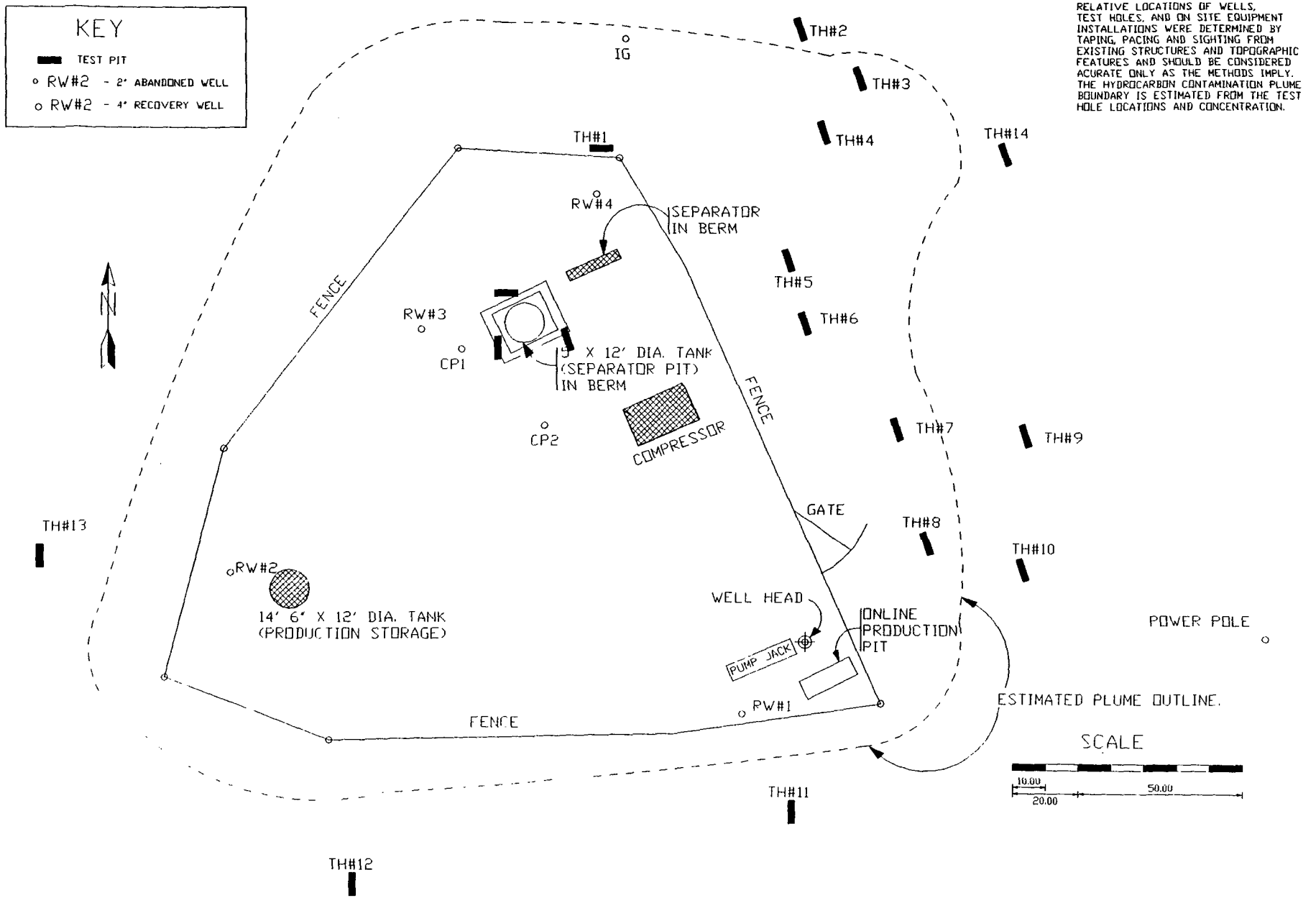
JW/MKL:mkl

4028RM.PLN




REFERENCE: USGS FARMINGTON SOUTH QUADRANGLE, SAN JUAN COUNTY, NM 7.5' SERIES.

| | | | |
|---|---|---|---|
| SAN JUAN GRAVEL TANK BATTERY #1<br>SE/4, SE/4, SEC 21, T29N, R13W<br>PRODUCTION TANK PIT AREA<br>REMEDIATION PLAN<br>PROJECT NO: 92140/94028-29 | AMOCO PRODUCTION COMPANY<br>200 AMOCO CT.<br>FARMINGTON, NEW MEXICO | ENVIROTECH INC.<br>ENVIRONMENTAL SCIENTISTS & ENGINEERS<br>5796 U.S. HIGHWAY 64-3014<br>FARMINGTON, NEW MEXICO 87401<br>PHONE: (505) 632-0615 | VICINITY MAP<br>SHEET 1<br>9/30/92 |

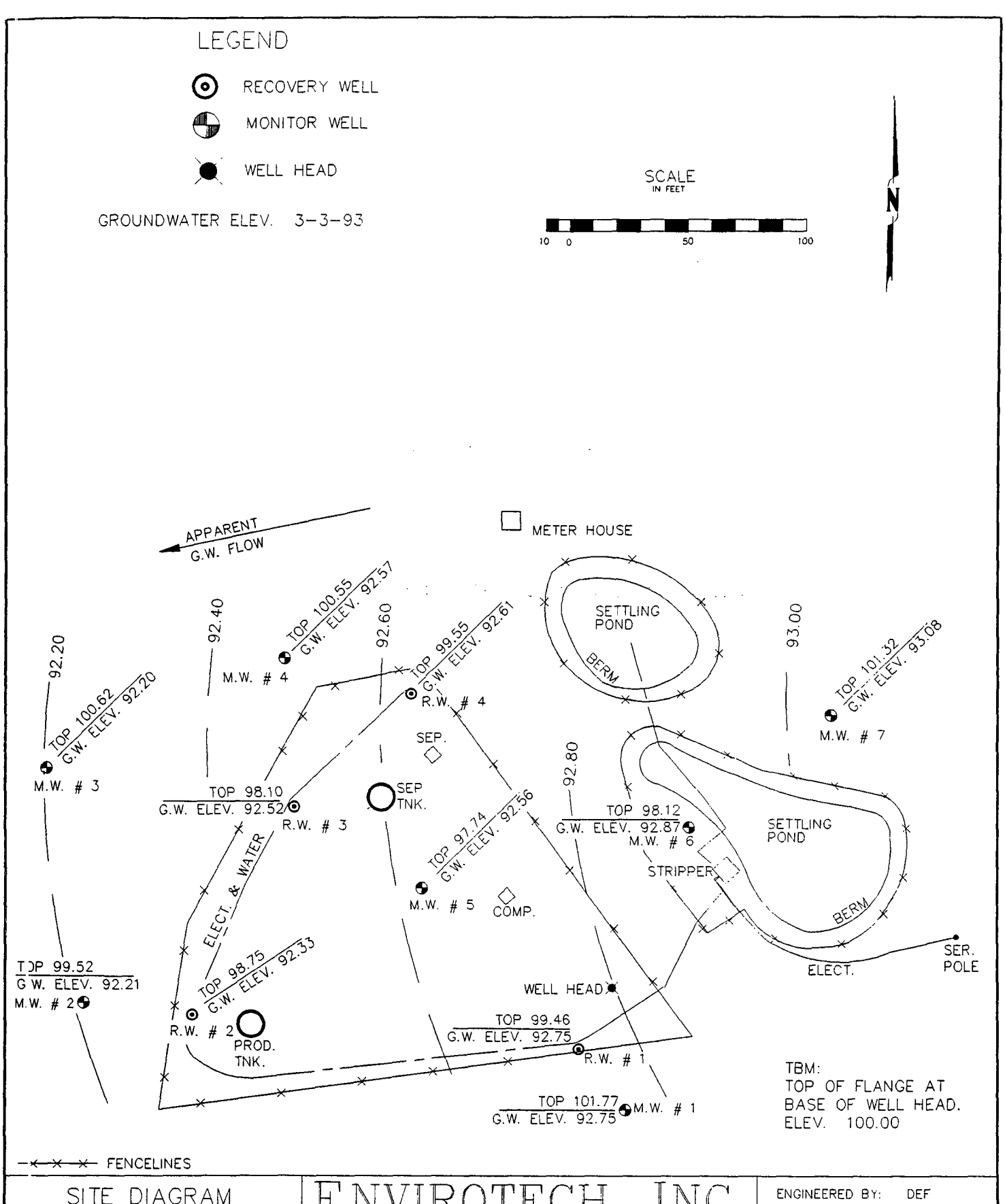



SAN JUAN GRAVEL TANK BATTERY #1
SE 1/4, SE/4, SEC. 21, T29, R13W
PRODUCTION TANK PIT AREA
REMEDIATION PLAN PROJECT NO: 92140/94028-29

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

SITE PLAN
SHEET 2
9/4/92




SITE DIAGRAM
AMOCO PRODUCTION CO
SAN JUAN GRAVEL
TANK BATTERY A-1

PROJECT NO. 92140/94028


ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615


ENGINEERED BY: DEF
DRAWN BY: DEF
PROJECT MGR.: JW
DATE SURVEYED: 2-24-93
DATE DRAWN: 3-2-93

SHEET: #3

94028

# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

4/14 2 hours 4
4/15 2 hours 3.5

OVM Model 580B

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 1

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: Back w/24"

DATE STARTED: 4/14/92
DATE FINISHED: 4/16/92
ENVIRO. SPCLT: RPB
OPERATOR: D
ASSISTANT: LT

LOCATION: LEASE: San Juan Gas WELL: Tank Bat. No. 6 QD: SE/4 SE/4
SEC: 21 TWP: 29 N RNG: 13W BM: NMPM CNTY: SJ ST: NM PIT: Steel Tank #12174
LAND USE: Range / Game (Black Rock) Refuge (Big Sage)
SURFACE CONDITIONS: Sandy ↓ 36"

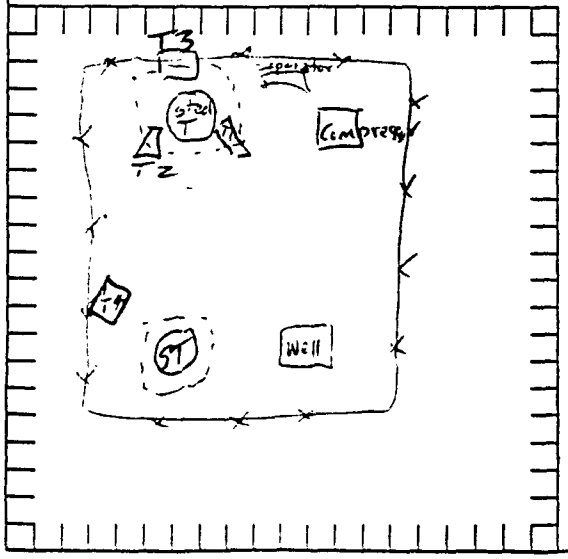
FIELD NOTES & REMARKS: Very Sandy site w/ clean surface on top to a depth of 36". 36" ↓ GW Gray to Black soils. GW @ 6'. Free Product in $H_2O$ in all 4 Test Holes. ✓ Water samples from monitoring well to be taken by MCL.

SAMPLE INVENTORY:

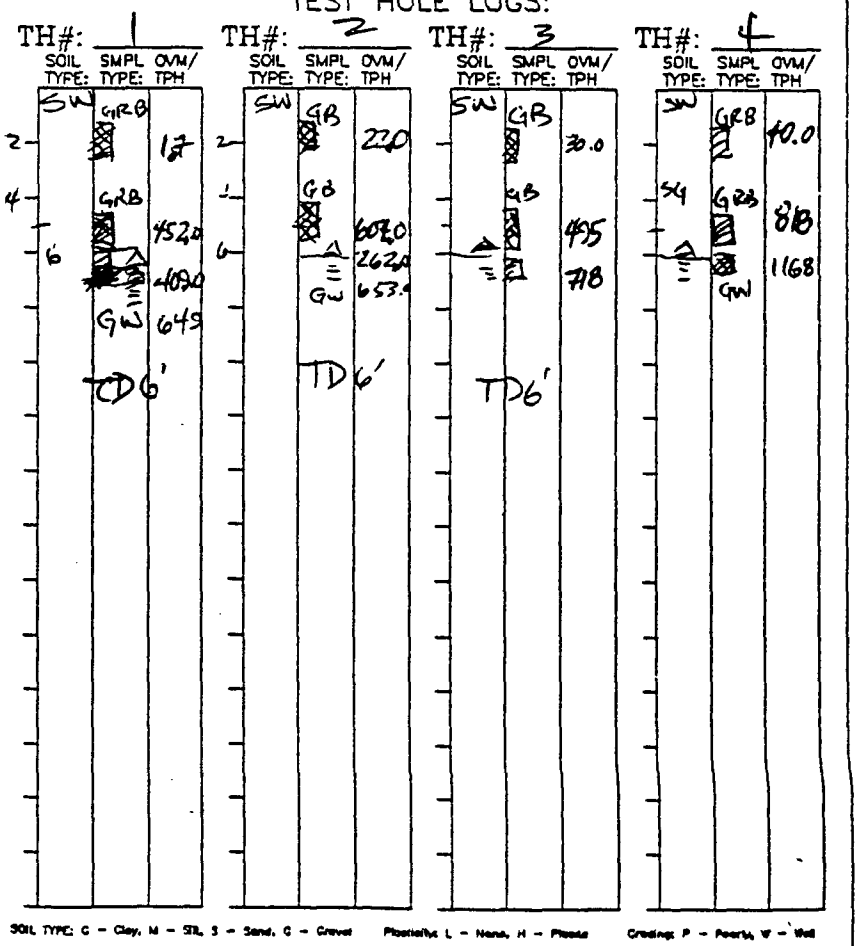
| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: | |
|---|---|---|---|
| T1@5' | SOIL | Head | |
| T1@GW | SOIL | Head | |
| T2@5' | SOIL | 8020/418.1 | |
| T2@GW | SOIL | 8020/418.1 | |
| T2@GW | WATER | 8020 (2x) | |
| " | " | " | |
| | | | |
| T2@5' | SOIL | 8020/418.1 | 4/14 |
| T2@GW | WATER | 8020 | ↑ |
| | WATER | 8020 | ↓ |
| T3@5' | SOIL | Head | |
| T3@5' | SOIL | HEAD | 4/15 |
| T3@GW | WATER | Head (2x) | |
| T3@5' | SOIL | 8020/418.1 | |
| T4@5' | SOIL | Head | |
| T4@GW | WATER | Head (2x) | |
| T4@5' | SOIL | 8020/418.1 | |

0 2 4 FEET

SITE DIAGRAM




TEST HOLE LOGS:



# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

1 hr
9403

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 1

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH INC.
EQUIPMENT USED: Back Hoe w/ 24"

DATE STARTED: 4/15/92
DATE FINISHED: 4/16/92
ENVIRO. SPCLT: JRB
OPERATOR: DD
ASSISTANT: LJ

LOCATION: LEASE: San Juan Gravel WELL: Tank Battery QQ: SE/4 SE 4
SEC: 21 TWP: T29N RNG: R13W BM: NMPM CNTY: SJ ST: NM PIT: [redacted] # [redacted] Well Head
LAND USE: Range & Wildlife Refuge Tom (Black)
SURFACE CONDITIONS:

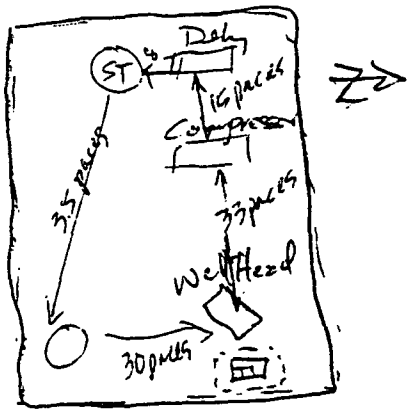
FIELD NOTES & REMARKS: Well Head appears to be 20+ yrs at site. Sandy soils [redacted] from surface to depth of 5', 6 foot depth has gray/[redacted] black river gravel/soils & GW @ 7'. Pit [redacted] located 20' from well head in SE/E direction

SAMPLE INVENTORY:

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
|---|---|---|
| TH#1 @ 2' | SOIL | Head |
| TH#1 @ 6' | SOIL | 8020 [redacted] 418.1 |
| TH#1 @ 7' GW | WATER | HEAD |

SCALE
0 FEET

SITE DIAGRAM




TEST HOLE LOGS:

TH#: 1

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| SW | GRB | N/D |
| | GRB | 1124 |
| | GRB (GW) | 1212 |

TH#: _____ TH#: _____ TH#: _____

SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, H - Plastic Cracking: P - Poorly, W - Well

# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

C4028

## FIELD REPORT: SITE ASSESSMENT

JOB No: 9214C
PAGE No: 1 of 2

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: EXTENDAHOE

DATE STARTED: 7-7-92
DATE FINISHED: 7-7-92
ENVIRO. SPCLT: SW
OPERATOR: MS
ASSISTANT: TN

LOCATION: LSE: SJG WELL: TR No 1 QD:
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: SJ ST: NM PIT:
LAND USE: Private B Square Ranch Bolack
SURFACE CONDITIONS:

FIELD NOTES & REMARKS: Soil surrounding location is brown sandy Contamination through-out site area, except T-2

### SAMPLE INVENTORY:

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
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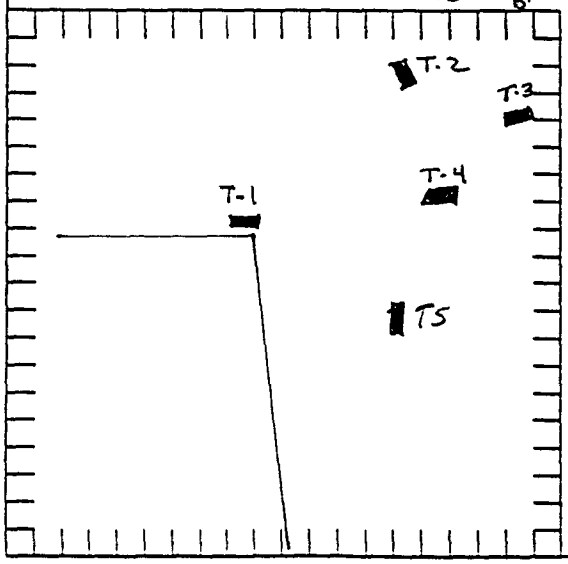
SCALE
0 5' 10' FEET

### SITE DIAGRAM

Soil stained black




### TEST HOLE LOGS:

TH#: 1

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| BROWN SANDY Soil | | |
| SW | Soil | 340 |

TH#: 2

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| BROWN SANDY Soil | | |
| GW | | 0 |

TH#: 3

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| BROWN SANDY Soil | | |
| BLACK SW | SAND Soil | 240 |

TH#: 4

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| BROWN SANDY Soil | | |
| BLACK SW | SAND Soil | 378 |

1 2 3 4 5 6 7 8 9 10

SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, H - Plastic Gradings: P - Poorly, W - Well

# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

C4028

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 2

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED:

DATE STARTED: 7-7-92
DATE FINISHED:
ENVIRO. SPCLT:
OPERATOR: JW
ASSISTANT:

LOCATION: LSE: WELL: QD:
SEC: TWP: RNG: PM: CNTY: ST: PIT:

LAND USE:
SURFACE CONDITIONS:

FIELD NOTES & REMARKS:

SAMPLE INVENTORY:

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
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SCALE
0 FEET

SITE DIAGRAM

TEST HOLE LOGS:

TH#: 5

| | SOIL TYPE: | SMPL TYPE: | OVM/ TPH |
|---|---|---|---|
| 1 | BROWN | | |
| 2 | SAND | | |
| 3 | | | |
| 4 | BLACK SAND | | |
| | SW SOIL | | 190 |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

TH#: ____ TH#: ____ TH#: ____

SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, M - Plastic Gradings: P - Poorly, W - Well

# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 1

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: EXTENDAHOE

DATE STARTED: 9-1-92
DATE FINISHED: 9-1-92
ENVIRO. SPCLT: JW
OPERATOR: BW
ASSISTANT:

LOCATION: LSE: SJ C WELL: TB No QD:
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: SJ ST: NM PIT:
LAND USE: Private Bolack
SURFACE CONDITIONS:

FIELD NOTES & REMARKS: Soil is brown sandy not apparent sign of contamination

**SAMPLE INVENTORY:**

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
|---|---|---|
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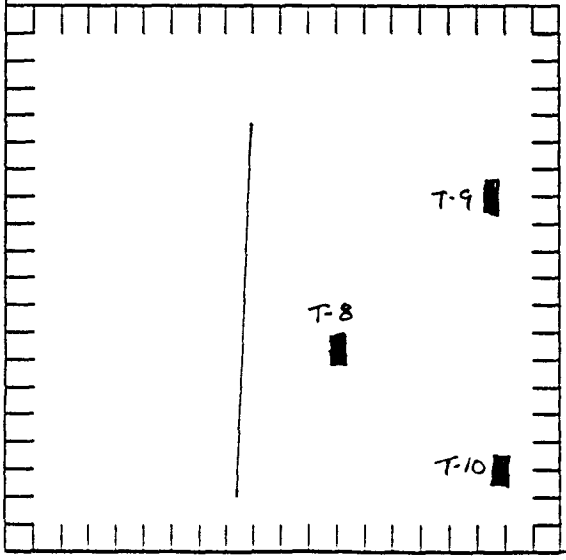
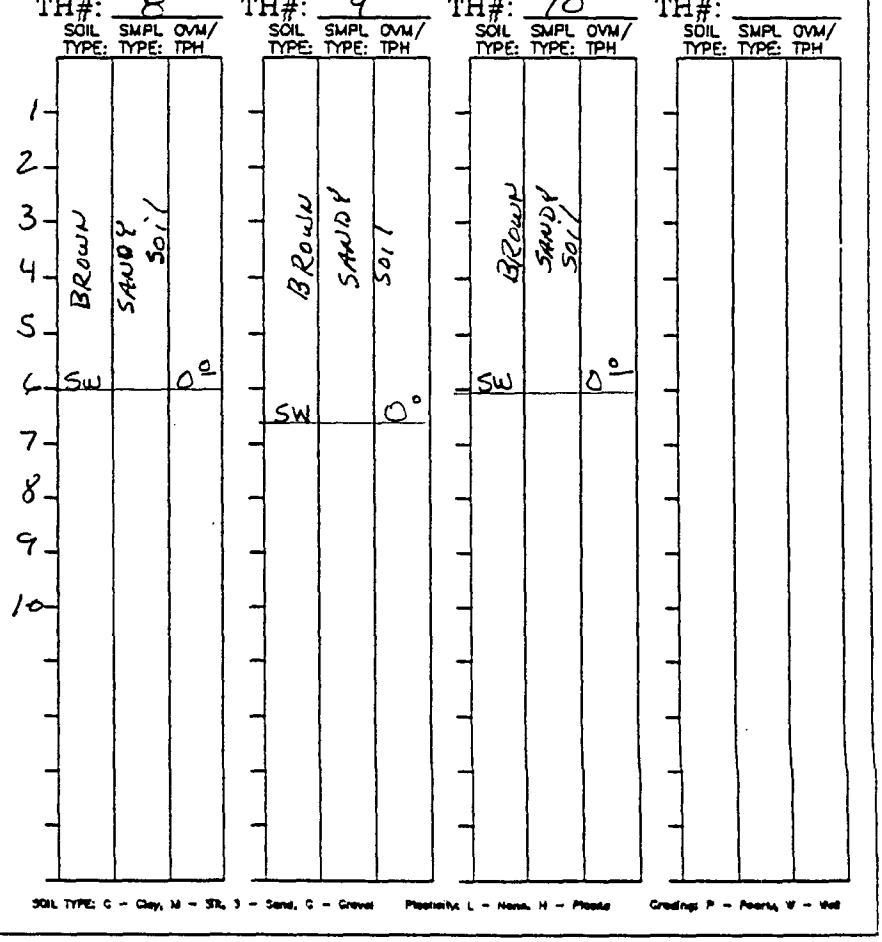
SCALE
0 5' 10' FEET

SITE DIAGRAM




TEST HOLE LOGS:



# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 2

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: Extendahoe

DATE STARTED: 9-2-92
DATE FINISHED:
ENVIRO. SPCLT: JDD
OPERATOR: B.W.
ASSISTANT: P.U.

LOCATION: LSE: S.J.G. TK. Batt #3 WELL: A-1 QD: SE¼-SE¼ (P)
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: S.J. ST: NM PIT: Extent of Plume
LAND USE: Game Refuge B-Square Ranch (Bolack)
SURFACE CONDITIONS:

FIELD NOTES & REMARKS: No Samples were taken for Laboratory ~~Results~~ Analysis.

OVM Readings only.

**SAMPLE INVENTORY:**

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
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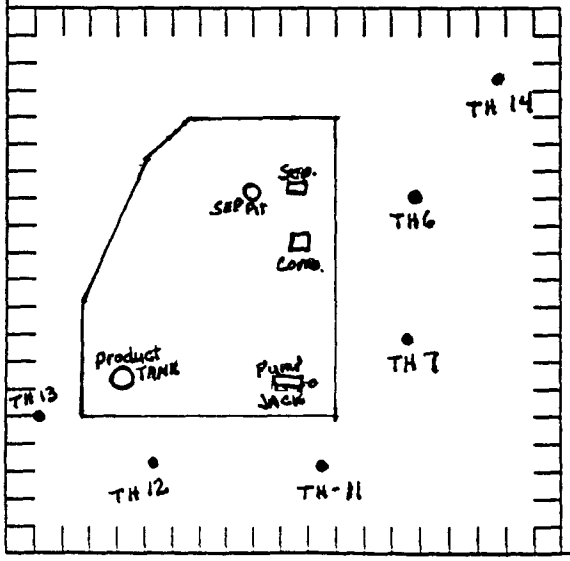
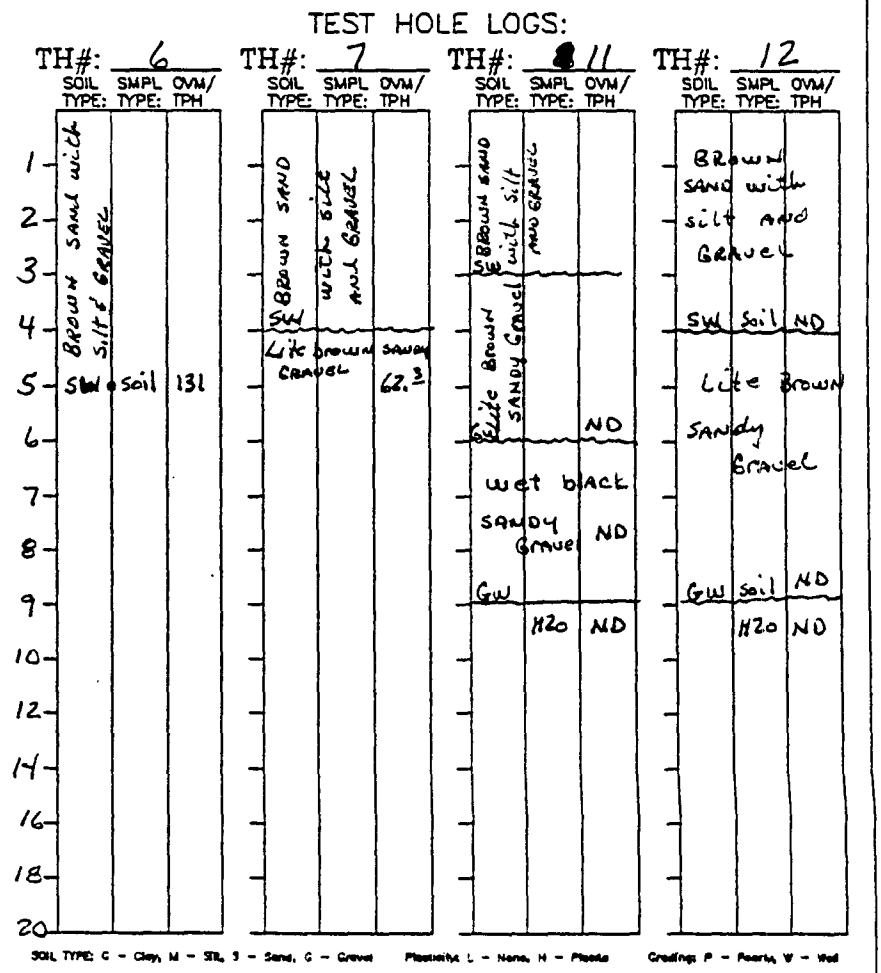
SCALE
0 NO SCALE FEET

SITE DIAGRAM




TEST HOLE LOGS:



# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0815

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 2 of 2

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: Extendahoe

DATE STARTED: 9-2-92
DATE FINISHED:
ENVIRO. SPCLT: JDD
OPERATOR: BW
ASSISTANT: PU

LOCATION: LSE: S.J.G Tk. Batt WELL: A-1 QD: SE 1/4 SE 1/4 (P)
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: S.J ST: N.M. PIT: EXTENT of Plume
LAND USE: Game Refuge B-Square Ranch (Bolack)
SURFACE CONDITIONS:

FIELD NOTES & REMARKS: O.U.M. Readings Only

SAMPLE INVENTORY:

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
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SCALE
0 FEET

SITE DIAGRAM

TEST HOLE LOGS:

TH#: 13

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| Brown Sand with silt and Gravel | | |
| SW | Soil | ND |
| Lite Brown SAND & Gravel | | |
| GW | Soil | ND |
| | H2O | ND |

TH#: 14

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| BROWN SAND with Silt AND GRAVEL | | |
| SW | Soil | ND |
| Lite BROWN SAND & GRAVEL | | |
| GW | Soil | ND |
| | H2O | ND |

TH#:

TH#:

SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, H - Plastic Grading: P - Poorly, W - Well

# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0815

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 1 of 3

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH INC.
EQUIPMENT USED:

DATE STARTED: 2-2-93
DATE FINISHED: 2-2-93
ENVIRO. SPCLT: JW
OPERATOR:
ASSISTANT:

LOCATION: LSE: S.J.G Unit A TK BATT WELL: 1 QD: SE1/4 NE1/4
SEC: 21 TWP: 29N RNG: 13W PM: NM CNTY: SJ ST: NM PIT: M/w's R/w's
LAND USE: Wild Life Refuge - Black B square Ranch
SURFACE CONDITIONS: 2" monitor well 4½" Recovery wells

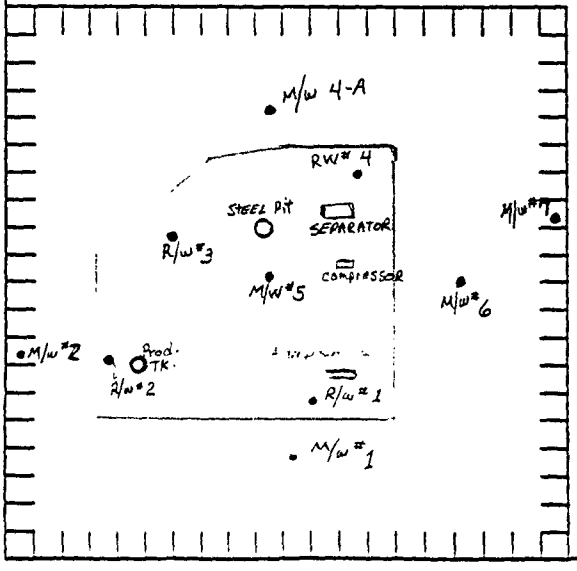
FIELD NOTES & REMARKS: OVM samples of water taken from each Recovery well and monitor well.

SAMPLE INVENTORY:

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
|---|---|---|
| | | |

SCALE
0 10 40 FEET

SITE DIAGRAM




TEST HOLE LOGS:

TH#: R/w#1 — SOIL TYPE: | SMPL TYPE: | OVM/TPH: H2O 0
TH#: R/w#2 — SOIL TYPE: 1 | SMPL TYPE: H2O | OVM/TPH: 2.4
TH#: R/w#3 — SOIL TYPE: | SMPL TYPE: H2O | OVM/TPH: 134
TH#: R/w#4 — SOIL TYPE: | SMPL TYPE: H2O | OVM/TPH: 6.2

1 2 3 4 5 6 7 8 9 10

SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, M - Plastic Grading: P - Poorly, W - Well

# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 2 of 3

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED:

DATE STARTED: 2-2-93
DATE FINISHED: 2-2-93
ENVIRO. SPCLT: JW
OPERATOR:
ASSISTANT:

LOCATION: LSE: S. J. Gc Unit A Tk. Batt WELL: 1 QD:
SEC: TWP: RNG: PM: CNTY: ST: PIT:

LAND USE:
SURFACE CONDITIONS:

FIELD NOTES & REMARKS:

SAMPLE INVENTORY:

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
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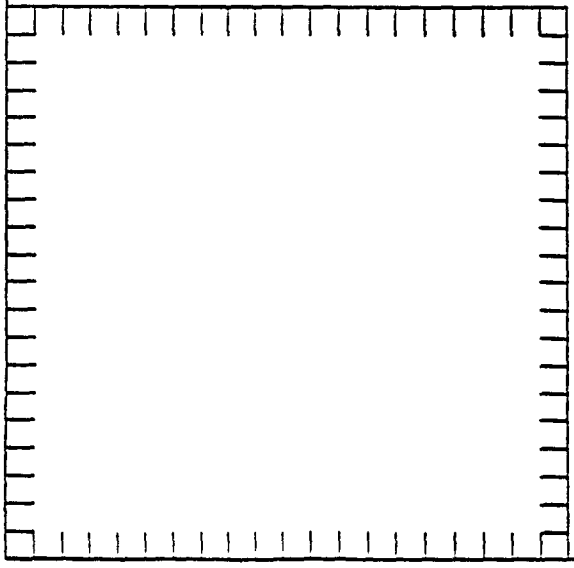
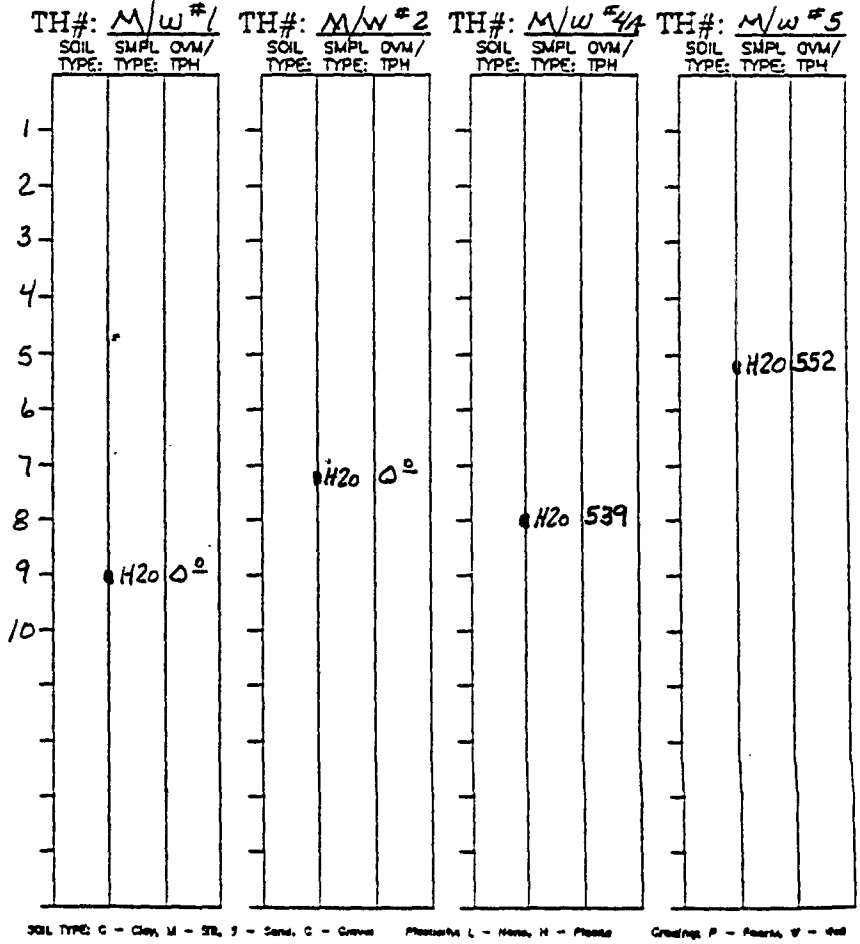
SCALE
0 FEET

SITE DIAGRAM



TEST HOLE LOGS:




SOIL TYPE: C - Clay, M - Silt, S - Sand, G - Gravel Plasticity: L - None, H - Plastic Groundwater: P - Perched, W - Well

# ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

## FIELD REPORT: SITE ASSESSMENT

JOB No: 92140
PAGE No: 3 of 3

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: AMOCO PRODUCTION COMPANY
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED:

DATE STARTED: 2-2-93
DATE FINISHED: 2-2-93
ENVIRO. SPCLT: JJ
OPERATOR:
ASSISTANT:

LOCATION: LSE: S.J.G. Unit A Tk. Batt WELL: 1 QD:
SEC: TWP: RNG: PM: CNTY: ST: PIT:

LAND USE:
SURFACE CONDITIONS:

FIELD NOTES & REMARKS:

SAMPLE INVENTORY:

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
|---|---|---|
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SCALE
0 FEET

SITE DIAGRAM

TEST HOLE LOGS:

TH#: M/W #6

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| | | |
| | H2O | 1.4 |

TH#: M/W #7

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| | | |
| | H2O | 2.3 |

TH#: _____

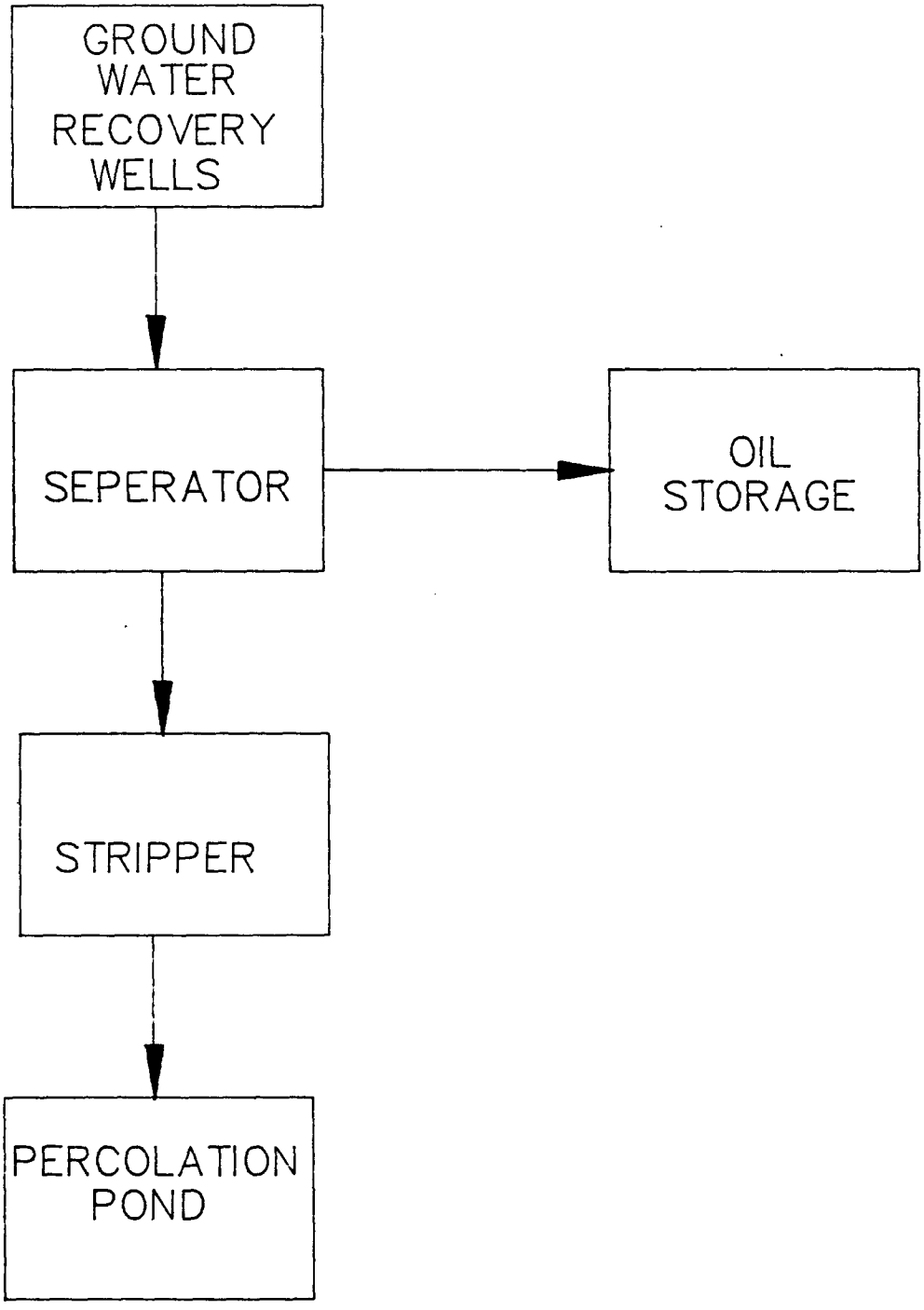
| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| | | |

TH#: _____

| SOIL TYPE: | SMPL TYPE: | OVM/TPH |
|---|---|---|
| | | |

1 2 3 4 5 6 7 8 9 10

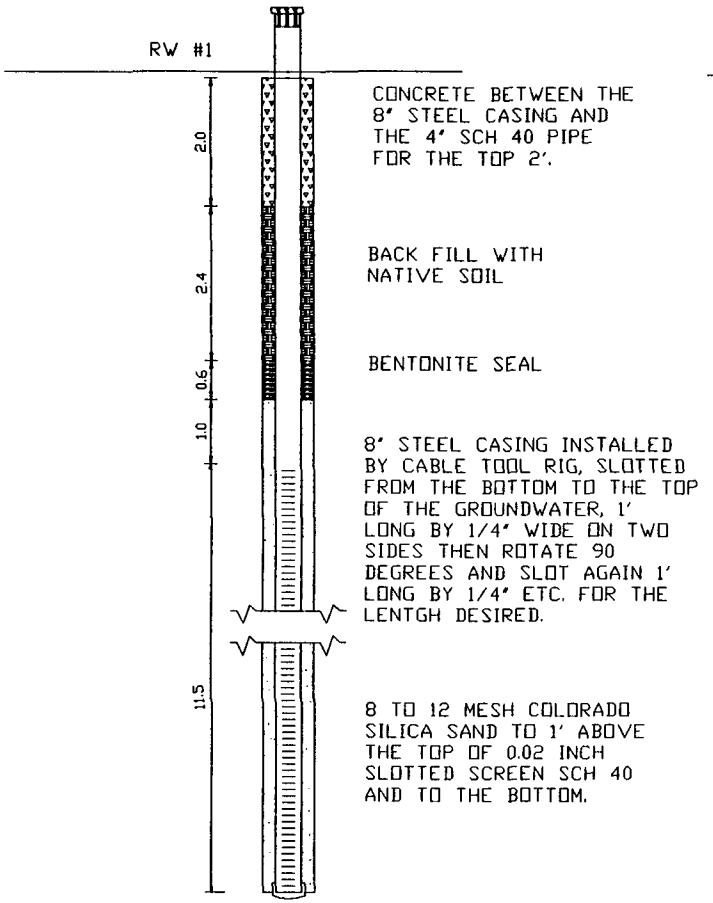
SOIL TYPE: C = Clay, M = Silt, S = Sand, G = Gravel Plasticity: L = None, H = Plastic Grading: P = Poorly, W = Well

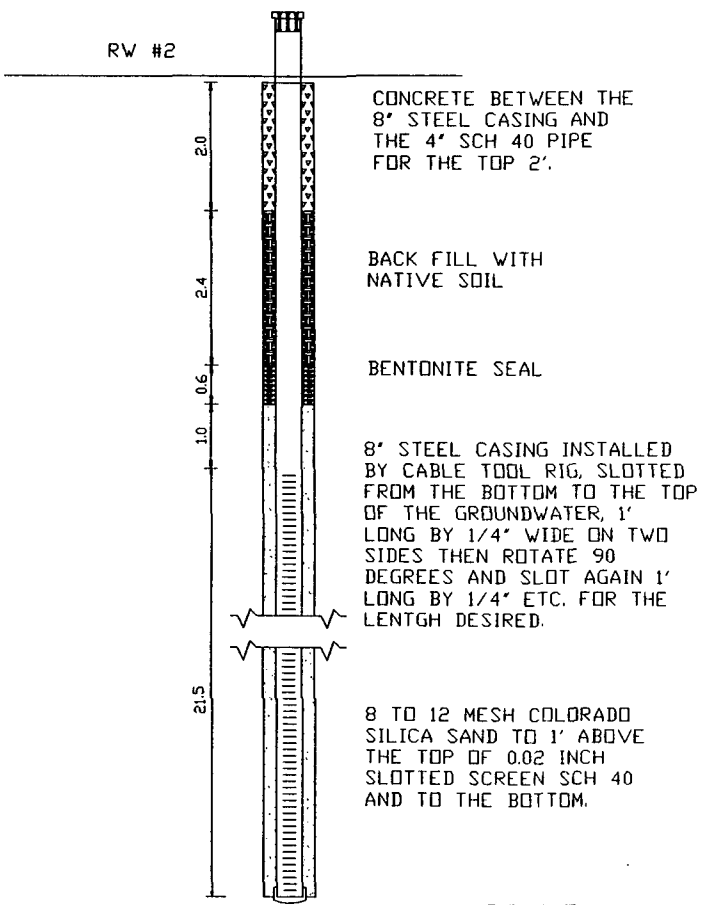



ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

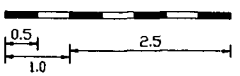
# CONTAMINATED WATER TREATMENT FLOW-CHART

SHEET 4




SCALE




SUBMERSIBLE PUMPS WILL OR HAVE BEEN SET APPROXIMATELY ONE FOOT ABOVE THE BOTTOM OF THE WELL AND CONNECTED BY A 2" PVC PIPE TO THE STRIPPER. THE CONNECTING PIPE TO THE 2" COLLECTION PIPE WILL OR IS A 1" PVC WITH AN INLINE BALL VALVE.

SAN JUAN GRAVEL TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W
PRODUCTION TANK PIT AREA
RECOVERY WELLS #1 AND #2.

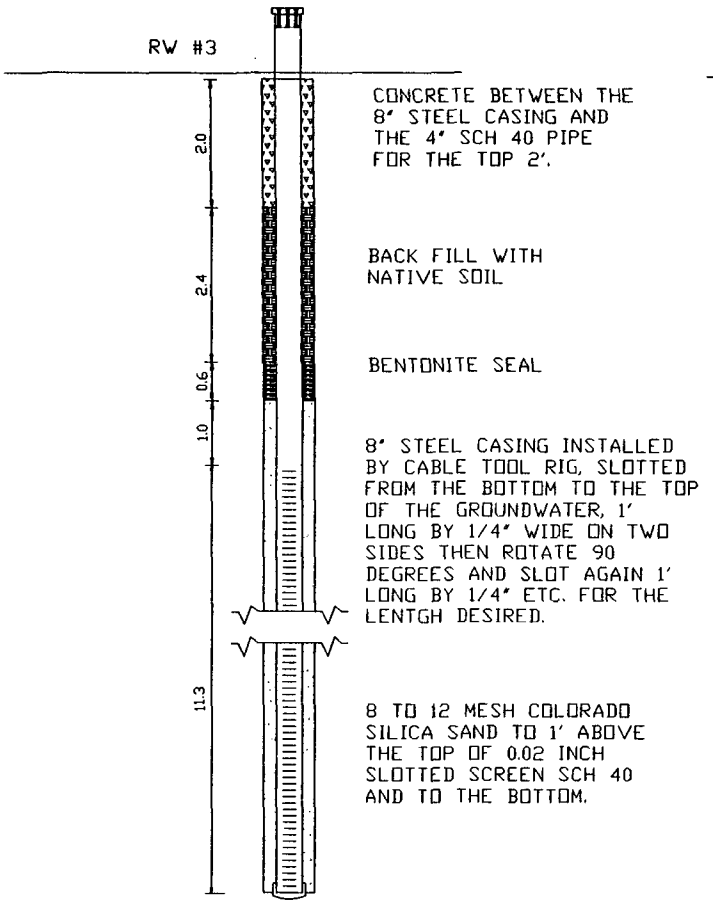
RECOVERY WELL DETAIL
DRW BY: JDD

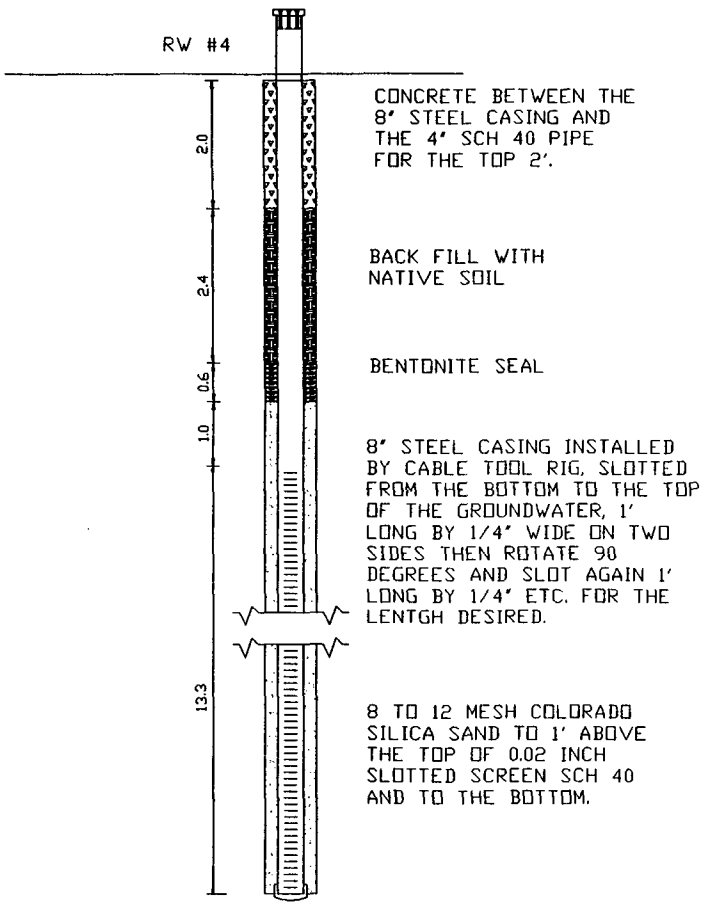
PROJECT NO: 92140/94028-29
DATE: 10/13/92

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

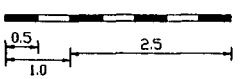
ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615




SCALE




SUBMERSIBLE PUMPS WILL OR HAVE BEEN SET APPROXIMATELY ONE FOOT ABOVE THE BOTTOM OF THE WELL AND CONNECTED BY A 2" PVC PIPE TO THE STRIPPER. THE CONNECTING PIPE TO THE 2" COLLECTION PIPE WILL OR IS A 1" PVC WITH AN INLINE BALL VALVE.

SAN JUAN GRAVEL TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W
PRODUCTION TANK PIT AREA
RECOVERY WELLS #3 AND #4.

RECOVERY WELL DETAIL
DRW BY: JDD

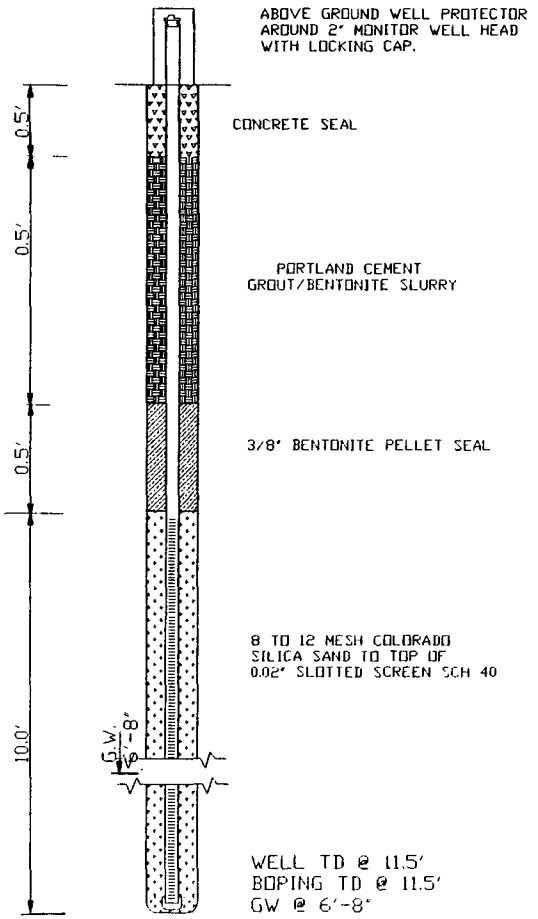
PROJECT NO: 92140/94028-29
DATE: 10/13/92

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

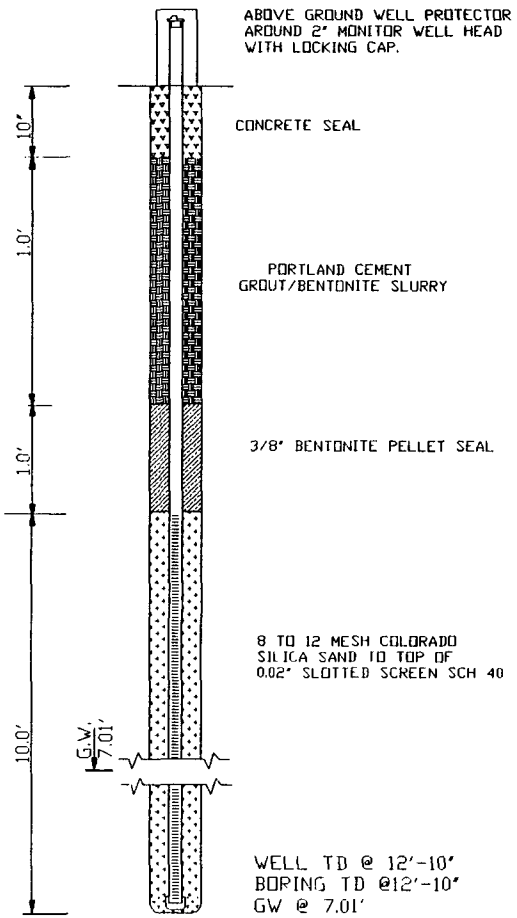
ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

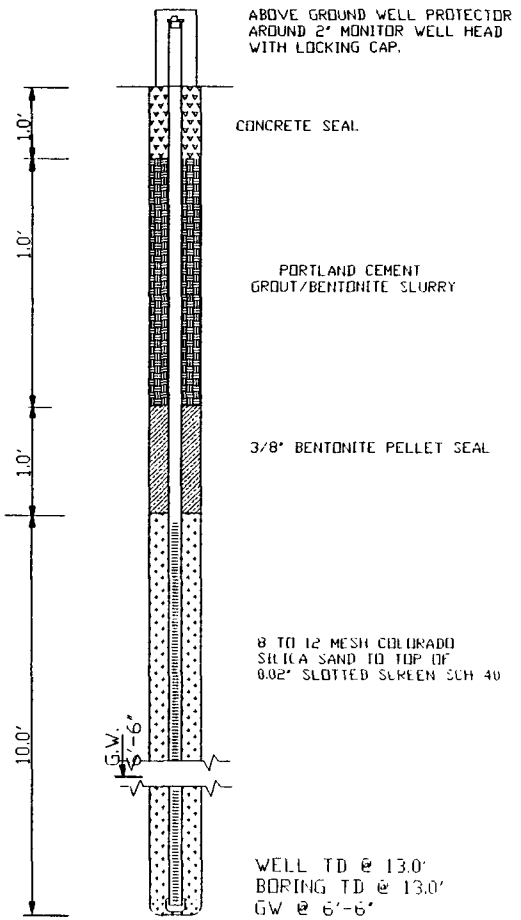
MONITOR WELL #1




MONITOR WELL #2




MONITOR WELL #3



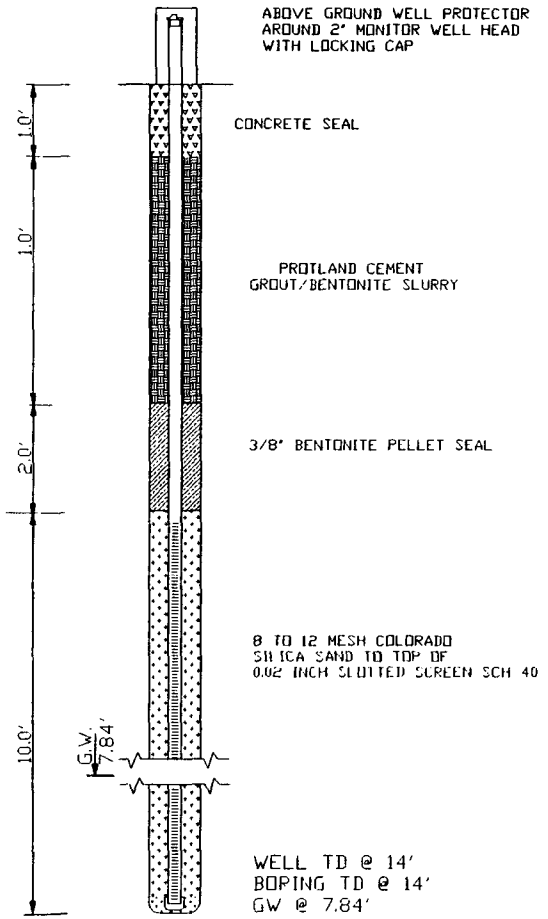

MONITOR WELL DETAILS
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL
TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W


ENVIROTECH INC.

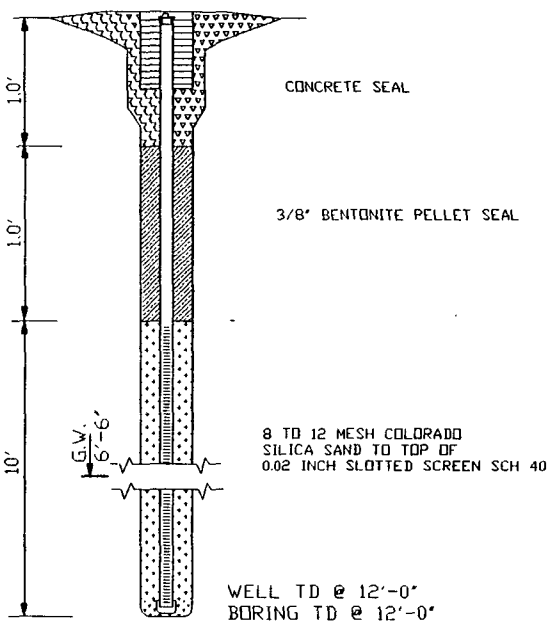
ENVIRONMENTAL SCIENTISTS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615


ENGINEER: L. WEAVER
DRAFTER: P. YOUNG
DATE: 4-21-93
MONITOR WELLS: 1,2,3

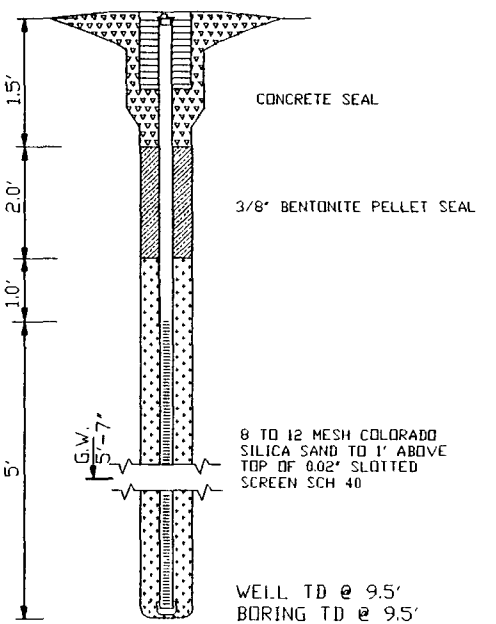
MONITOR WELL #4




MONITOR WELL #5




MONITOR WELL #6



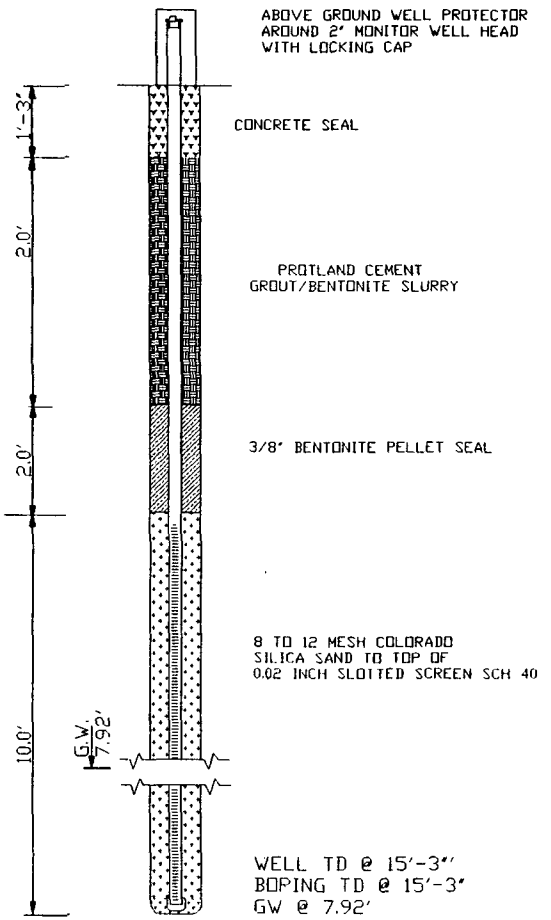

MONITOR WELL DETAILS
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL
TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W


ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615


ENGINEER: T. WEAVER
DRAFTER: P. YOUNG
DATE: 4-21-93
MONITOR WELLS: 4,5,6

MONITOR WELL #7

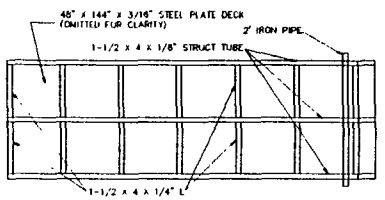



MONITOR WELL DETAILS
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL
TANK BATTERY #1
SE/4, SE/4, SEC 21, T29N, R13W

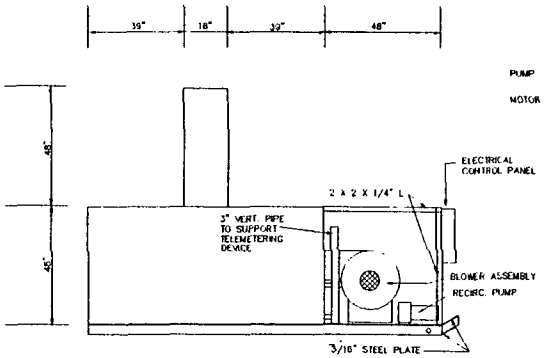

ENVIROTECH INC.

ENVIRONMENTAL SCIENTISTS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

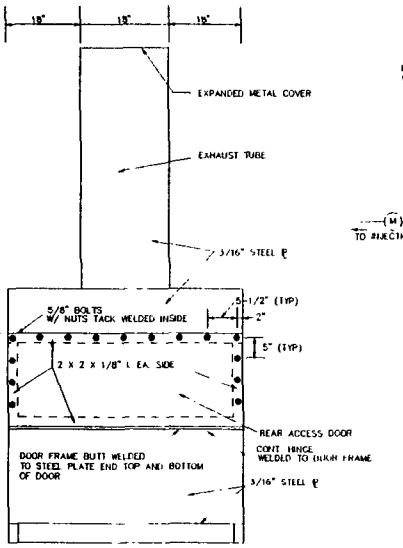

ENGINEER: J. WEAVER
DRAFTER: P. YOUNG
DATE: 4-21-93
MONITOR WELL: 7




SKID PLAN

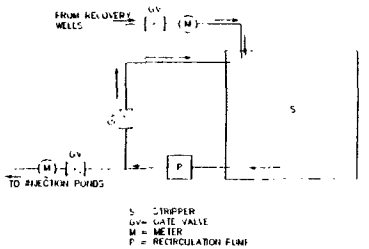


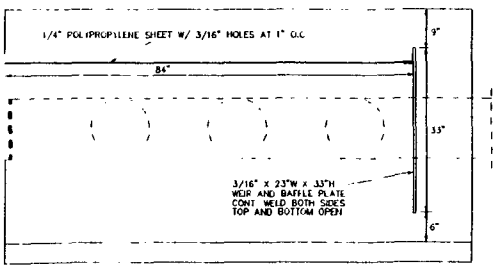

SIDE VIEW



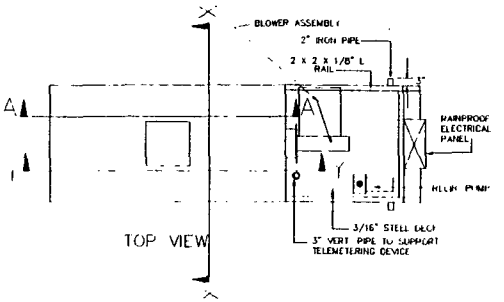

REAR VIEW

SCHEMATIC
WATER FLOW DIAGRAM

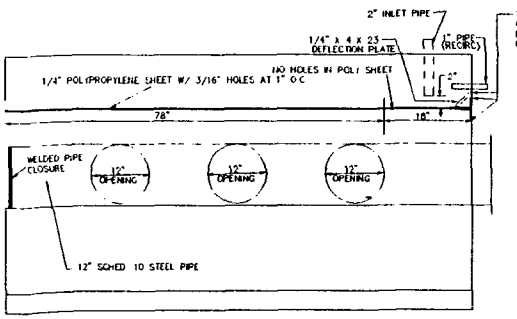


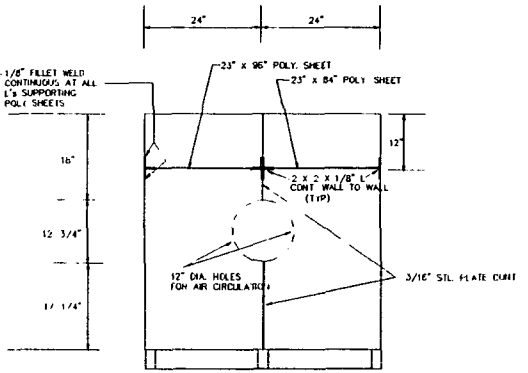

SECTION A-A



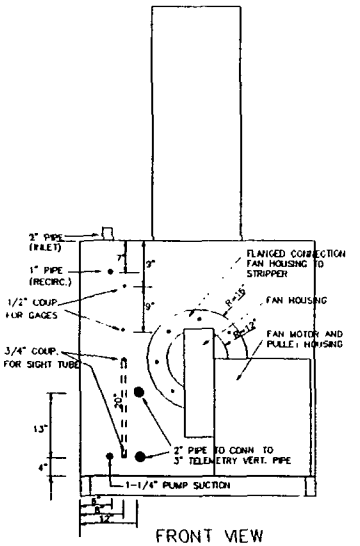

TOP VIEW




SECTION Y-Y




SECTION X-X




FRONT VIEW

# AIR STRIPPER DETAIL SHEET

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

| | | | |
|---|---|---|---|
| Client: | **Envirotech Inc.** | | |
| Sample ID: | m/w # 5 (4678) | Date Reported: | 03/25/93 |
| Laboratory ID: | 2045 | Date Sampled: | 03/04/93 |
| Sample Matrix: | Water | Time Sampled: | 0916 |
| Condition: | Cool/Intact | Date Received: | 03/05/93 |

| Parameter | Analytical Result | Units | | Units |
|---|---|---|---|---|
| Lab pH | 7.8 | s.u. | | |
| Lab Conductivity @ 25° C | 2,060 | umhos/cm | | |
| Total Dissolved Solids @ 180°C | 1,310 | mg/L | | |
| Total Dissolved Solids (Calc) | 1,390 | mg/L | | |
| Total Alkalinity as CaCO3 | 807 | mg/L | | |
| Total Hardness as CaCO3 | 831 | mg/L | | |
| Bicarbonate as HCO3 | 985 | mg/L | 16.14 | meq/L |
| Carbonate as CO3 | 0 | mg/L | 0.00 | meq/L |
| Hydroxide as OH | 0 | mg/L | 0.00 | meq/L |
| Chloride | 102 | mg/L | 2.87 | meq/L |
| Sulfate | 326 | mg/L | 6.79 | meq/L |
| Calcium | 193 | mg/L | 9.62 | meq/L |
| Magnesium | 85 | mg/L | 7.01 | meq/L |
| Potassium | 14 | mg/L | 0.37 | meq/L |
| Sodium | 190 | mg/L | 8.26 | meq/L |
| Cations | | | 25.26 | meq/L |
| Anions | | | 25.82 | meq/L |
| Cation/Anion Difference | | | 1.11 | % |

**Reference:** U.S.E.P.A. 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", 1983.
"Standard Methods For The Examination Of Water And Waste Water", 17th ed., 1989.

Reviewed by 

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## EPA METHOD 8020
## AROMATIC VOLATILE ORGANICS

| | | | |
|---|---|---|---|
| Client: | Amoco | Project #: | 92140 |
| Sample ID: | Stripper (inlet) | Date Reported: | 03-04-93 |
| Laboratory Number: | 4675 | Date Sampled: | 03-04-93 |
| Sample Matrix: | Water | Date Received: | 03-04-93 |
| Preservative: | HgCl & Cool | Date Analyzed: | 03-04-93 |
| Condition: | Cool & Intact | Analysis Requested: | BTEX |

| Parameter | Concentration (ug/L) | Det. Limit (ug/L) |
|---|---|---|
| Benzene | 280 | 0.4 |
| Toluene | 31.8 | 0.4 |
| Ethylbenzene | 8.6 | 0.5 |
| p,m-Xylene | 67 | 0.2 |
| o-Xylene | 15.2 | 0.3 |

SURROGATE RECOVERIES:

| Parameter | Percent Recovery |
|---|---|
| Trifluorotoluene | 102 % |
| Bromfluorobenzene | 106 % |

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments: Stripper, San Juan Gravel TK. Battery A-1, C-4028.

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## EPA METHOD 8020
## AROMATIC VOLATILE ORGANICS

| | | | |
|---|---|---|---|
| Client: | Amoco | Project #: | 92140 |
| Sample ID: | Stripper(outlet) | Date Reported: | 03-04-93 |
| Laboratory Number: | 4676 | Date Sampled: | 03-04-93 |
| Sample Matrix: | Water | Date Received: | 03-04-93 |
| Preservative: | HgCl & Cool | Date Analyzed: | 03-04-93 |
| Condition: | Cool & Intact | Analysis Requested: | BTEX |

| Parameter | Concentration (ug/L) | Det. Limit (ug/L) |
|---|---|---|
| Benzene | 81 | 0.4 |
| Toluene | 10.0 | 0.4 |
| Ethylbenzene | 2.5 | 0.5 |
| p,m-Xylene | 21.0 | 0.2 |
| o-Xylene | 5.0 | 0.3 |

SURROGATE RECOVERIES:

| Parameter | Percent Recovery |
|---|---|
| Trifluorotoluene | 93 % |
| Bromfluorobenzene | 103 % |

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments: Stripper, San Juan Gravel TK. Battery A-1, C-4028.

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## EPA METHOD 8020
## AROMATIC VOLATILE ORGANICS

| | | | |
|---|---|---|---|
| Client: | Amoco | Project #: | 92140 |
| Sample ID: | Stripper Outlet | Date Reported: | 04-14-93 |
| Laboratory Number: | 4917 | Date Sampled: | 04-13-93 |
| Sample Matrix: | Water | Date Received: | 04-13-93 |
| Preservative: | HgCl & Cool | Date Analyzed: | 04-13-93 |
| Condition: | Cool & Intact | Analysis Requested: | BTEX |

| Parameter | Concentration (ug/L) | Det. Limit (ug/L) |
|---|---|---|
| Benzene | 4.7 | 0.3 |
| Toluene | 0.6 | 0.4 |
| Ethylbenzene | 0.2 | 0.2 |
| p,m-Xylene | 1.4 | 0.2 |
| o-Xylene | 0.3 | 0.2 |

SURROGATE RECOVERIES:

| Parameter | Percent Recovery |
|---|---|
| Trifluorotoluene | 82 % |
| Bromofluorobenzene | 87 % |

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments: San Juan Gravel TK.Battery A-1, Stripper Outlet, C-4028.

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## EPA METHOD 418.1
## TOTAL PETROLEUM HYDROCARBONS

| | | | |
|---|---|---|---|
| Client: | Amoco | Project #: | 92140 |
| Sample ID: | Stripper outlet | Date Sampled: | 03-04-93 |
| Laboratory Number: | 4677 | Date Received: | 03-04-93 |
| Sample Matrix: | Water | Date Analyzed: | 03-04-93 |
| Preservative: | Cool | Date Reported: | 03-04-93 |
| Condition: | Cool & Intact | Analysis Needed: | TPH |

| Parameter | Concentration (mg/L) | Det. Limit (mg/L) |
|---|---|---|
| TPH | 0.9 | 0.5 |

Method: Method 418.1, Total Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments: Stripper S.J.G. Tk. Batt. A-1 C-4028

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## MODIFIED EPA METHOD 8015
## NONHALOGENATED VOLATILE ORGANICS

| | | | |
|---|---|---|---|
| Client: | Amoco | Project #: | 92140 |
| Sample ID: | Stripper Outlet | Date Reported: | 04-13-93 |
| Laboratory Number: | 4917 | Date Sampled: | 04-13-93 |
| Sample Matrix: | Water | Date Received: | 04-13-93 |
| Preservative: | Cool | Date Analyzed: | 04-13-93 |
| Condition: | Cool and Intact | Analysis Requested: | TPH |

| Parameter | Concentration (mg/L) | Det. Limit (mg/L) |
|---|---|---|
| Gasoline Range (C5 - C10) | ND | 0.1 |
| Diesel Range (C10 - C28) | ND | 0.1 |
| C28 - C36 Range | ND | 0.1 |
| Total Petroleum Hydrocarbons | ND | 0.1 |

Method: Method 8015, Nonhalogenated Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments: S.J.G. Tk Batt A-1 C-4028

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## EPA METHOD 8020
## AROMATIC VOLATILE ORGANICS

| | | | |
|---|---|---|---|
| Client: | NA | Project #: | NA |
| Sample ID: | Laboratory Blank | Date Reported: | 03-04-93 |
| Laboratory Number: | 0304AM.BLK | Date Sampled: | NA |
| Sample Matrix: | Water | Date Received: | NA |
| Preservative: | NA | Date Analyzed: | 03-04-93 |
| Condition: | NA | Analysis Requested: | BTEX |

| Parameter | Concentration (ug/L) | Det. Limit (ug/L) |
|---|---|---|
| Benzene | ND | 0.4 |
| Toluene | ND | 0.4 |
| Ethylbenzene | ND | 0.5 |
| p,m-Xylene | ND | 0.2 |
| o-Xylene | ND | 0.3 |

SURROGATE RECOVERIES:

| Parameter | Percent Recovery |
|---|---|
| Trifluorotoluene | 88 % |
| Bromfluorobenzene | 95 % |

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments:

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## EPA METHOD 8020
## AROMATIC VOLATILE ORGANICS

| | | | |
|---|---|---|---|
| Client: | NA | Project #: | NA |
| Sample ID: | Laboratory Blank | Date Reported: | 04-14-93 |
| Laboratory Number: | 0413AM.BLK | Date Sampled: | NA |
| Sample Matrix: | Water | Date Received: | NA |
| Preservative: | NA | Date Analyzed: | 04-13-93 |
| Condition: | NA | Analysis Requested: | BTEX |

| Parameter | Concentration (ug/L) | Det. Limit (ug/L) |
|---|---|---|
| Benzene | ND | 0.3 |
| Toluene | ND | 0.4 |
| Ethylbenzene | ND | 0.2 |
| p,m-Xylene | ND | 0.2 |
| o-Xylene | ND | 0.2 |

SURROGATE RECOVERIES:

| Parameter | Percent Recovery |
|---|---|
| Trifluorotoluene | 91 % |
| Bromofluorobenzene | 89 % |

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments:

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


** QUALITY ASSURANCE EPA METHOD 8020
MATRIX SPIKE - AROMATIC VOLATILE ORGANICS

| | | | |
|---|---|---|---|
| Client: | NA | Project #: | NA |
| Sample ID: | Sample Spike | Date Reported: | 04-14-93 |
| Laboratory Number: | 4917 | Date Sampled: | 04-13-93 |
| Sample Matrix: | Water | Date Received: | 04-13-93 |
| Analysis Requested: | BTEX | Date Analyzed: | 04-13-93 |
| Condition: | NA | | |

| Parameter | Sample Result (ug/L) | Spike Added (ug/L) | Spiked Sample Result (ug/L) | Det. Limit (ug/L) | Percent Recovery | SW-846 % Rec. Accept. Range |
|---|---|---|---|---|---|---|
| Benzene | 4.7 | 20.0 | 28.1 | 0.3 | 113 | 39-150 |
| Toluene | 0.6 | 20.0 | 21.3 | 0.4 | 104 | 46-148 |
| Ethylbenzene | 0.2 | 20.0 | 21.0 | 0.2 | 104 | 32-160 |
| p,m-Xylene | 1.4 | 20.0 | 23.3 | 0.2 | 109 | 46-148 |
| o-Xylene | 0.3 | 20.0 | 21.3 | 0.2 | 105 | 46-148 |

Method: Method 5030, Purge-and-Trap, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

Method 8020, Aromatic Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments:

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## EPA METHOD 418.1
## TOTAL PETROLEUM HYDROCARBONS

| | | | |
|---|---|---|---|
| Client: | NA | Project #: | NA |
| Sample ID: | Laboratory Blank | Date Sampled: | NA |
| Laboratory Number: | TPWB0304 | Date Received: | NA |
| Sample Matrix: | Water | Date Analyzed: | 03-04-93 |
| Preservative: | NA | Date Reported: | 03-04-93 |
| Condition: | NA | Analysis Needed: | TPH |

| Parameter | Concentration (mg/L) | Det. Limit (mg/L) |
|---|---|---|
| TPH | ND | 0.5 |

Method: Method 418.1, Total Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments:

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


** QUALITY ASSURANCE REPORT
MATRIX SPIKE - TOTAL PETROLEUM HYDROCARBONS

| | | | |
|---|---|---|---|
| Client: | NA | Project #: | NA |
| Sample ID: | Laboratory Spike | Date Sampled: | NA |
| Laboratory Number: | TPWS0304 | Date Received: | NA |
| Sample Matrix: | Water | Date Analyzed: | 03-04-93 |
| Analysis Requested: | TPH | Date Reported: | 03-04-93 |
| Condition: | NA | | |

| Parameter | Sample Result (mg/L) | Spike Added (mg/L) | Spiked sample Result (mg/L) | Percent Recovery |
|---|---|---|---|---|
| Total Petroleum Hydrocarbons | ND | 50.0 | 53.6 | 107 |

QA ACCEPTANCE CRITERIA:

| Parameter | Acceptance Range % |
|---|---|
| TPH | 80 - 120 |

Method: Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments:

Analyst

Review

# ENVIROTECH LABS

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PHONE: (505) 632-0615 • FAX: (505) 632-1865


## MODIFIED EPA METHOD 8015
## NONHALOGENATED VOLATILE ORGANICS

| | | | |
|---|---|---|---|
| Client: | NA | Project #: | NA |
| Sample ID: | Laboratory Blank | Date Reported: | 04-13-93 |
| Laboratory Number: | 0413tph.blk | Date Sampled: | NA |
| Sample Matrix: | Methanol | Date Received: | NA |
| Preservative: | NA | Date Analyzed: | 04-03-93 |
| Condition: | NA | Analysis Requested: | TPH |

| Parameter | Concentration (mg/L) | Det. Limit (mg/L) |
|---|---|---|
| Gasoline Range C5 - C10 | ND | 0.1 |
| Diesel Range C10 - C28 | ND | 0.1 |
| C28 - C36 Range | ND | 0.1 |
| Total Petroleum Hydrocarbons | ND | 0.1 |

Method: Method 8015, Nonhalogenated Volatile Organics, Test Methods for Evaluating Solid Waste, SW-846, USEPA, Sept. 1986

ND - Parameter not detected at the stated detection limit.

Comments:

Analyst

Review

2442

# CHAIN OF CUSTODY RECORD

C-4028

| Client/Project Name | Project Location | ANALYSIS/PARAMETERS |
|---|---|---|
| Amoco 92140 | STRIPPER S.J.G TK. BATT. A-1 | |
| Sampler: (Signature) | Chain of Custody Tape No. | |
| Jim Weakfee | | |

| Sample No./ Identification | Sample Date | Sample Time | Lab Number | Sample Matrix | No. of Containers | BTEX | TPH | MJR. CATIONS ANIONS | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STRIPPER (Inlet) | 3-4-93 | 900 | 4675 | WATER | 2 | ✓ | | | | | | |
| STRIPPER (outlet) | 3-4-93 | 905 | 4676 | WATER | 2 | ✓ | | | | | | |
| STRIPPER (outlet) | 3-4-93 | 920 | 4677 | WATER | 1 | | ✓ | | | | | |
| M/W # 5 | 3-4-93 | 916 | 4678 | WATER | 1 | | | ✓ | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

| Relinquished by: (Signature) | Date | Time | Received by: (Signature) | Date | Time |
|---|---|---|---|---|---|
| Jim Weakfee | 3-4-93 | 940 | Sheila Feltman | 3-4-93 | 940 |
| Relinquished by: (Signature) | | | Received by: (Signature) | | |
| Relinquished by: (Signature) | | | Received by: (Signature) | | |


**ENVIROTECH INC.**
5796 U.S. Highway 64-3014
Farmington, New Mexico 87401
(505) 632-0615

2516

# CHAIN OF CUSTODY RECORD

C-4028

| Client/Project Name | Project Location | ANALYSIS/PARAMETERS |
|---|---|---|
| Amoco 92140 | Stripper Outlet S.J.G.TK Batt A-1 | |
| Sampler: (Signature) Jim Weakee | Chain of Custody Tape No. | |

| Sample No./ Identification | Sample Date | Sample Time | Lab Number | Sample Matrix | No. of Containers | BTEX 8015 | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stripper Outlet | 4-13-93 | 8:15 | 4917 | WATER | 3 | ✓ | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

| Relinquished by: (Signature) | Date | Time | Received by: (Signature) | Date | Time |
|---|---|---|---|---|---|
| Jim Weakee | 4-13-93 | 9:15 | Linda Pender | 4-13-93 | 9:15 |
| Relinquished by: (Signature) | | | Received by: (Signature) | | |
| Relinquished by: (Signature) | | | Received by: (Signature) | | |


**ENVIROTECH INC.**
5796 U.S. Highway 64-3014
Farmington, New Mexico 87401
(505) 632-0615

PUMP TEST EVALUATION
AMOCO PRODUCTION COMPANY
SAN JUAN GRAVEL TANK BATTERY A#1
SAN JUAN COUNTY, NEW MEXICO
MAY 10, 1993

## Introduction

This report documents the results of an evaluation of data obtained during a limited pump test performed April 1, 1993 by Envirotech Inc. at the Amoco Production Company San Juan Gravel Tank Battery A#1 site, San Juan County, New Mexico. A rigorous interpretation of the pump test data could not be executed due to limited piezometric surface impacts witnessed at observation wells, thus restricting data analysis to the effects recorded within the pumping well only. Additionally, the pump test data was evaluated using extremely limited knowledge of the aquifer geology, boundary effects, aquifer type (confined or unconfined), barometric effects, aquifer thickness and other variables. Therefore, the conclusions presented herein concerning aquifer properties (ie, transmissivity, storativity and pumping well capture radius) will require additional investigation to substantiate.

## Background and Pump Test Procedure

The near surface site geology at the San Juan Gravel Tank Battery A#1 is poorly documented. Review of logs for 13 test holes advanced in the area indicates the lithology to be a sand and sand/gravel mix beginning from the ground surface and extending to a depth of approximately 7 feet. Information on the subsurface lithology at depths greater than this is not documented, but reportedly a plastic clay layer is found immediately above the shallow aquifer known to exist at a depth of approximately 10 feet to 12 feet below the ground surface. The aquifer is reportedly a sand and sand/gravel mix approximately 10 feet thick, with a base defined by a well cemented sandstone found at approximately 17 feet to 27 feet below the ground surface. There is insufficient lithologic data available to determine if the aquifer is confined or unconfined, or if the strata reportedly above and below the aquifer (clay layer and sandstone, respectively) may act as an aquitard or aquiclude.

There are 4 groundwater recovery wells located at the San Juan Gravel Tank Battery A#1 (see attached Site Plan). One groundwater recovery well (RW#3) was selected for performance of a pump test and the remaining three groundwater recovery wells were utilized as observation wells. Observation wells RW#1, RW#2 and RW#4 were located 152 feet, 93 feet and 67 feet, respectively, from pumping well RW#3.

Recovery well RW#3 was installed with an inner and outer casing string. The outer casing was constructed of a driven 8-inch

diameter steel pipe with a slotted interval across the aquifer, and the inner casing was constructed of 4 1/2-inch PVC casing, also with a slotted interval across the aquifer. A filter pack of 8-12 mesh sand was installed in the annulus between the casing strings.

The pump test was designed to operate for 24 hours at a pump rate of 2 gpm - 2.5 gpm. Electronic transducers were installed in the three observation wells and in the pumping well and connected to a data logger to provide a continuous record of water level changes during the test. Pre-pumping water level fluctuations, barometric pressure readings and confirmation water level readings using a tape or electronic probe were not obtained.

An electronic submersible pump was installed in well RW#3 and the pump test commenced at 10:55 AM on April 1, 1993. A pump rate of 2 gpm was maintained for approximately 1 hour, followed by a step rate increase to 2.5 gpm. A pump failure occurred at approximately 2 hours 20 minutes into the test. After pump repairs the test was resumed at approximately 3:00 PM on April 1, 1993. A flow rate of 2 gpm was maintained until 10:57 AM on April 2, 1993, at which time the pump test was terminated.

Pumping well and observation well drawdown data was down-loaded from the data logger to a computer spreadsheet (Lotus 123) following the pump test (attached). The data was plotted on a linear drawdown versus time scale for initial interpretation (attached). Review of the pumping well data indicates that water level changes were recorded during each phase of the pump test, however, data obtained on the observation wells is of questionable quality. The water level recorded in each observation well was constant with no drawdown until the end of the test, and then a minimal drawdown response over time was recorded in each well. An identical water level and water level change was recorded in each observation well, indicating a malfunction in the data logger. Post test analysis of the aquifer properties (see below) would allow an investigator to predict that the observation wells are too distant to experience an effect until the end of the test, but an identical response in three wells at various distances from the pump well is not an acceptable aquifer reaction. The data logger may have been connected in series rather than in parallel, thus recording a summation of the response of all three observation wells. No attempt was made at analyzing aquifer properties from the observation well data.

## Pump Test Analysis

Analysis of the pump test performed at the Amoco San Juan Gravel A#1 Tank Battery was restricted to evaluation of the pumping well response only. Observation well data was not interpreted due to questionable data quality and minimal response during the test (see

Background and Pump Test Procedure, above). Transient drawdown data could not be interpreted due to an almost instantaneous response when pumping was initiated. Therefore, analysis was performed on the buildup data recorded following the pump failure which occurred at approximately 2 hours 20 minutes into the test.

Due to limited knowledge of the aquifer type, numerous models for analysis were selected. These models included the Jacob Method for pumping well analysis, specific capacity analysis, Boulton delayed yield analysis and Hantush-Jacob analysis. Each model is inhibited by numerous assumptions and limitations. Universal assumptions for all methods include:

1) An aquifer infinite in extent
2) Isotropic and homogeneous lithology
3) An aquifer of uniform thickness throughout
4) Known effects of recharge and no-flow boundaries

Assumptions 1), 2) and 3) may have been valid during the limited extent of the well test. Assumption 4) was violated; flow is known to exist with a gradient of 0.00277 feet/foot at the site and pre-test piezometric fluctuations were not recorded. However, this violation is not expected to be a significant factor in evaluation of the pump test data because analysis was limited to the pumping well only.

Following is a discussion of the results of each analysis performed in evaluation of the San Juan Gravel A#1 Tank Battery pump test.

**Jacob Method of Pumped Well Analysis**

The Jacob Method of pumped well analysis was selected due to its universal application to well test analysis. The method is documented in "Ground Water Hydrology", David Keith Todd, PhD, 1959, John Wiley & Sons, Inc., pages 94-98.

The primary restriction in use of this model for analysis of buildup data is the requirement of transient water level conditions after wellbore storage and loss (skin damage) effects are overcome. Insufficient data is available to determine if this limitation was violated. A second restriction is that shut in time, t', be "large". The pump time for the test, t, was rate adjusted to 128.6 minutes, and the total buildup time was 28 minutes. Therefore, the restriction that t' be large may be violated. This method does not allow calculation of wellbore storage effects or well losses.

Plots, calculations and evaluation using the Jacob Method are attached. Transmissivity using this method was determined to be 3,300 gpd/foot and storativity was estimated at $1.3 \times 10^{-4}$. Based on this value of storativity, one could infer that the aquifer is

confined.

**Specific Capacity Analysis**

A method for estimating transmissivity by specific capacity analysis is presented by William C. Walton in "Practical Aspects of Ground Water Modeling", third edition, 1988, National Water Well Association, pages 130-134. The primary restriction in use of this method is that the pumping well penetrate the entire aquifer and be uncased throughout, and that well losses be negligible. Although the well is believed to penetrate the entire aquifer, it is cased and significant well losses were likely experienced during the well test. A limitation in use of specific capacity is that storativity is not determined with the method. Storativity must be estimated by interpretation of aquifer type and lithology.

Specific capacity analysis was performed using data from the two separate pump rates executed during the pump test. An unconfined aquifer was assumed, due to the relative ease with which one can estimate storativity in an unconfined aquifer versus a confined aquifer. Transmissivity determinations obtained from the two pump rates was extrapolated to a zero pump rate to account for well losses. Plots, calculations and evaluation using the specific capacity method are included. Storativity was estimated at 0.25 and transmissivity was calculated to be 3,512 gpd/foot.

**Boulton Delayed Yield Analysis**

The Boulton delayed yield analytical method was selected for analysis of the pump test because it was noted that a log-log plot of drawdown versus buildup time followed the general trend of the type curves used in the model. The method is described by S.W. Lohman in "Ground-Water Hydraulics", 1972, USGS Professional Paper 708, pages 34-40, and requires use of the type curves which accompany the paper. The Boulton delayed yield method accounts for an anisotropic unconfined aquifer in which there is a delayed yield from storage. The method is not normally applied to a pumped well because wellbore storage effects and well losses (skin damage) can significantly skew the analytical results.

Plots, calculations and evaluation using the Boulton method are included. Transmissivity was calculated at 686 gpd/foot, however, an unreasonable estimate of storativity was obtained. Therefore, the Boulton method may not be applicable and the transmissivity estimate should be used with considerable caution.

**Hantush-Jacob Transient Analysis**

The Hantush-Jacob transient analytical method was selected for analysis because it was noted that a log-log plot of drawdown versus buildup time divided by radius squared followed the general trend of the type curves used in the model. The method is described by Lohman (previously referenced), pages 30-32, and require the use of type curves.

A leaky confined aquifer with water released from the aquitard is modeled with the Hantush-Jacob transient analysis. As with the Boulton method, it is not normally applied to a pumped well because of storage and well loss effects.

Plots, calculations and evaluation using the Hantush-Jacob model are included. Transmissivity was calculated at 421 gpd/foot, but an unreasonable estimate of storativity was obtained. The Hantush-Jacob estimate of transmissivity should therefore be used with considerable caution.

Capture Radius Estimate

The following section provides an estimate of the capture radius of the recovery well used in the pump test at the San Juan Gravel Tank Battery A#1. Capture radius is the limit to which drawdown effects can overcome the natural gradient. The gradient at the subject site has been reported to be 0.00277 feet/foot.

Pump test analysis presented herein has indicated that more than one value of transmissivity can be supported, depending on the model applied for transmissivity determination. The most conservative model for estimation of capture radius, if aquifer type (confined or unconfined) is unknown, is use of an unconfined (water table) model because drawdown effects are substantially less in unconfined aquifers than in confined aquifers at any given pump rate.

There is evidence that the aquifer at the San Juan Gravel Tank Battery A#1 site is unconfined. Although the observation well drawdown data was not utilized in the pump test analysis because the data was of questionable validity, the minimal drawdown effects observed at the conclusion of the 24 hour pump test indicate that the aquifer is unconfined. Preliminary calculations (not presented herein), based on the values of transmissivity determined by this investigation, indicate that a considerable drawdown effect would have been experienced at the observation wells if the aquifer were confined.

Based on the assumption of an unconfined aquifer, capture radius can be estimated with the Boulton Model for a water table aquifer.

Application of this model requires the use of type curves and the usual assumptions that the aquifer is infinite, homogenous, isotropic and of equal thickness throughout. Equations and type curves presented in "Groundwater Resource Evaluation", William C. Walton, 1970, McGraw - Hill, Inc., pages 153-157 and 222-225, were used for evaluation. General assumptions for the analysis included:

1) Capture radius based on 100 days pump time
2) Water table storativity of 0.25
3) Transmissivity of 3,512 gpd/foot
4) Natural gradient of 0.00277 feet/foot

Calculations of capture radius are attached. Presented below is a summary table indicating the required pump rate to achieve a capture radius downgradient from the pumping well:

Table 1
San Juan Gravel Tank Battery A#1
Estimate of Pump Rate to Achieve Capture Radius

| Capture Radius | Drawdown Required[1] | Pump Rate Required[2] |
|---|---|---|
| 10 feet | 0.03 feet | 0.1 gpm |
| 50 feet | 0.14 feet | 0.8 gpm |
| 100 feet | 0.28 feet | 2.2 gpm |
| 200 feet | 0.55 feet | 7.1 gpm |

[1] Drawdown required to be established at the given downgradient radius to effect capture.

[2] Pump rate which will produce the required downgradient drawdown to achieve the given capture radius.

## Summary

Limited information is available concerning the aquifer type at the San Juan Gravel Tank Battery A#1 site. Analysis of the pump test performed at the site indicates that the aquifer may be unconfined. Additional pump testing or subsurface investigation is required to provide supportable documentation of the aquifer type.

Assuming that the aquifer is unconfined, the transmissivity estimate is 3,512 gpd/foot with an assumed storativity of 0.25. If the aquifer is confined, the transmissivity estimate is 3,300 gpd/foot and the storativity estimate is $1.3 \times 10^{-4}$.

Capture radius estimates based on an unconfined aquifer indicate that a 100 foot radius can be achieved at a rate of 2.2 gpm and a 200 foot radius can be achieved at a rate of 7.1 gpm.

If supportable estimates of aquifer properties at the San Juan Gravel Tank Battery A#1 are required, further investigation may be necessary as follows:

1) Drilling additional borings at the site to verify three dimensional lithology from the ground surface to the base of the aquifer

2) Installation of observation wells at approximately 10 foot, 20 foot and 40 foot distances from the recovery well

3) Performance of a pump test which includes pre-pumping water fluctuation data collection. The pump test should be performed with a constant, undisturbed pump rate and water level changes should be continuously recorded in the pump well and each of the observation wells

4) Data evaluation should be performed using a model which reflects the type of aquifer encountered at the site. Type curve matching should be performed if significant storage, loss, and/or pre-post transient conditions are identified.

## Limitations

This evaluation of the pump test performed at the San Juan Gravel Tank Battery A#1 site on April 1, 1993 is based on review of the data obtained during the pump test, review of test hole logs and personal communication with the personnel who designed and operated the test. Considerable interpretation is required in well test analysis and un-recorded or non-reported information could substantially alter the selection of methods applied for the well test analysis.

Prepared by:
**Envirotech Inc.**

Jeffrey C. Blagg, P.E.
Geological Engineer

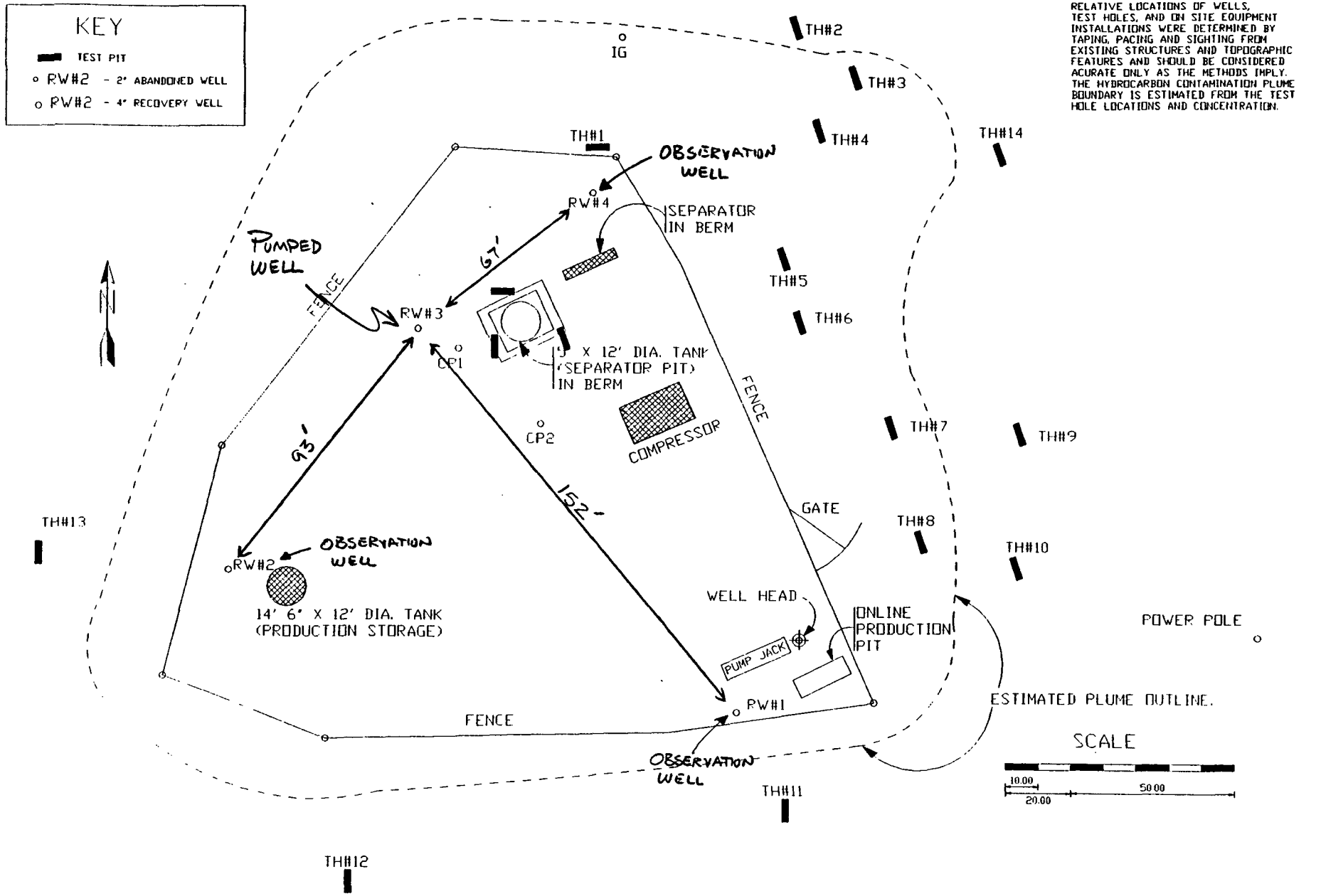
Reviewed By:

Michael K. Lane, P.E.
Geological Engineer

# Attachments

## San Juan Gravel Tank Battery A#1 Pump Test

Site Plan
Plot of Drawdown vs Time
Printout of Drawdown vs Time



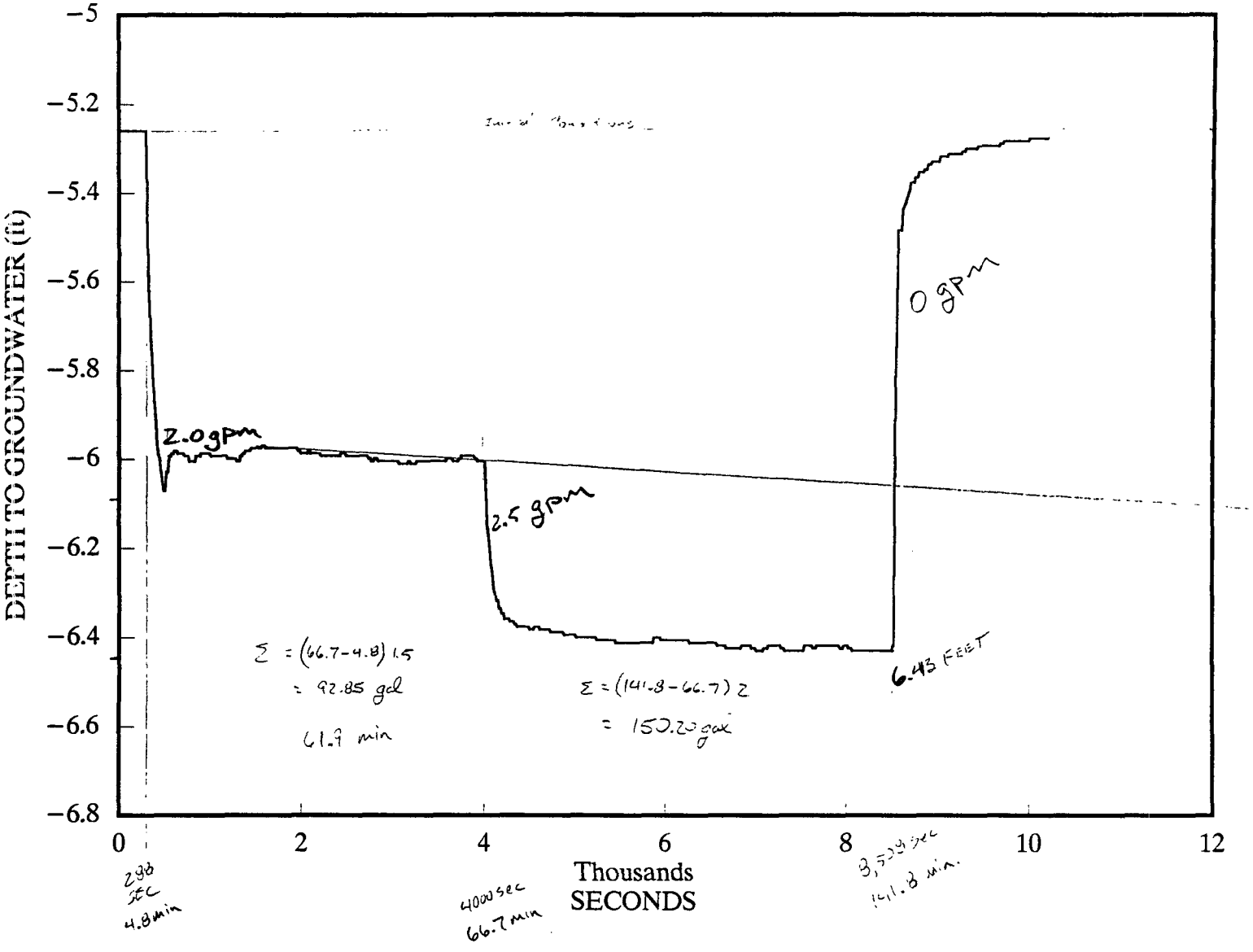

SAN JUAN GRAVEL TANK BATTERY #1
SE 4, SE/4, SEC 21, T29, R13W
PRODUCTION TANK PIT AREA
REMEDIATION PLAN PROJECT NO: 92140/94028-29

AMOCO PRODUCTION COMPANY
200 AMOCO CT.
FARMINGTON, NEW MEXICO

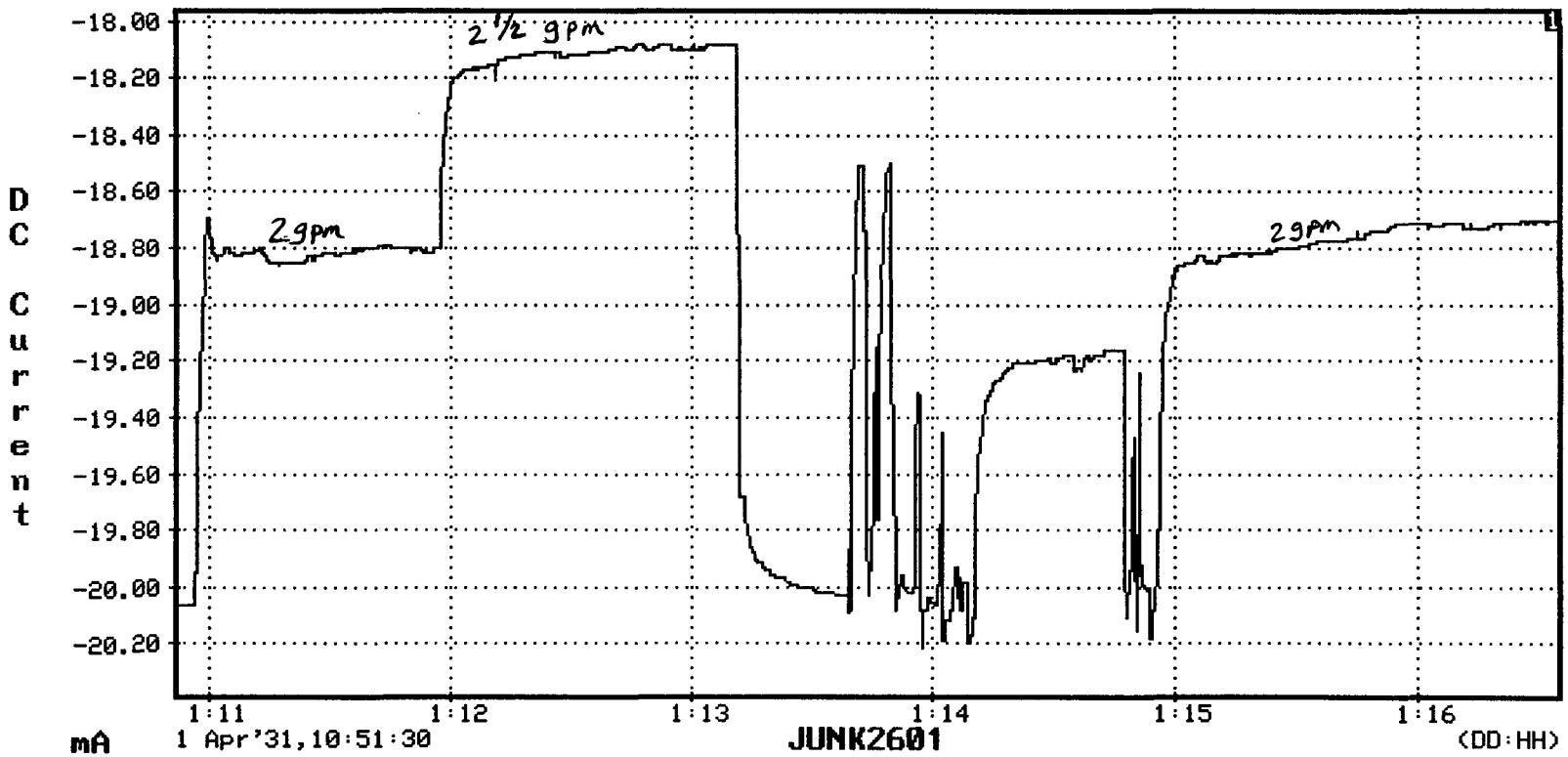
ENVIROTECH INC.
ENVIRONMENTAL SCIENTISTS & ENGINEERS
5796 U.S. HIGHWAY 64-3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

SITE PLAN
SHEET 2
9/4/92

AMOCO C.C. GRAVEL KW-2




Apparent Pump Time = $\frac{150.20 + 92.85}{2 \text{ gpm}}$ = 121.53 min.


-18.00
-18.20
-18.40
-18.60
-18.80
-19.00
-19.20
-19.40
-19.60
-19.80
-20.00
-20.20
DC Current
2 1/2 gpm
2gpm
2gpm
1:11
1:12
1:13
1:14
1:15
1:16
mA
1 Apr'31,10:51:30
JUNK2601
(DD:HH)

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 0 | 20.06 | 0.00 | 5.26 | -5.26 |
| 10 | 20.06 | 0.00 | 5.26 | -5.26 |
| 20 | 20.06 | 0.00 | 5.26 | -5.26 |
| 30 | 20.06 | 0.00 | 5.26 | -5.26 |
| 40 | 20.06 | 0.00 | 5.26 | -5.26 |
| 50 | 20.06 | 0.00 | 5.26 | -5.26 |
| 60 | 20.06 | 0.00 | 5.26 | -5.26 |
| 70 | 20.06 | 0.00 | 5.26 | -5.26 |
| 80 | 20.06 | 0.00 | 5.26 | -5.26 |
| 90 | 20.06 | 0.00 | 5.26 | -5.26 |
| 100 | 20.06 | 0.00 | 5.26 | -5.26 |
| 110 | 20.06 | 0.00 | 5.26 | -5.26 |
| 120 | 20.06 | 0.00 | 5.26 | -5.26 |
| 130 | 20.06 | 0.00 | 5.26 | -5.26 |
| 140 | 20.06 | 0.00 | 5.26 | -5.26 |
| 150 | 20.06 | 0.00 | 5.26 | -5.26 |
| 160 | 20.06 | 0.00 | 5.26 | -5.26 |
| 170 | 20.06 | 0.00 | 5.26 | -5.26 |
| 180 | 20.06 | 0.00 | 5.26 | -5.26 |
| 190 | 20.06 | 0.00 | 5.26 | -5.26 |
| 200 | 20.06 | 0.00 | 5.26 | -5.26 |
| 210 | 20.06 | 0.00 | 5.26 | -5.26 |
| 220 | 20.06 | 0.00 | 5.26 | -5.26 |
| 230 | 20.06 | 0.00 | 5.26 | -5.26 |
| 240 | 20.06 | 0.00 | 5.26 | -5.26 |
| 250 | 20.06 | 0.00 | 5.26 | -5.26 |
| 260 | 20.06 | 0.00 | 5.26 | -5.26 |
| 270 | 20.06 | 0.00 | 5.26 | -5.26 |
| 280 | 20.06 | 0.00 | 5.26 | -5.26 |
| 290 | 20.06 | 0.00 | 5.26 | -5.26 |
| 300 | 19.95 | 0.07 | 5.33 | -5.325 |
| 310 | 19.63 | 0.25 | 5.51 | -5.51409 |
| 320 | 19.47 | 0.35 | 5.61 | -5.60864 |
| 330 | 19.39 | 0.40 | 5.66 | -5.65591 |
| 340 | 19.32 | 0.44 | 5.70 | -5.69727 |
| 350 | 19.24 | 0.48 | 5.74 | -5.74455 |
| 360 | 19.19 | 0.51 | 5.77 | -5.77409 |
| 370 | 19.14 | 0.54 | 5.80 | -5.80364 |
| 380 | 19.04 | 0.60 | 5.86 | -5.86273 |
| 390 | 18.99 | 0.63 | 5.89 | -5.89227 |
| 400 | 18.95 | 0.66 | 5.92 | -5.91591 |
| 410 | 18.9 | 0.69 | 5.95 | -5.94546 |
| 420 | 18.85 | 0.72 | 5.98 | -5.975 |
| 430 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 440 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 450 | 18.77 | 0.76 | 6.02 | -6.02227 |
| 460 | 18.75 | 0.77 | 6.03 | -6.03409 |
| 470 | 18.72 | 0.79 | 6.05 | -6.05182 |
| 480 | 18.69 | 0.81 | 6.07 | -6.06955 |
| 490 | 18.69 | 0.81 | 6.07 | -6.06955 |
| 500 | 18.69 | 0.81 | 6.07 | -6.06955 |
| 510 | 18.76 | 0.77 | 6.03 | -6.02818 |
| 520 | 18.76 | 0.77 | 6.03 | -6.02818 |
| 530 | 18.76 | 0.77 | 6.03 | -6.02818 |
| 540 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 550 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 560 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 570 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 580 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 590 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 600 | 18.84 | 0.72 | 5.98 | -5.98091 |

| Elap Time SECONDS | −mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 610 | 18.84 | 0.72 | 5.98 | −5.98091 |
| 620 | 18.84 | 0.72 | 5.98 | −5.98091 |
| 630 | 18.84 | 0.72 | 5.98 | −5.98091 |
| 640 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 650 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 660 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 670 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 680 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 690 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 700 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 710 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 720 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 730 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 740 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 750 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 760 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 770 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 780 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 790 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 800 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 810 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 820 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 830 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 840 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 850 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 860 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 870 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 880 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 890 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 900 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 910 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 920 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 930 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 940 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 950 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 960 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 970 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 980 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 990 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 1000 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1010 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1020 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1030 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1040 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1050 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1060 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1070 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1080 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1090 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1100 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1110 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1120 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1130 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1140 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1150 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1160 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1170 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 1180 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 1190 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 1200 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 1210 | 18.81 | 0.74 | 6.00 | −5.99864 |

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 1220 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 1230 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 1240 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 1250 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 1260 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 1270 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 1280 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 1290 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 1300 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 1310 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 1320 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 1330 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 1340 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 1350 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 1360 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 1370 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 1380 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1390 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1400 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1410 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1420 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1430 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1440 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1450 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1460 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1470 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1480 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1490 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1500 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1510 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1520 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1530 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1540 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1550 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1560 | 18.86 | 0.71 | 5.97 | -5.96909 |
| 1570 | 18.86 | 0.71 | 5.97 | -5.96909 |
| 1580 | 18.86 | 0.71 | 5.97 | -5.96909 |
| 1590 | 18.86 | 0.71 | 5.97 | -5.96909 |
| 1600 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1610 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1620 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1630 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1640 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1650 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1660 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1670 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1680 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1690 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1700 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1710 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1720 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1730 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1740 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1750 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1760 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1770 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1780 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1790 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1800 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1810 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1820 | 18.85 | 0.72 | 5.98 | -5.975 |

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 1830 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1840 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1850 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1860 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1870 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1880 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1890 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1900 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1910 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1920 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1930 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1940 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1950 | 18.85 | 0.72 | 5.98 | -5.975 |
| 1960 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1970 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1980 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 1990 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2000 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2010 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2020 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2030 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2040 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2050 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2060 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2070 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 2080 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 2090 | 18.84 | 0.72 | 5.98 | -5.98091 |
| 2100 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2110 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2120 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2130 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2140 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2150 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2160 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2170 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2180 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2190 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2200 | 18.83 | 0.73 | 5.99 | -5.98682 |
| 2210 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2220 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2230 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2240 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2250 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2260 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2270 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2280 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2290 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2300 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2310 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2320 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2330 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2340 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2350 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2360 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2370 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2380 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2390 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2400 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2410 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2420 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 2430 | 18.83 | 0.73 | 5.99 | -5.98682 |

| Elap Time SECONDS | −mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 2440 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 2450 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 2460 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 2470 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 2480 | 18.83 | 0.73 | 5.99 | −5.98682 |
| 2490 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2500 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2510 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2520 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2530 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2540 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2550 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2560 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2570 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2580 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2590 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2600 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2610 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2620 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2630 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2640 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2650 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2660 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2670 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2680 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2690 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2700 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2710 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2720 | 18.82 | 0.73 | 5.99 | −5.99273 |
| 2730 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 2740 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 2750 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 2760 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2770 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2780 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2790 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 2800 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 2810 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 2820 | 18.81 | 0.74 | 6.00 | −5.99864 |
| 2830 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2840 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2850 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2860 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2870 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2880 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2890 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2900 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2910 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2920 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2930 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2940 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2950 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2960 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2970 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2980 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 2990 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 3000 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 3010 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 3020 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 3030 | 18.8 | 0.74 | 6.00 | −6.00455 |
| 3040 | 18.8 | 0.74 | 6.00 | −6.00455 |

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 3050 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3060 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3070 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3080 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3090 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3100 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3110 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3120 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3130 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3140 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3150 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3160 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3170 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3180 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3190 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3200 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3210 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3220 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3230 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3240 | 18.79 | 0.75 | 6.01 | -6.01046 |
| 3250 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3260 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3270 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3280 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3290 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3300 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3310 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3320 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3330 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3340 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3350 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3360 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3370 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3380 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3390 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3400 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3410 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3420 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3430 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3440 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3450 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3460 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3470 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3480 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3490 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3500 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3510 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3520 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3530 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3540 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3550 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3560 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3570 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3580 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3590 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3600 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3610 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3620 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3630 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3640 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3650 | 18.8 | 0.74 | 6.00 | -6.00455 |

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 3660 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3670 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3680 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3690 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3700 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3710 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3720 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3730 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3740 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3750 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3760 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3770 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3780 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3790 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3800 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3810 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3820 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3830 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3840 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3850 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3860 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3870 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3880 | 18.82 | 0.73 | 5.99 | -5.99273 |
| 3890 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3900 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3910 | 18.81 | 0.74 | 6.00 | -5.99864 |
| 3920 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3930 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3940 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3950 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3960 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3970 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3980 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 3990 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 4000 | 18.8 | 0.74 | 6.00 | -6.00455 |
| 4010 | 18.71 | 0.80 | 6.06 | -6.05773 |
| 4020 | 18.64 | 0.84 | 6.10 | -6.09909 |
| 4030 | 18.55 | 0.89 | 6.15 | -6.15227 |
| 4040 | 18.52 | 0.91 | 6.17 | -6.17 |
| 4050 | 18.49 | 0.93 | 6.19 | -6.18773 |
| 4060 | 18.44 | 0.96 | 6.22 | -6.21727 |
| 4070 | 18.41 | 0.98 | 6.24 | -6.235 |
| 4080 | 18.39 | 0.99 | 6.25 | -6.24682 |
| 4090 | 18.36 | 1.00 | 6.26 | -6.26455 |
| 4100 | 18.33 | 1.02 | 6.28 | -6.28227 |
| 4110 | 18.31 | 1.03 | 6.29 | -6.29409 |
| 4120 | 18.29 | 1.05 | 6.31 | -6.30591 |
| 4130 | 18.27 | 1.06 | 6.32 | -6.31773 |
| 4140 | 18.27 | 1.06 | 6.32 | -6.31773 |
| 4150 | 18.27 | 1.06 | 6.32 | -6.31773 |
| 4160 | 18.24 | 1.08 | 6.34 | -6.33546 |
| 4170 | 18.24 | 1.08 | 6.34 | -6.33546 |
| 4180 | 18.24 | 1.08 | 6.34 | -6.33546 |
| 4190 | 18.22 | 1.09 | 6.35 | -6.34727 |
| 4200 | 18.22 | 1.09 | 6.35 | -6.34727 |
| 4210 | 18.22 | 1.09 | 6.35 | -6.34727 |
| 4220 | 18.2 | 1.10 | 6.36 | -6.35909 |
| 4230 | 18.2 | 1.10 | 6.36 | -6.35909 |
| 4240 | 18.2 | 1.10 | 6.36 | -6.35909 |
| 4250 | 18.2 | 1.10 | 6.36 | -6.35909 |
| 4260 | 18.2 | 1.10 | 6.36 | -6.35909 |

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 4270 | 18.2 | 1.10 | 6.36 | -6.35909 |
| 4280 | 18.19 | 1.11 | 6.37 | -6.365 |
| 4290 | 18.19 | 1.11 | 6.37 | -6.365 |
| 4300 | 18.19 | 1.11 | 6.37 | -6.365 |
| 4310 | 18.19 | 1.11 | 6.37 | -6.365 |
| 4320 | 18.19 | 1.11 | 6.37 | -6.365 |
| 4330 | 18.18 | 1.11 | 6.37 | -6.37091 |
| 4340 | 18.18 | 1.11 | 6.37 | -6.37091 |
| 4350 | 18.18 | 1.11 | 6.37 | -6.37091 |
| 4360 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4370 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4380 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4390 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4400 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4410 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4420 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4430 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4440 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4450 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4460 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4470 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4480 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4490 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4500 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4510 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4520 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4530 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4540 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4550 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4560 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4570 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4580 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4590 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4600 | 18.17 | 1.12 | 6.38 | -6.37682 |
| 4610 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4620 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4630 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4640 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4650 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4660 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4670 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4680 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4690 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4700 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4710 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4720 | 18.16 | 1.12 | 6.38 | -6.38273 |
| 4730 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4740 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4750 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4760 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4770 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4780 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4790 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4800 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4810 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4820 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4830 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4840 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4850 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4860 | 18.15 | 1.13 | 6.39 | -6.38864 |
| 4870 | 18.15 | 1.13 | 6.39 | -6.38864 |

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 4880 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4890 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4900 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4910 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4920 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4930 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4940 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4950 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4960 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4970 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4980 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 4990 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 5000 | 18.14 | 1.13 | 6.39 | -6.39455 |
| 5010 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5020 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5030 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5040 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5050 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5060 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5070 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5080 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5090 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5100 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5110 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5120 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5130 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5140 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5150 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5160 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5170 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5180 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5190 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5200 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5210 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5220 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5230 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5240 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5250 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5260 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5270 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5280 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5290 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5300 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5310 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5320 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5330 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5340 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5350 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5360 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5370 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5380 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5390 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5400 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5410 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5420 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5430 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5440 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5450 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5460 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5470 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5480 | 18.11 | 1.15 | 6.41 | -6.41227 |

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 5490 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5500 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5510 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5520 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5530 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5540 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5550 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5560 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5570 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5580 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5590 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5600 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5610 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5620 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5630 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5640 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5650 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5660 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5670 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5680 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5690 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5700 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5710 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5720 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5730 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5740 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5750 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5760 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5770 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5780 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5790 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5800 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5810 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5820 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5830 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5840 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5850 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5860 | 18.11 | 1.15 | 6.41 | -6.41227 |
| 5870 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5880 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5890 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5900 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5910 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5920 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5930 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5940 | 18.13 | 1.14 | 6.40 | -6.40046 |
| 5950 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5960 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5970 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5980 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 5990 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6000 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6010 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6020 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6030 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6040 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6050 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6060 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6070 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6080 | 18.12 | 1.15 | 6.41 | -6.40637 |
| 6090 | 18.12 | 1.15 | 6.41 | -6.40637 |

| Elap Time SECONDS | −mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 6100 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6110 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6120 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6130 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6140 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6150 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6160 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6170 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6180 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6190 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6200 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6210 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6220 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6230 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6240 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6250 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6260 | 18.12 | 1.15 | 6.41 | −6.40637 |
| 6270 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6280 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6290 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6300 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6310 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6320 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6330 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6340 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6350 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6360 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6370 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6380 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6390 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6400 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6410 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6420 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6430 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6440 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6450 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6460 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6470 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6480 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6490 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6500 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6510 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6520 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6530 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6540 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6550 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6560 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6570 | 18.11 | 1.15 | 6.41 | −6.41227 |
| 6580 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6590 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6600 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6610 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6620 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6630 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6640 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6650 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6660 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6670 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 6680 | 18.09 | 1.16 | 6.42 | −6.42409 |
| 6690 | 18.09 | 1.16 | 6.42 | −6.42409 |
| 6700 | 18.09 | 1.16 | 6.42 | −6.42409 |

| Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 6710 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6720 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6730 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6740 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6750 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6760 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6770 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6780 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6790 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6800 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6810 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6820 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6830 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6840 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6850 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6860 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6870 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6880 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6890 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6900 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6910 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6920 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6930 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6940 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6950 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 6960 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6970 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6980 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 6990 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7000 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7010 | 18.08 | 1.17 | 6.43 | -6.43 |
| 7020 | 18.08 | 1.17 | 6.43 | -6.43 |
| 7030 | 18.08 | 1.17 | 6.43 | -6.43 |
| 7040 | 18.08 | 1.17 | 6.43 | -6.43 |
| 7050 | 18.08 | 1.17 | 6.43 | -6.43 |
| 7060 | 18.08 | 1.17 | 6.43 | -6.43 |
| 7070 | 18.08 | 1.17 | 6.43 | -6.43 |
| 7080 | 18.08 | 1.17 | 6.43 | -6.43 |
| 7090 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7100 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7110 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7120 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7130 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7140 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7150 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7160 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7170 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7180 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7190 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7200 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7210 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7220 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7230 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7240 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7250 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7260 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7270 | 18.1 | 1.16 | 6.42 | -6.41818 |
| 7280 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7290 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7300 | 18.09 | 1.16 | 6.42 | -6.42409 |
| 7310 | 18.09 | 1.16 | 6.42 | -6.42409 |

| Elap Time SECONDS | −mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|
| 7320 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7330 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7340 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7350 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7360 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7370 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7380 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7390 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7400 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7410 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7420 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7430 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7440 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7450 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7460 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7470 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7480 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7490 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7500 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7510 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7520 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7530 | 18.08 | 1.17 | 6.43 | −6.43 |
| 7540 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7550 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7560 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7570 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7580 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7590 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7600 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7610 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7620 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7630 | 18.09 | 1.16 | 6.42 | −6.42409 |
| 7640 | 18.09 | 1.16 | 6.42 | −6.42409 |
| 7650 | 18.09 | 1.16 | 6.42 | −6.42409 |
| 7660 | 18.09 | 1.16 | 6.42 | −6.42409 |
| 7670 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7680 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7690 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7700 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7710 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7720 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7730 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7740 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7750 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7760 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7770 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7780 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7790 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7800 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7810 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7820 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7830 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7840 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7850 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7860 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7870 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7880 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7890 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7900 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7910 | 18.1 | 1.16 | 6.42 | −6.41818 |
| 7920 | 18.1 | 1.16 | 6.42 | −6.41818 |

| Elap Time SECONDS | −mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE | |
|---|---|---|---|---|---|
| 7930 | 18.09 | 1.16 | 6.42 | −6.42409 | |
| 7940 | 18.09 | 1.16 | 6.42 | −6.42409 | |
| 7950 | 18.09 | 1.16 | 6.42 | −6.42409 | |
| 7960 | 18.09 | 1.16 | 6.42 | −6.42409 | |
| 7970 | 18.1 | 1.16 | 6.42 | −6.41818 | |
| 7980 | 18.1 | 1.16 | 6.42 | −6.41818 | |
| 7990 | 18.1 | 1.16 | 6.42 | −6.41818 | |
| 8000 | 18.1 | 1.16 | 6.42 | −6.41818 | |
| 8010 | 18.1 | 1.16 | 6.42 | −6.41818 | |
| 8020 | 18.09 | 1.16 | 6.42 | −6.42409 | |
| 8030 | 18.09 | 1.16 | 6.42 | −6.42409 | |
| 8040 | 18.09 | 1.16 | 6.42 | −6.42409 | |
| 8050 | 18.09 | 1.16 | 6.42 | −6.42409 | |
| 8060 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8070 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8080 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8090 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8100 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8110 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8120 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8130 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8140 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8150 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8160 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8170 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8180 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8190 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8200 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8210 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8220 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8230 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8240 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8250 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8260 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8270 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8280 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8290 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8300 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8310 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8320 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8330 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8340 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8350 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8360 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8370 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8380 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8390 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8400 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8410 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8420 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8430 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8440 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8450 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8460 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8470 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8480 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8490 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8500 | 18.08 | 1.17 | 6.43 | −6.43 | |
| 8510 | 18.1 | 1.16 | 6.42 | −6.41818 | |
| t = 0 8520 | 18.1 | 1.16 | 6.42 | −6.41818 | BUILD-UP DATA ↓ |
| 8530 | 18.63 | 0.85 | 6.11 | −6.105 | |

| | Elap Time SECONDS | −mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|---|
| | 8540 | 19.07 | 0.59 | 5.85 | −5.845 |
| | 8550 | 19.29 | 0.46 | 5.72 | −5.715 |
| | 8560 | 19.51 | 0.33 | 5.59 | −5.585 |
| | 8570 | 19.68 | 0.22 | 5.48 | −5.48455 |
| t = 1 | 8580 | 19.68 | 0.22 | 5.48 | −5.48455 |
| | 8590 | 19.68 | 0.22 | 5.48 | −5.48455 |
| | 8600 | 19.68 | 0.22 | 5.48 | −5.48455 |
| | 8610 | 19.68 | 0.22 | 5.48 | −5.48455 |
| | 8620 | 19.76 | 0.18 | 5.44 | −5.43727 |
| | 8630 | 19.77 | 0.17 | 5.43 | −5.43136 |
| t = 2 | 8640 | 19.78 | 0.17 | 5.43 | −5.42545 |
| | 8650 | 19.78 | 0.17 | 5.43 | −5.42545 |
| | 8660 | 19.8 | 0.15 | 5.41 | −5.41364 |
| | 8670 | 19.81 | 0.15 | 5.41 | −5.40773 |
| | 8680 | 19.82 | 0.14 | 5.40 | −5.40182 |
| | 8690 | 19.83 | 0.14 | 5.40 | −5.39591 |
| t = 3 | 8700 | 19.86 | 0.12 | 5.38 | −5.37818 |
| | 8710 | 19.86 | 0.12 | 5.38 | −5.37818 |
| | 8720 | 19.86 | 0.12 | 5.38 | −5.37818 |
| | 8730 | 19.86 | 0.12 | 5.38 | −5.37818 |
| | 8740 | 19.86 | 0.12 | 5.38 | −5.37818 |
| | 8750 | 19.88 | 0.11 | 5.37 | −5.36636 |
| t = 4 | 8760 | 19.88 | 0.11 | 5.37 | −5.36636 |
| | 8770 | 19.88 | 0.11 | 5.37 | −5.36636 |
| | 8780 | 19.88 | 0.11 | 5.37 | −5.36636 |
| | 8790 | 19.9 | 0.09 | 5.35 | −5.35455 |
| | 8800 | 19.9 | 0.09 | 5.35 | −5.35455 |
| | 8810 | 19.9 | 0.09 | 5.35 | −5.35455 |
| t = 5 | 8820 | 19.9 | 0.09 | 5.35 | −5.35455 |
| | 8830 | 19.9 | 0.09 | 5.35 | −5.35455 |
| | 8840 | 19.9 | 0.09 | 5.35 | −5.35455 |
| | 8850 | 19.91 | 0.09 | 5.35 | −5.34864 |
| | 8860 | 19.91 | 0.09 | 5.35 | −5.34864 |
| | 8870 | 19.91 | 0.09 | 5.35 | −5.34864 |
| t = 6 | 8880 | 19.91 | 0.09 | 5.35 | −5.34864 |
| | 8890 | 19.93 | 0.08 | 5.34 | −5.33682 |
| | 8900 | 19.93 | 0.08 | 5.34 | −5.33682 |
| | 8910 | 19.93 | 0.08 | 5.34 | −5.33682 |
| | 8920 | 19.93 | 0.08 | 5.34 | −5.33682 |
| | 8930 | 19.94 | 0.07 | 5.33 | −5.33091 |
| t = 7 | 8940 | 19.94 | 0.07 | 5.33 | −5.33091 |
| | 8950 | 19.94 | 0.07 | 5.33 | −5.33091 |
| | 8960 | 19.94 | 0.07 | 5.33 | −5.33091 |
| | 8970 | 19.94 | 0.07 | 5.33 | −5.33091 |
| | 8980 | 19.94 | 0.07 | 5.33 | −5.33091 |
| | 8990 | 19.94 | 0.07 | 5.33 | −5.33091 |
| t = 8 | 9000 | 19.94 | 0.07 | 5.33 | −5.33091 |
| | 9010 | 19.94 | 0.07 | 5.33 | −5.33091 |
| | 9020 | 19.96 | 0.06 | 5.32 | −5.31909 |
| | 9030 | 19.96 | 0.06 | 5.32 | −5.31909 |
| | 9040 | 19.96 | 0.06 | 5.32 | −5.31909 |
| | 9050 | 19.96 | 0.06 | 5.32 | −5.31909 |
| t = 9 | 9060 | 19.96 | 0.06 | 5.32 | −5.31909 |
| | 9070 | 19.96 | 0.06 | 5.32 | −5.31909 |
| | 9080 | 19.96 | 0.06 | 5.32 | −5.31909 |
| | 9090 | 19.96 | 0.06 | 5.32 | −5.31909 |
| | 9100 | 19.96 | 0.06 | 5.32 | −5.31909 |
| | 9110 | 19.97 | 0.05 | 5.31 | −5.31318 |
| t = 10 | 9120 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9130 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9140 | 19.97 | 0.05 | 5.31 | −5.31318 |

| | Elap Time SECONDS | −mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|---|
| | 9150 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9160 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9170 | 19.97 | 0.05 | 5.31 | −5.31318 |
| t = 11 | 9180 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9190 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9200 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9210 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9220 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9230 | 19.97 | 0.05 | 5.31 | −5.31318 |
| t = 12 | 9240 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9250 | 19.97 | 0.05 | 5.31 | −5.31318 |
| | 9260 | 19.98 | 0.05 | 5.31 | −5.30727 |
| | 9270 | 19.98 | 0.05 | 5.31 | −5.30727 |
| | 9280 | 19.98 | 0.05 | 5.31 | −5.30727 |
| | 9290 | 19.98 | 0.05 | 5.31 | −5.30727 |
| t = 13 | 9300 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9310 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9320 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9330 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9340 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9350 | 19.99 | 0.04 | 5.30 | −5.30136 |
| t = 14 | 9360 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9370 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9380 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9390 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9400 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9410 | 19.99 | 0.04 | 5.30 | −5.30136 |
| t = 15 | 9420 | 19.99 | 0.04 | 5.30 | −5.30136 |
| | 9430 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9440 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9450 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9460 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9470 | 20 | 0.04 | 5.30 | −5.29545 |
| t = 16 | 9480 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9490 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9500 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9510 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9520 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9530 | 20 | 0.04 | 5.30 | −5.29545 |
| t = 17 | 9540 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9550 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9560 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9570 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9580 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9590 | 20 | 0.04 | 5.30 | −5.29545 |
| t = 18 | 9600 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9610 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9620 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9630 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9640 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9650 | 20 | 0.04 | 5.30 | −5.29545 |
| t = 19 | 9660 | 20 | 0.04 | 5.30 | −5.29545 |
| | 9670 | 20.01 | 0.03 | 5.29 | −5.28955 |
| | 9680 | 20.01 | 0.03 | 5.29 | −5.28955 |
| | 9690 | 20.01 | 0.03 | 5.29 | −5.28955 |
| | 9700 | 20.01 | 0.03 | 5.29 | −5.28955 |
| | 9710 | 20.02 | 0.02 | 5.28 | −5.28364 |
| t = 20 | 9720 | 20.02 | 0.02 | 5.28 | −5.28364 |
| | 9730 | 20.02 | 0.02 | 5.28 | −5.28364 |
| | 9740 | 20.02 | 0.02 | 5.28 | −5.28364 |
| | 9750 | 20.02 | 0.02 | 5.28 | −5.28364 |

| | Elap Time SECONDS | -mV | FEET OF DRAWDOWN | DTW | DEPTH FROM SURFACE |
|---|---|---|---|---|---|
| | 9760 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9770 | 20.02 | 0.02 | 5.28 | -5.28364 |
| t=21 | 9780 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9790 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9800 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9810 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9820 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9830 | 20.02 | 0.02 | 5.28 | -5.28364 |
| t=22 | 9840 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9850 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9860 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9870 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9880 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9890 | 20.02 | 0.02 | 5.28 | -5.28364 |
| t=23 | 9900 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9910 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9920 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9930 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9940 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9950 | 20.02 | 0.02 | 5.28 | -5.28364 |
| t=24 | 9960 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9970 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9980 | 20.02 | 0.02 | 5.28 | -5.28364 |
| | 9990 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10000 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10010 | 20.03 | 0.02 | 5.28 | -5.27773 |
| t=25 | 10020 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10030 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10040 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10050 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10060 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10070 | 20.03 | 0.02 | 5.28 | -5.27773 |
| t=26 | 10080 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10090 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10100 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10110 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10120 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10130 | 20.03 | 0.02 | 5.28 | -5.27773 |
| t=27 | 10140 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10150 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10160 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10170 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10180 | 20.03 | 0.02 | 5.28 | -5.27773 |
| | 10190 | 20.03 | 0.02 | 5.28 | -5.27773 |
| t=28 | 10200 | 20.03 | 0.02 | 5.28 | -5.27773 |

# Jacob Method of Pumped Well Analysis
# San Juan Gravel Tank Battery A#1 Pump Test

## Calculations and Plots

JACOB METHOD OF PUMPED WELL ANALYSIS (TODD[4], pg 97)

$$T = \frac{2.30\,Q}{4\pi(s)} \log \frac{t}{t'}$$

$Q = 2.5$ gpm

$t = 128.6$ min

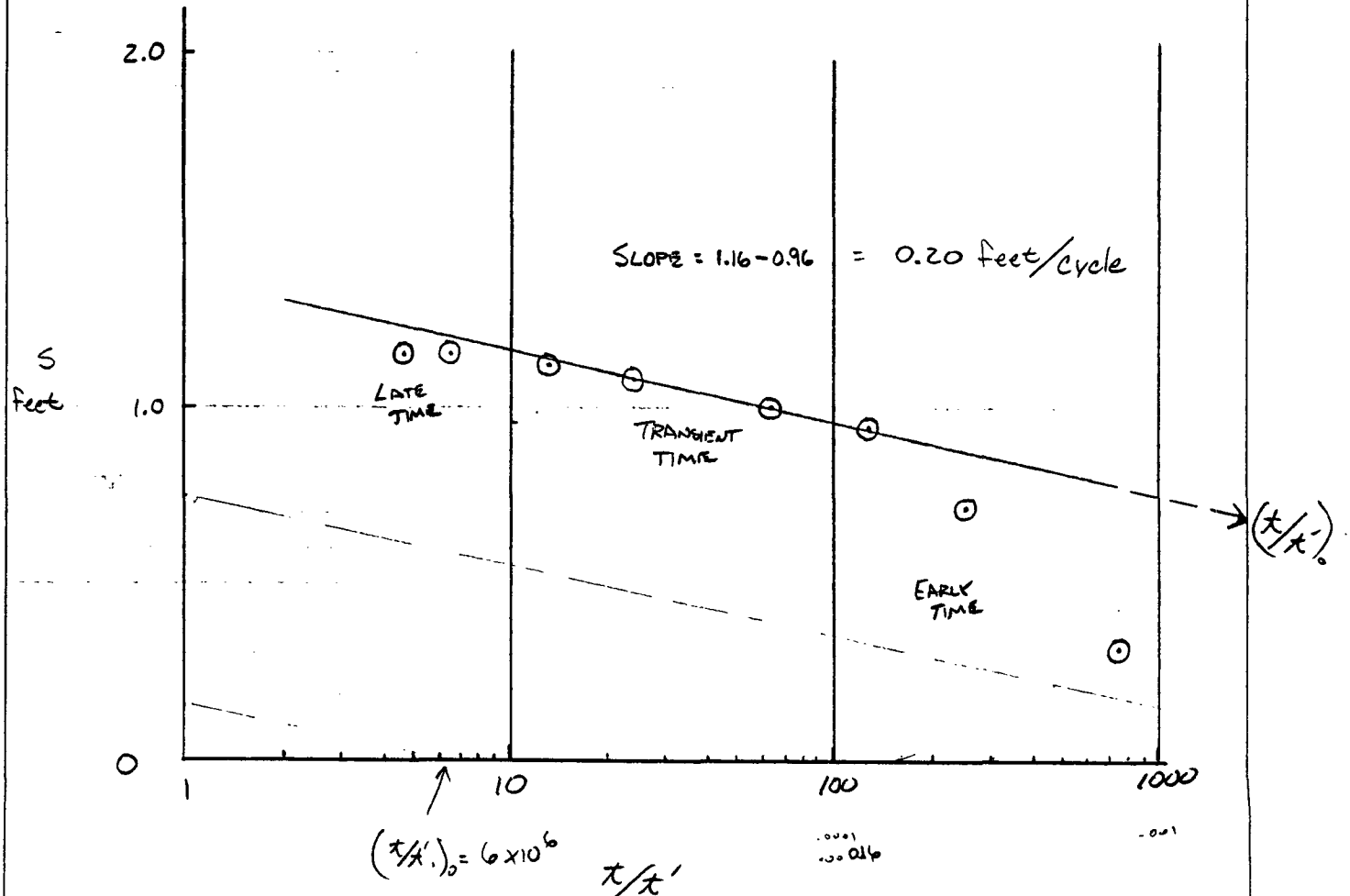
$t'$ = shut-in time

$s = \Delta h$ @ $t'$

| $t'$ | $t/t'$ | $s$ |
|---|---|---|
| 0 | $\infty$ | 0 |
| 0.17 | 756 | 0.32 |
| 0.50 | 257 | 0.71 |
| 1.0 | 129 | 0.85 |
| 2.0 | 64.3 | 1.00 |
| 5.0 | 25.7 | 1.08 |
| 10.0 | 12.9 | 1.12 |
| 20.0 | 6.43 | 1.15 |
| 28.0 | 4.59 | 1.15 |

$$T = \frac{264 \times 2.5}{0.20} = 3{,}300 \frac{\text{gpd}}{\text{foot}}$$

$$S = \frac{(0.3)(3{,}300)(1.49\times10^{-8})}{(.333)^2} = 1.33\times10^{-4}$$




$\Rightarrow t' = 2.14\times10^{-5}$ min

$= 1.49\times10^{-2}$ days

# Specific Capacity Analysis
# San Juan Gravel Tank Battery A#1 Pump Test

## Calculations and Plots

EVALUATION OF PUMP TEST USING SPECIFIC CAPACITY TO DETERMINE T

$$Q/s = \frac{T}{264 \log\left(\frac{Tt}{2693 r_w^2 S}\right) - 66.1}$$ WALTON[1], pg 130

$Q_1$ = 2.0 gpm
$s_1$ = 0.74 FEET
$t_1$ = 4000 sec = 67 min.
$r_w$ = 4" = 0.333 feet

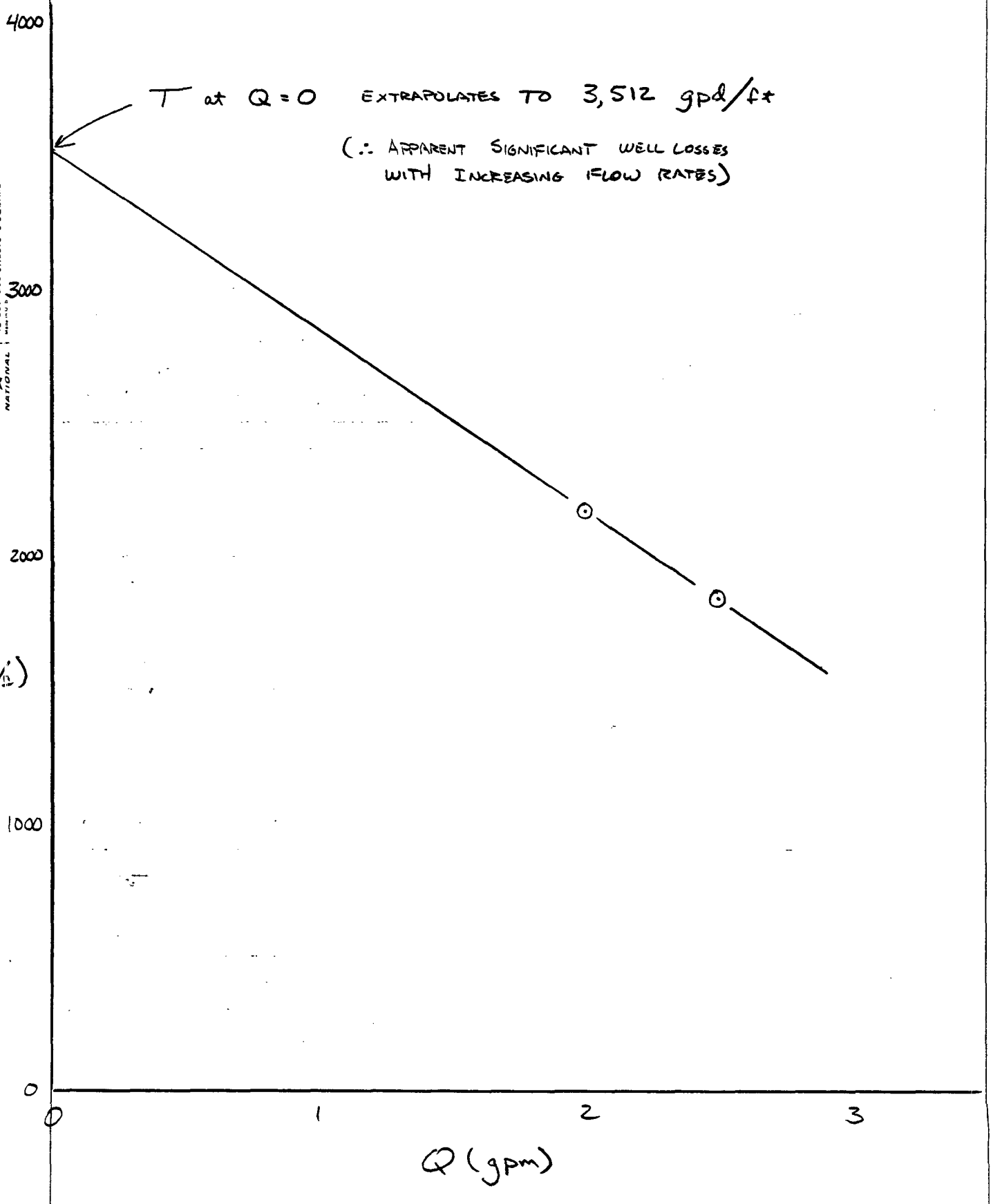
$S$ (ESTIMATED) = 0.25 WALTON[2], pg 165
[ASSUMING UNCONFINED AQUIFER]

SOLVING FOR T, TRANSMISSIVITY = 2,168 gpd/ft

$Q_2$ = 2.5 gpm
$s_2$ = 1.17 feet
$t_2$ = Apparent Pump Time = $\frac{67 \text{ min.} \times 2 \text{ gpm} + (142-67)\text{min} \times 2.5 \text{ gpm}}{2.5 \text{ gpm}}$ = 128.6 min
$r_w$ = 0.333 feet
$S$ = 0.25

SOLVING FOR T, TRANSMISSIVITY = 1,832 gpd/ft

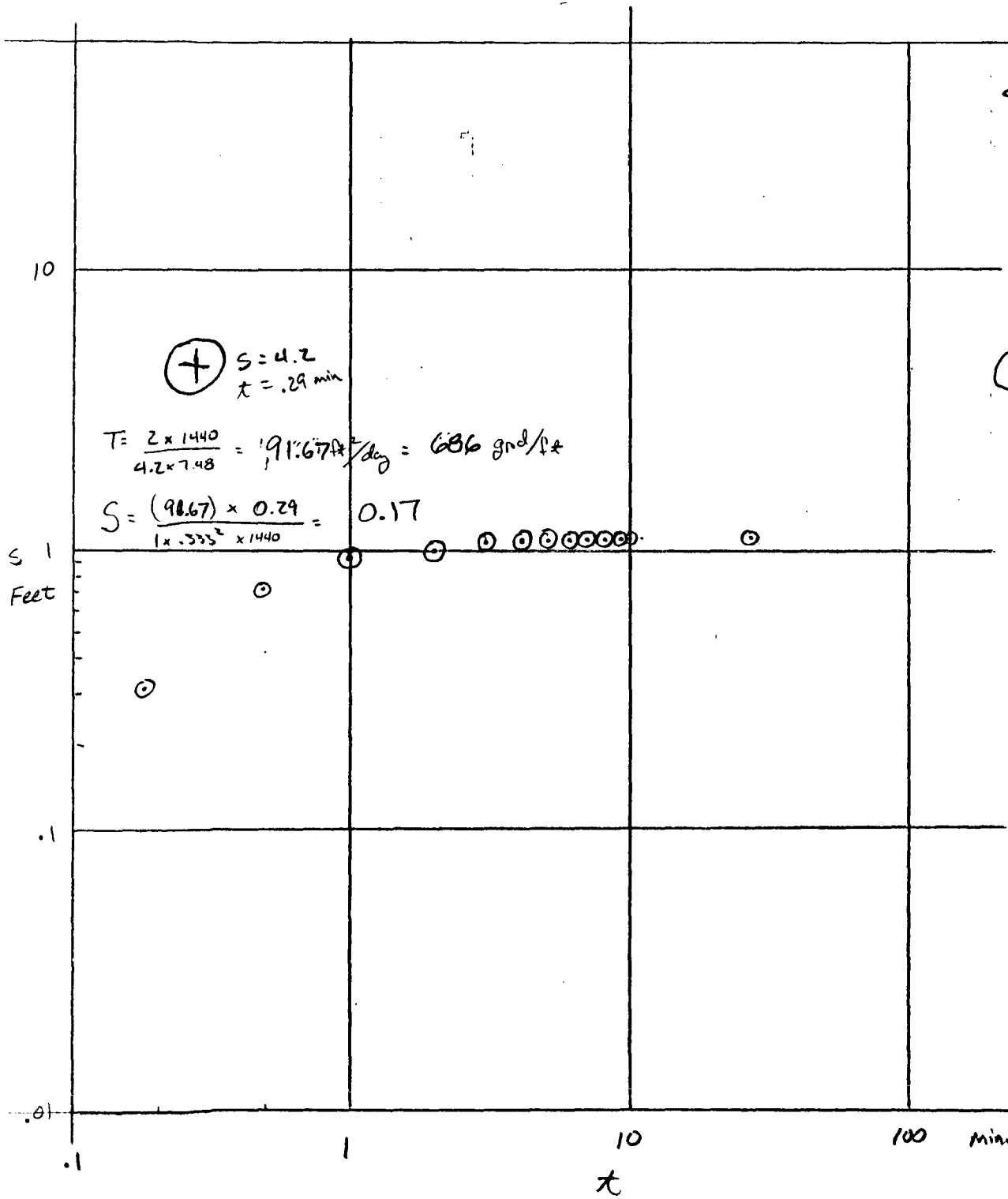
Apparent T decreases with increasing Q. ∴ Assume well losses increase with flow rate. Will Plot Q vs T + EXTRAPOLATE TO Q = 0 to estimate T.



# Boulton Delayed Yield Analysis
# San Juan Gravel Tank Battery A#1 Pump Test

## Calculations and Plots

# AMOCO
## PUMP TEST EVALUATION
FROM LOHMAN[3]: pg 36




⊕ S = 4.2
t = .29 min

$T = \frac{2 \times 1440}{4.2 \times 7.48} = 91.67 \text{ ft}^2/\text{day} = 686 \text{ gpd/ft}$

$S = \frac{(91.67) \times 0.29}{1 \times .333^2 \times 1440} = 0.17$

⊕ MATCH POINT
r/B = 2.0
S = 4.2 feet
t = 250 minutes

$T = \frac{(1)(2.0 \text{ g/m})(1440 \text{ min/day})}{(4.2 \text{ ft})(7.48 \text{ gal/ft})} = 91.67 \text{ ft}^2/\text{day}$

OR 686 gpd/ft

$S = \frac{(91.67 \text{ ft}^2/\text{d})(250 \text{ min})}{(1)(.333)^2 \text{ ft}^2 (1440 \text{ min/day})} = 1.14$

NOTE: AN UNREASONABLE VALUE for S.
∴ ASSUME T IS ALSO NOT VALID.

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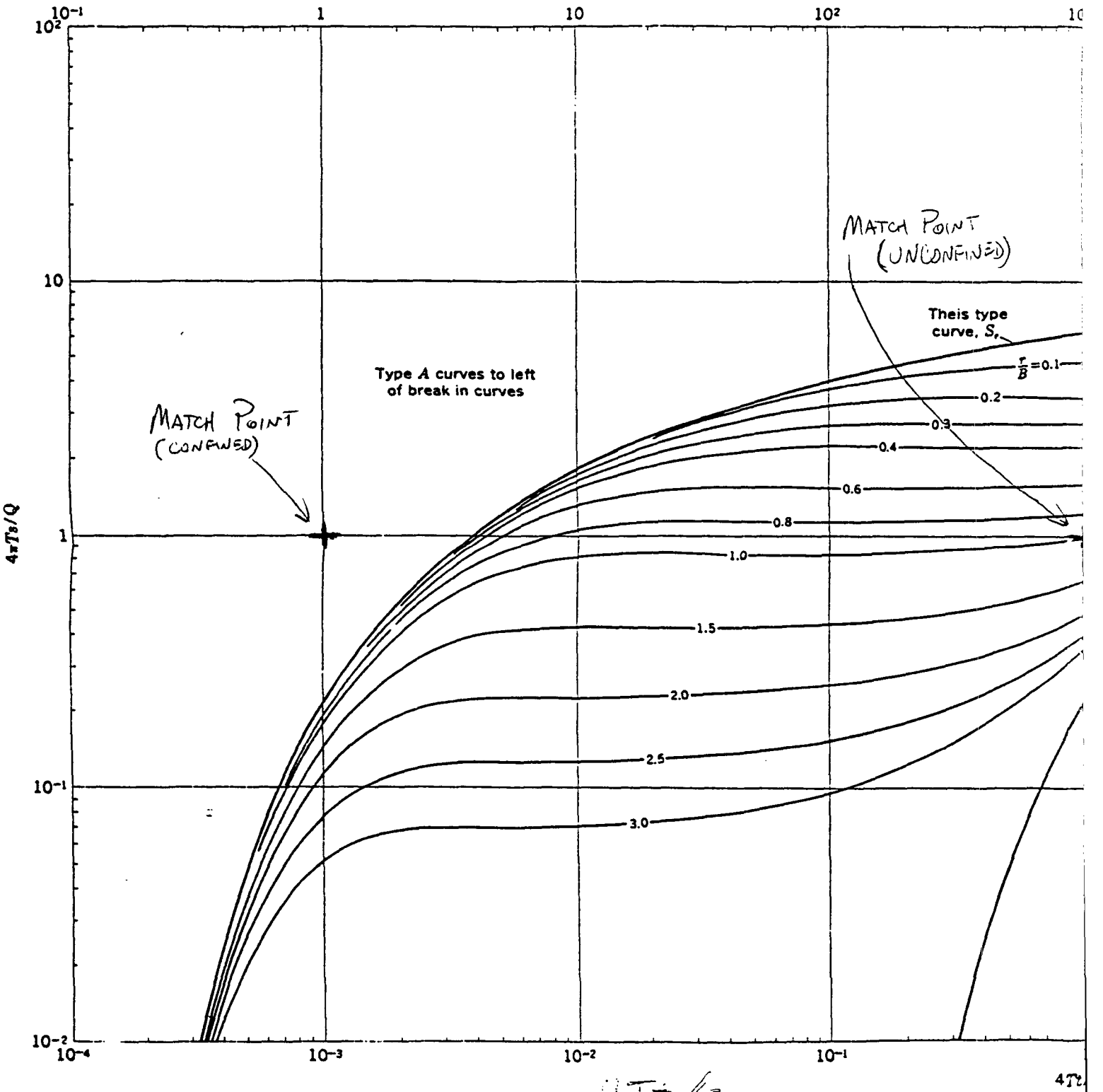
GEOLOGICAL SURVEY

$4Ts/r^2$ (confined)




$4Ts/r^2$ (unconfined)

# DELAYED-YIELD

After Boulton

# Hantush-Jacob Analysis
# San Juan Gravel Tank Battery A#1 Pump Test

## Calculations and Plots

AMOCO | PUMP TEST EVALUATION : SAN JUAN GRAVEL | 4-22-93

| $t$ (min) | $t$ (days) | $t/r^2$ | $s$ (feet) |
|---|---|---|---|
| 0 | 0 | 0 | 0 |
| 0.17 | $1.18 \times 10^{-4}$ | .00106 | 0.32 |
| 0.50 | $3.47 \times 10^{-4}$ | .00313 | 0.71 |
| 1.0 | $6.94 \times 10^{-4}$ | .00625 | 0.95 |
| 5.0 | $34.7 \times 10^{-4}$ | .03125 | 1.08 |
| 10.0 | $69.4 \times 10^{-4}$ | .06251 | 1.12 |
| 20.0 | $138.9 \times 10^{-4}$ | 0.125 | 1.15 |
| 28.0 | $194.4 \times 10^{-4}$ | 0.175 | 1.15 |
| 2.0 | $13.9 \times 10^{-4}$ | 0.0125 | 1.00 |

FROM LOHMAN[3] : pg 31

$$s = \frac{Q}{4\pi T} L(u,v)$$

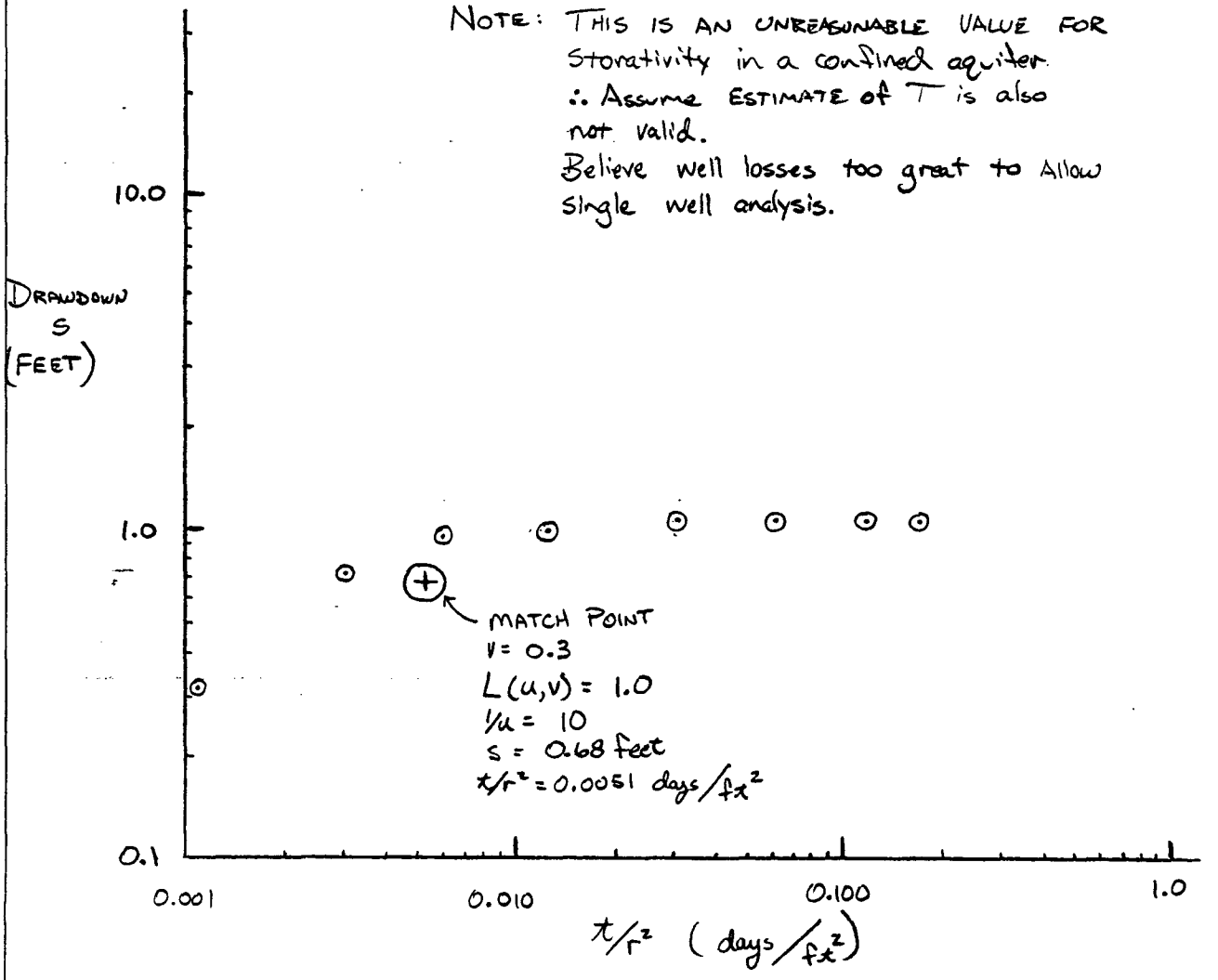
$$S = 4T \frac{t/r^2}{1/u}$$

$Q = 2.5$ gpm
$r = 0.333$ feet

$$T = \frac{2.5 \text{ gpm} \times 1440 \text{ min/day}}{4\pi \times 0.68 \text{ feet}} = 421 \text{ gpd/ft}$$

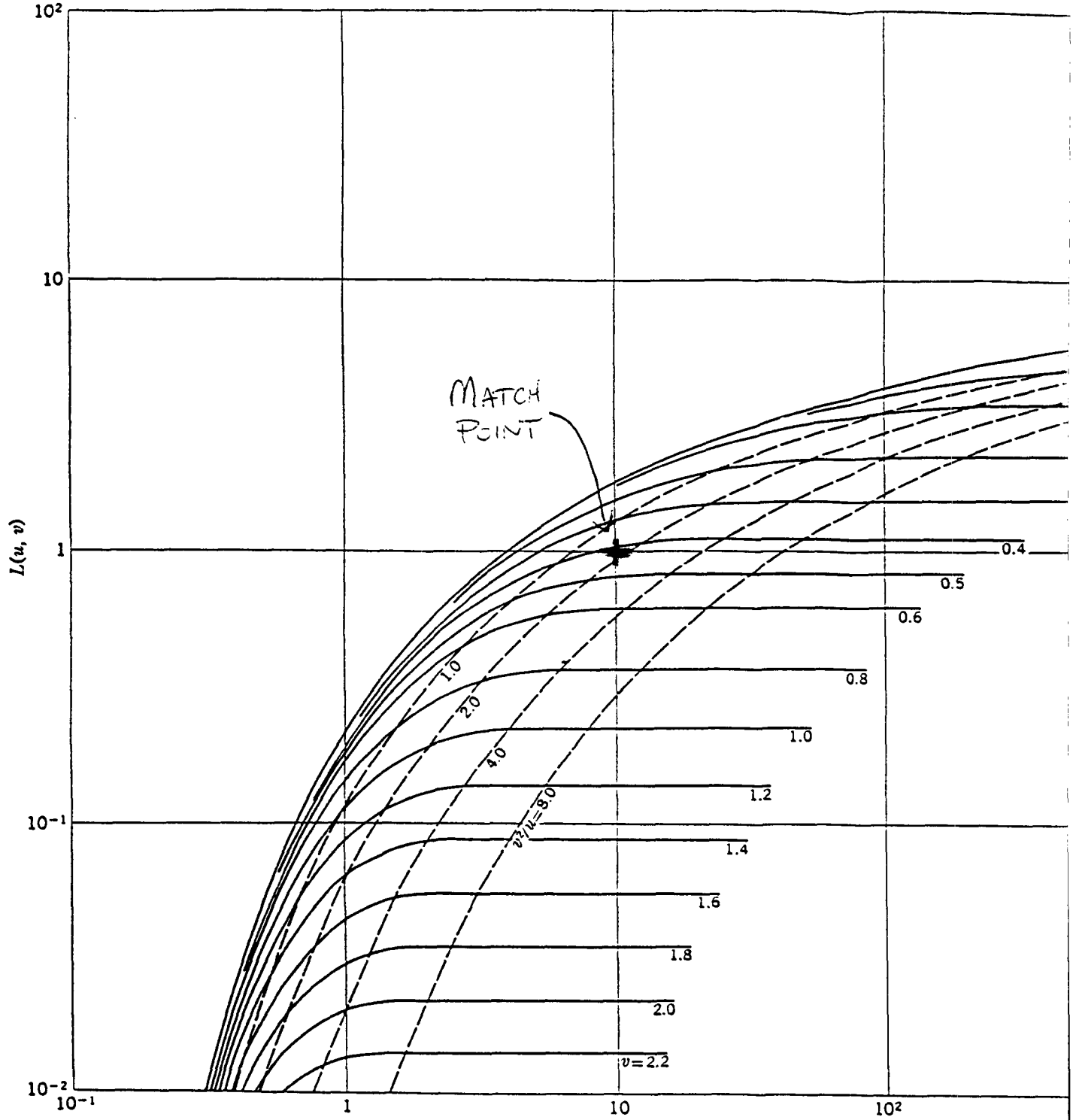
$$S = \frac{4 \times 421 \text{ gpd/ft} \times 0.0051 \text{ days/ft}^2}{10 \times 7.48 \text{ gal/ft}^3} = 0.115$$

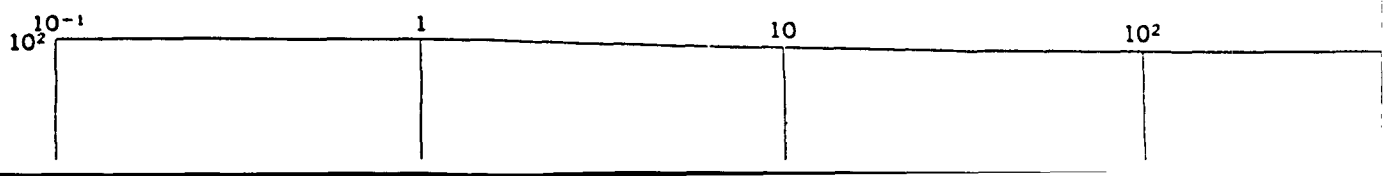
NOTE: THIS IS AN UNREASONABLE VALUE FOR Storativity in a confined aquifer.
∴ Assume ESTIMATE of $T$ is also not valid.
Believe well losses too great to Allow single well analysis.



PROFESSIONAL PAPER 708
PLATE 3

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



# Capture Radius Estimate
# San Juan Gravel Tank Battery A#1 Pump Test

## Calculations and Plots

## ESTIMATE OF RADIUS OF INFLUENCE + CAPTURE RADIUS

Assumptions: WATER TABLE AQUIFER WITH FULLY PENETRATING WELL
INFINITE + HOMOGENEOUS WITH NO RECHARGE BOUNDARIES
Constant DISCHARGE

FROM WALTON[3]: (pg 157)

$$s = \frac{114.6\,Q}{T}\,W(u)$$

$$u = \frac{1.87\,r^2\,S}{Tt}$$

$T = 3{,}512$ gpd/ft from Pump Test

$S = 0.25$ (ASSUMED FROM LITHOLOGY)

Assume radius of influence is defined by a drawdown of 0.05 feet

WITH a given pump time, pump rate + assumed $T$ + $S$, calculate $W(u)$, enter graph pg 222 (Walton[3]) to determine $u$, calculate $r$:

| PUMP TIME $t$ (days) | PUMP RATE $Q$ (gpm) | DRAWDOWN $s$ (feet) | $W(u)$ | $u$ | RADIUS of Influence $r$ (feet) |
|---|---|---|---|---|---|
| 1 | 2.5 | 0.05 | 0.61 | 0.48 | 60 feet |
| 10 | 2.5 | 0.05 | 0.61 | 0.48 | 190 feet |
| 100 | 2.5 | 0.05 | 0.61 | 0.48 | 600 feet |

CAPTURE RADIUS: Assuming Local Gradient of 0.00277 feet/foot, the required pump rate to achieve a capture radius @ 100 days is as follows:

| CAPTURE RADIUS (feet) | PUMP TIME (DAYS) | REQUIRED DRAWDOWN (feet) | $u$ | $W(u)$ | $Q$ (gpm) |
|---|---|---|---|---|---|
| 10 | 100 | 0.028 | $1.3\times10^{-4}$ | 8.2 | 0.1 gpm |
| 50 | 100 | 0.138 | $3.3\times10^{-3}$ | 5.3 | 0.8 gpm |
| 100 | 100 | 0.277 | $1.3\times10^{-2}$ | 3.9 | 2.2 gpm |
| 200 | 100 | 0.554 | $5.3\times10^{-2}$ | 2.4 | 7.1 gpm |