GW - 1

REPORTS

YEAR(S):

1988

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary

December 6, 1988

Mr. David Boyer
Environmental Bureau Chief
New Mexico Oil Conservation Division
P. O. Box 2088
State Land Office Building
Santa Fe, New Mexico 87504

RE: Response To Comments On Groundwater Remediation
at Bloomfield Refining Company

Dear Mr. Boyer:

Enclosed are responses to comments pertaining to the soil vapor survey, incompleted Work Plan items, requests for the OCD letter dated May 13, 1988, and miscellaneous issues. I am confident that remaining issues will be resolved in the technical progress report which is scheduled for submission in mid-February.

Also, we have made significant progress with source control projects that should be considered in your evaluation of our progress toward groundwater remediation. In November, we completed the installation of entirely new sewer systems for the crude unit and reformer unit. The sewer systems included the addition of extensive, curbed concrete paving to ensure the recovery of oil and oily water from those units to the API separator. Additional surface drains were also added outside the process areas to improve overall area drainage. In the tank farm, a project to provide exterior cathodic protection for all tanks and some underground piping is well underway and should be completed by the end of this year.

Please feel free to call me or Randy Hicks at Geoscience Consultants, Ltd. if you have any questions.

Sincerely,

Chris Hawley
Environmental Engineer

CH/jm

cc: Richard Traylor
Mike Macy
Joe Warr

COMMENTS ON SOIL VAPOR SURVEY

1. GCL agrees with the conclusion that halogenated hydrocarbons do not pose a threat to the quality of ground water in the perched alluvial aquifer underlying BRC. PCE and TCE were below detectable concentrations in all wells sampled in September, 1988, including well MW-11 where PCE and TCE concentrations previously observed to be above WQCC standards in September, 1987. The absence of detectable levels of these volatile organic compounds (VOCs) in MW-11 at the present time suggests that the high levels observed last year may be the result of sampling or analytical errors. As indicated by the attached table of water-quality parameters, concentrations of 1,2-Dichloroethane (EDC) in wells sampled on BRC and BLM property were below the WQCC standard of 0.01 mg/l, with the exception of water sampled at MW-13 where an EDC concentration of 0.0156 mg/l was observed. This concentration was not viewed to be significantly above the WQCC standard.

2. Soil vapor concentrations of aromatic hydrocarbons, particularly for toluene, have correlated very strongly with concentrations of aromatic hydrocarbons dissolved in the underlying ground water wherever ground-water and soil-vapor sample locations coincide. The distribution of toluene vapors in soil has been used to infer the lateral extent of dissolved BTEX in ground water.

AGREEMENT ON UNCOMPLETED WORK PLAN ITEMS

1. Logs and completion diagrams for all wells and piezometers installed during the period extending from August 29 to September 2, 1988 are attached.

2. The attached plate showing structural contours of the Nacimiento Formation was generated on the basis of bedrock elevations reported by Engineering Science and obtained from GCL logs. The contours indicate the presence of erosional channels in the bedrock underlying the API separator and wastewater ponds and beneath the evaporation ponds. These features represent buried stream channels that were once tributary to the San Juan River, and appear to be continuous to the bluffs that parallel the River. During the non-irrigation season, ground water in the perched alluvial system flows toward the San Juan River because there is no water in Hammond Ditch to create a hydraulic barrier with respect to northward and westward flow. At this time, some of the ground water and hydrocarbons originating from beneath the refinery discharge through these buried channels to the bluffs, where they probably evaporate and volatize before they can migrate down to the River through the several hundred feet of partially-saturated alluvium and bedrock comprising the bluffs.

3. Operation of the ground-water recovery system will begin in December of 1988 or January of 1989 after problems related to treatment-system sewers are resolved.

4. The technical report on recovery system installation, operation, start-up, and results will be submitted 11 weeks after start-up of the system so that hydraulic head and water-quality data collected 2, 4, and 10 weeks after system start-up can be included in the technical report, as discussed in the Work Plan.

REQUESTS FROM MAY 13, 1988 OCD LETTER

1. A land-ownership map was compiled from section maps supplied by the San Juan County Assessor's Office and is shown in the attached plate. The last update on the sections was performed in September of this year. In some sections, a legal description of the property was not available either because the property was not subject to taxation or because a detailed survey of the property was not conducted. Aquifer testing at well MW-10 was performed on September 9, 1987.

2. If infiltration trenches are chosen as a means of disposing of all or part of the recovered ground water following treatment, the mass flux of dissolved solids in infiltrating water will not exceed the mass flux of dissolved solids in recovered water. This will ensure that the TDS of the ground water will not increase due to operation of the disposal system. If trenches are constructed, they will be designed to minimize contact between unsaturated soils and infiltrating water. Design specifications of infiltration trenches, if they become part of the recovery strategy, will be submitted to NMOCD prior to their construction.

OTHER ISSUES

1. Locations and elevations of all new wells and piezometers will be plotted on an aerial photomap, which is to be included in the technical report. The report will also include tables of x- and y-coordinates and wellhead elevations. Measurement of water-level stages in Hammond Ditch is beyond the scope of the Work Plan, but water levels previously measured in the Ditch by BRC will be included in the technical report.

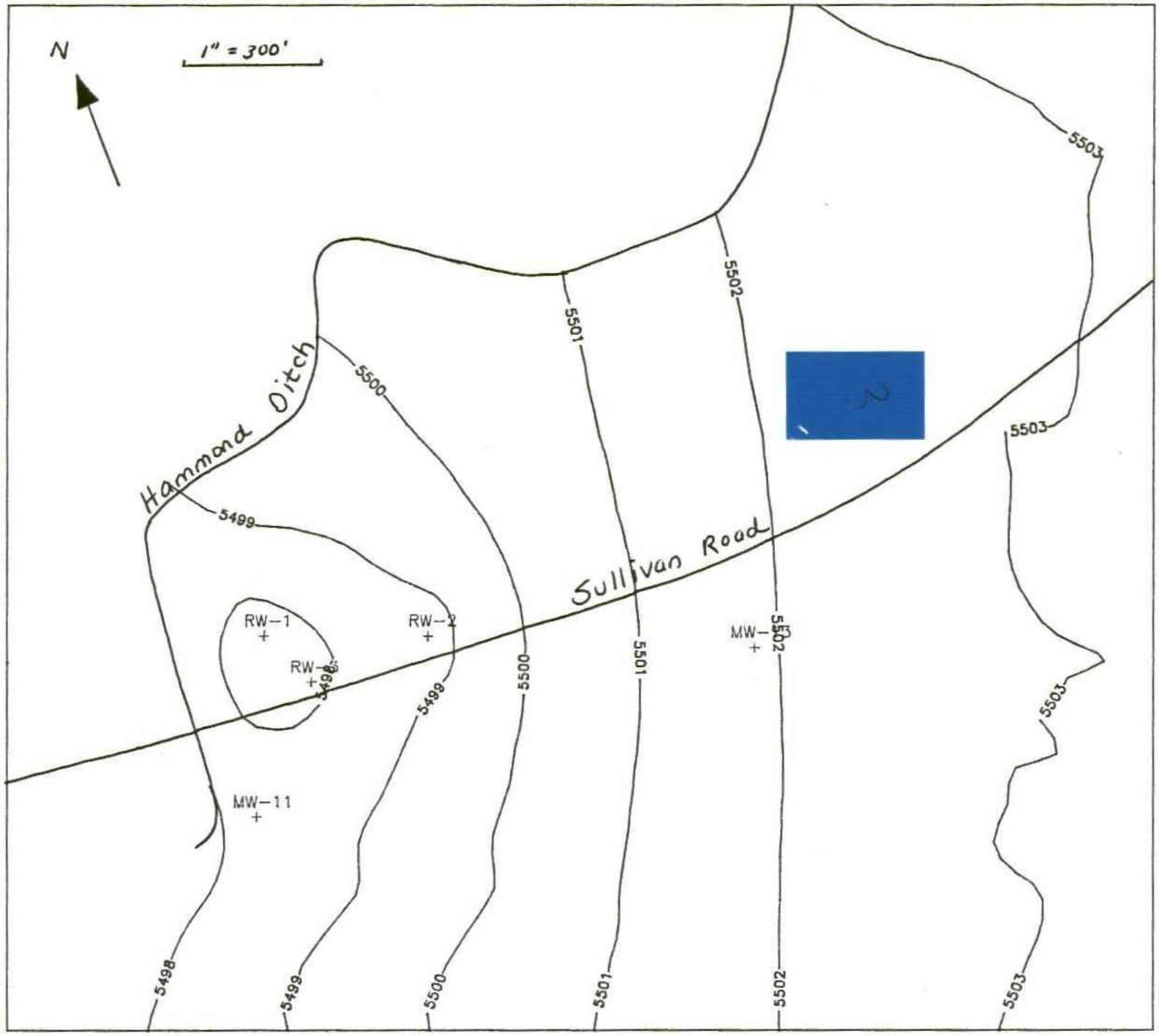
2. The steady-state hydraulic impacts of the 3-well recovery system were simulated using a numerical ground-water flow model and are presented in the attached figure. Model results indicate that, under worst-case conditions when Hammond Ditch is full and ground water that normally discharges along the bluffs adjacent to the San Juan River is diverted southwestward toward well MW-11, recovery of 3 gpm at well RW-1 and 1.5-gpm at wells RW-2 and RW-3 (MW-10) may result in capture of ground water from south of Sullivan Road near well MW-11. The recovery system would, at a minimum, prevent ground water and hydrocarbons originating on-site from migrating southward into the subsurface underlying U.S. Bureau of Land Management (BLM) property or westward towards private land. If hydraulic head data collected 10 weeks after start-up of the recovery system do not show evidence of capture of water from this area, the issue of hydrocarbon recovery south of Sullivan Road will be addressed and plans for further remediation outlined. If remediation south of Sullivan Road is determined to be necessary, ground water intercepted at well MW-11 will likely be stored and trucked daily to the refinery wastewater treatment system north of the Road.

3. It is anticipated that recovery of ground water at well RW-1 will capture a significant volume of water, along with both dissolved and non-aqueous phase hydrocarbons, from reaches of Hammond Ditch bounding the west side of the refinery property. Flowlines oriented perpendicular to equipotential lines shown in the attached map of

steady-state recovery head indicate convergence of flow at well RW-1 from over a large upgradient area.

4. Operation of the recovery system, particularly well RW-1, will prevent or minimize further westward migration of hydrocarbons. The degree to which westward migration of hydrocarbons will be reduced can not be known with certainty until 10 weeks after start-up of the recovery system, when steady-state impacts of the system will likely be attained.

STEADY-STATE HYDRAULIC HEAD WITH 3-WELL RECOVERY SYSTEM



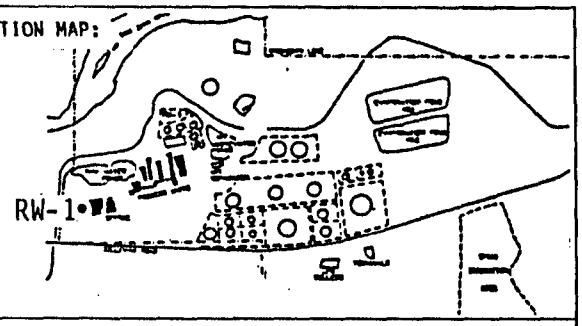
BLOOMFIELD REFINING COMPANY
GROUND WATER MONITORING SUMMARY OF DETECTED PARAMETERS

Parameter	Units	Detection Limit	New Mexico Standards 3-103 (A)	6-3-88 MW-4	9-9-88 RW-2	9-9-88 P-2
Benzene	mg/l	0.0002	0.01	8.9	11.000	4.80
Ethylbenzene	mg/l	0.0002	0.75	--	2.900	0.900
Toluene	mg/l	0.0002	0.75	0.93	10.200	1.430
M-Xylene	mg/l	0.0002	0.62	--	17.700	4.500
O-Xylene	mg/l	0.0002	0.62	--	4.900	1.460
P-Xylene	mg/l	0.0002	0.62	--	6.200	1.570
1,2-Dichloroethane	mg/l	0.001	0.01	--	0.0016	ND
Trans 1,2-Dichloroethene	mg/l	0.001	--	--	ND	ND
Nitrate as N	mg/l	0.01	10.0	0.14	<0.01	--
Phenol	mg/l	0.001	0.005	0.069	0.13	--
Sulfate	mg/l	1	600.	3	<1	--
TDS	mg/l	10	1000	1820	1980	--

Parameter	RW-3	P-3	RW-1	P-1	MW-11	MW-13
Benzene	12.000	19.400	6.400	102.200	44.400	0.00023
Ethylbenzene	0.00286	ND	0.540	0.00143	0.063	0.00029
Toluene	0.062	0.00435	0.070	0.034	0.840	0.00024
M-Xylene	3.500	22.800	4.800	0.483	2.600	0.00065
O-Xylene	0.103	3.600	8.300	0.061	0.061	0.00056
P-Xylene	1.800	8.700	1.700	0.322	0.745	0.00035
1,2-Dichloroethane	ND	ND	ND	ND	0.0022	0.0156
Trans 1,2-Dichloroethene	ND	ND	ND	0.0015	ND	ND
Nitrate as N	<0.01	--	<0.01	—	0.06	13.1
Phenol	0.05	--	0.34	--	0.06	0.03
Sulfate	9.5	--	4.5	--	30.	728.
TDS	3250	--	3130	--	1900	3220

LITHOLOGIC LOG (SOIL)

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S___ T___ R___

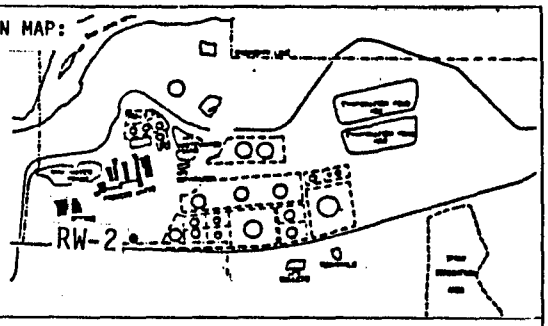
SITE ID: BRC LOCATION ID: RW-1
SITE COORDINATES (ft.):
N E
GROUND ELEVATION (ft. MSL): 5525.92
STATE: New Mexico COUNTY: San Juan
DRILLING METHOD: Casing Driver
DRILLING CONTR.: Beeman Brothers
DATE STARTED: 30 August 1988 DATE COMPLETED: 31 August 1988
FIELD REP.: W.S. Dubyk
COMMENTS: Static on September 2, 1988: 26.65 from TOC.

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			1642		0'-18' Silt and Sand - Dark yellowish brown (10 YR 4/2) to grayish brown (5 YR 3/2). Minor to strong hydrocarbon odor.
10			1646		
15			1710		
20			1720		18'-34' Sand and Gravel - Medium dark gray (N4). Sand is medium to very coarse grained, subangular to subrounded. Gravel is subrounded to well rounded, to 2" diameter. Strong hydrocarbon odor.
25			1725		
30			1730		
35			1738		34'-41' Shale - Nacimiento Formation - Dusky yellow (5 YR 6/4) to light olive gray (5 Y 6/1) shale.
40			1758		
		T.D. 41'			
45					
50					

LITHOLOGIC LOG (SOIL)

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S___ T___ R___

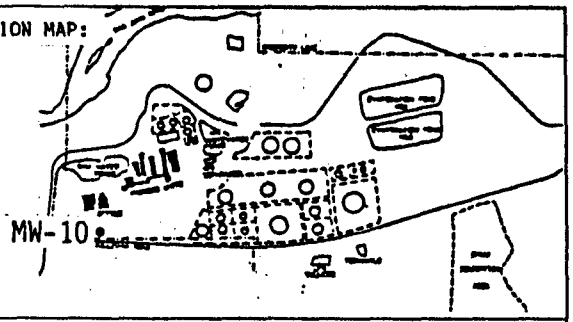
SITE ID: BRC LOCATION ID: RW-2
SITE COORDINATES (ft.):
N E
GROUND ELEVATION (ft. MSL): 5523.48
STATE: New Mexico COUNTY: San Juan
DRILLING METHOD: Casing Driver
DRILLING CONTR.: Beeman Brothers
DATE STARTED: 29 August 1988 DATE COMPLETED: 29 August 1988
FIELD REP.: W.S. Dubyk
COMMENTS: Static on September 2, 1988: 23.42 from TOC.

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			0948		0'-10' Silt and Clay - Medium dark gray (N4) to brownish gray (5 YR 4/1). Slightly effervescent in HCl. Faint hydrocarbon odor.
10			0953		10'-15' Sand and Silt - Moderate brown (5 YR 4/4), very fine grained and well sorted.
15			0958		15'-32' Sand and Gravel - Olive gray (5 Y 4/1) to brownish gry (5 YR 4/1). Sand is medium to very coarse grained, subangular to subrounded. Gravel is subangular to well rounded, to 2" diameter. Noticeable hydrocarbon odor below 25'.
20			1024		
25			1029		
30			1033		32'-41.2' Shale - Nacimiento Formation - Dusky yellow (5 Y 6/4) to olive gray (5 Y 3/2).
35			1050		
40		T.D. 41.2'	1100		
45					
50					

LITHOLOGIC LOG (SOIL)

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S___ T___ R___

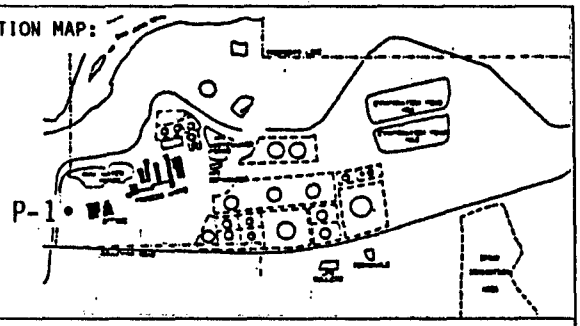
SITE ID: BRC LOCATION ID: MW-10 (RW-3)
SITE COORDINATES (ft.):
N E
GROUND ELEVATION (ft. MSL): ~5516
STATE: New Mexico COUNTY: San Juan
DRILLING METHOD: Auger
DRILLING CONTR.: Earl & Sons, Inc.
DATE STARTED: 4 March 1986 DATE COMPLETED: 4 March 1986
FIELD REP.: Engineering-Science, Inc.
COMMENTS:

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
					0'-5' Topsoil, Roadbase, Sandy Clay
5					5'-10' Silty, Sandy Clay
10					10'-15' Cobbles and Pebbles
15					15'-20' Gravel, Cobbles, and Pebbles
20					20'-30' Green Clay; Nacimiento Formation
25					30'-35' Nacimiento Formation - Yellow-green to blue-gray.
30					
35		T.D. 35'			
40					
45					
50					

LITHOLOGIC LOG (SOIL)

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S___ T___ R___

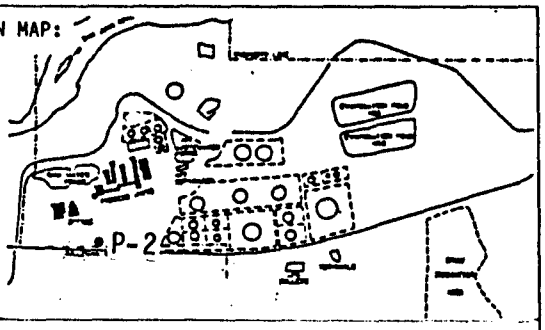
SITE ID: BRC LOCATION ID: P-1
SITE COORDINATES (ft.):
N E
GROUND ELEVATION (ft. MSL): 5524.62
STATE: New Mexico COUNTY: San Juan
DRILLING METHOD: Casing Driver
DRILLING CONTR.: Beeman Brothers
DATE STARTED: 30 August 1988 DATE COMPLETED: 30 August 1988
FIELD REP.: W.S. Dubyk
COMMENTS: This well replaced by P-1a on August 31, 1988.

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			1135		0'-20' Silt and Clay - Dark yellowish brown (10 YR 4/2) to grayish brown (5 YR 3/2). Weak hydrocarbon odor.
10			1140		
15			1145		
20			1200		20'-36.5' Sand and Gravel - Dark gray (N3) to grayish black (N2). Sand is fine to very coarse grained, subangular to rounded. Gravel is subangular to well rounded, to 2" diameter. Very strong to intense hydrocarbon odor.
25			1205		
30			1210		
35			1220		36.5'-42.0' Shale - Nacimiento Formation - Dusky yellow (5 Y 6/4) to olive gray (5 Y 3/2) shale.
40			1225		
			1240		
		T.D. 42'			
45					
50					

LITHOLOGIC LOG (SOIL)

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S___ T___ R___

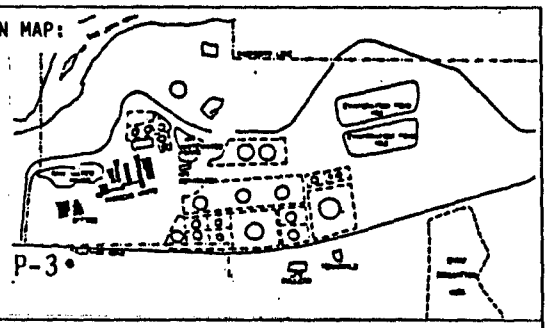
SITE ID: BRC LOCATION ID: P-2
SITE COORDINATES (ft.):
N E
GROUND ELEVATION (ft. MSL): 5523.73
STATE: New Mexico COUNTY: San Juan
DRILLING METHOD: Casing Driver
DRILLING CONTR.: Beeman Brothers
DATE STARTED: 29 August 1988 DATE COMPLETED: 29 August 1988
FIELD REP.: W.S. Dubyk
COMMENTS: This well replaced by P-2a. Static on September 2, 1988: 23.75 from TOC.

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			1650		0'-13' Silty and Clay - Dark gray (N3) to grayish black (N2) to dark yellowish brown (10 YR 4/2). Intense hydrocarbon odor.
10			1656		
15			1710		13'-31.5' Sand and Gravel - Moderate yellowish brown (10 YR 5/4) to medium gray (N5). Sand is medium to very coarse grained, subangular to subrounded. Gravel is subangular to well rounded, to 2" diameter. Strong hydrocarbon odor below 25'.
20			1720		
25			1730		
30			1734		31.5'-39.5' Shale - Nacimiento Formation - Dusky yellow (5 Y 6/4) to olive gray (5 Y 3/2).
35			1752		
40		T.D. 39.5'	1808		
45					
50					

LITHOLOGIC LOG (SOIL)

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S___ T___ R___

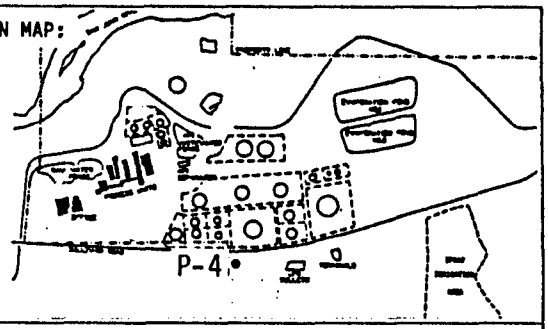
SITE ID: BRC LOCATION ID: P-3
SITE COORDINATES (ft.):
N E
GROUND ELEVATION (ft. MSL): 5507.20
STATE: New Mexico COUNTY: San Juan
DRILLING METHOD: Casing Driver
DRILLING CONTR.: Beeman Brothers
DATE STARTED: 1 September 1988 DATE COMPLETED: 1 September 1988
FIELD REP.: W.S. Dubyk
COMMENTS: Static on September 2, 1988: 8.30' from TOC.

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5			0902		0'-14' Sand and Gravel - Medium gray (N5) to dark gray (N3). Sand is medium to coarse grained, subangular to subrounded. Gravel is subrounded to rounded, to 2" diameter. Strong hydrocarbon odor.
10			0913		
15			0920		14'-22.7' Shale: Nacimiento Formation - Dusky yellow (5 YR 6/4) to light olive gray (5 Y 6/1) shale.
20			0925		
25			1000		
		T.D.22.7'			
30					
35					
40					
45					
50					

LITHOLOGIC LOG (SOIL)

LOCATION MAP:

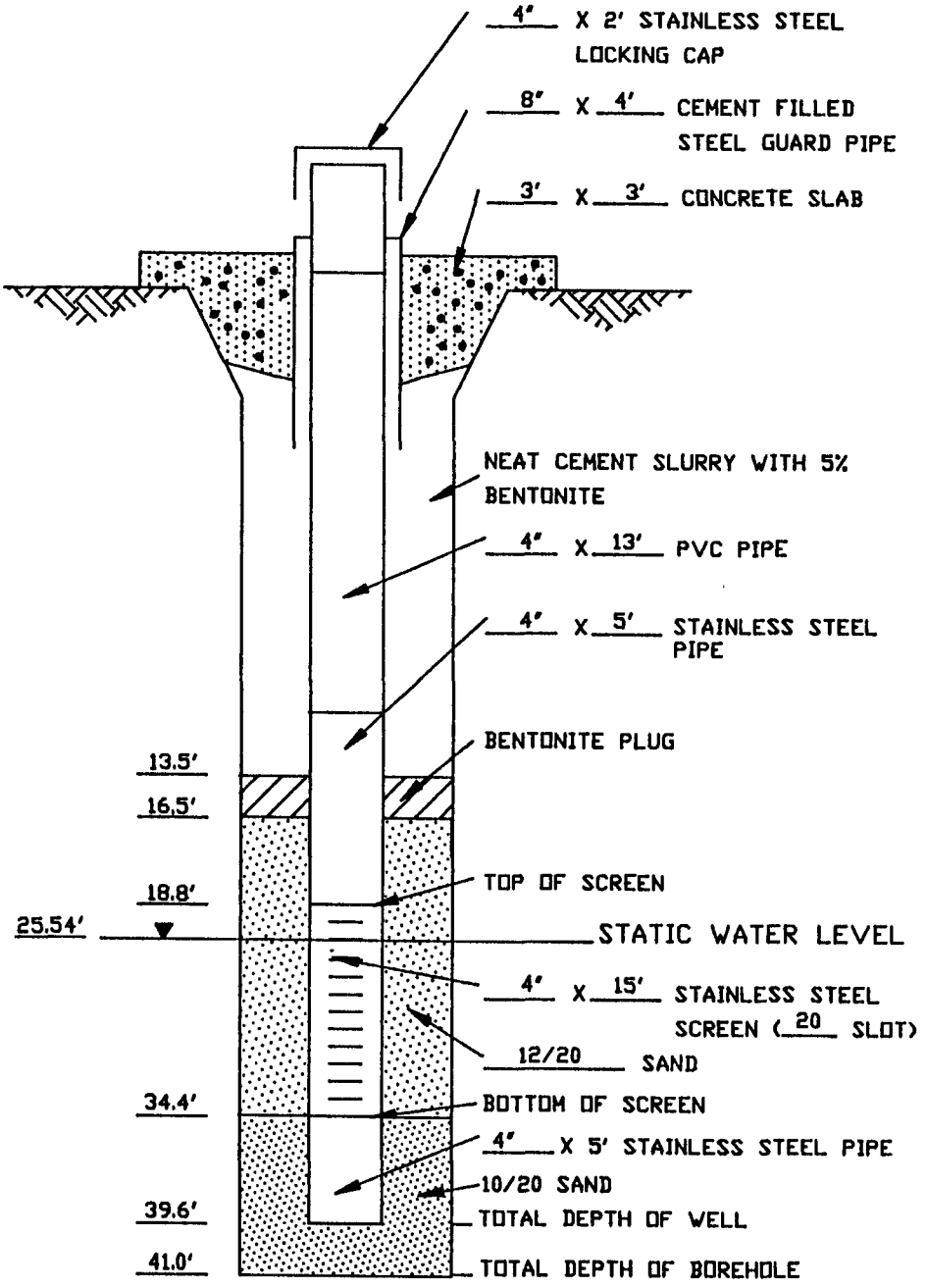


___1/4 ___1/4 ___1/4 ___1/4 S___ T___ R___

SITE ID: BRC LOCATION ID: P-4 (MW-13)
SITE COORDINATES (ft.):
N E
GROUND ELEVATION (ft. MSL): 5538.42
STATE: New Mexico COUNTY: San Juan
DRILLING METHOD: Casing Driver
DRILLING CONTR.: Beeman Brothers
DATE STARTED: 2 September 1988 DATE COMPLETED: 3 September 1988
FIELD REP.: W.S. Dubyk
COMMENTS: Static on September 9, 1988: 37.91' from TOC.

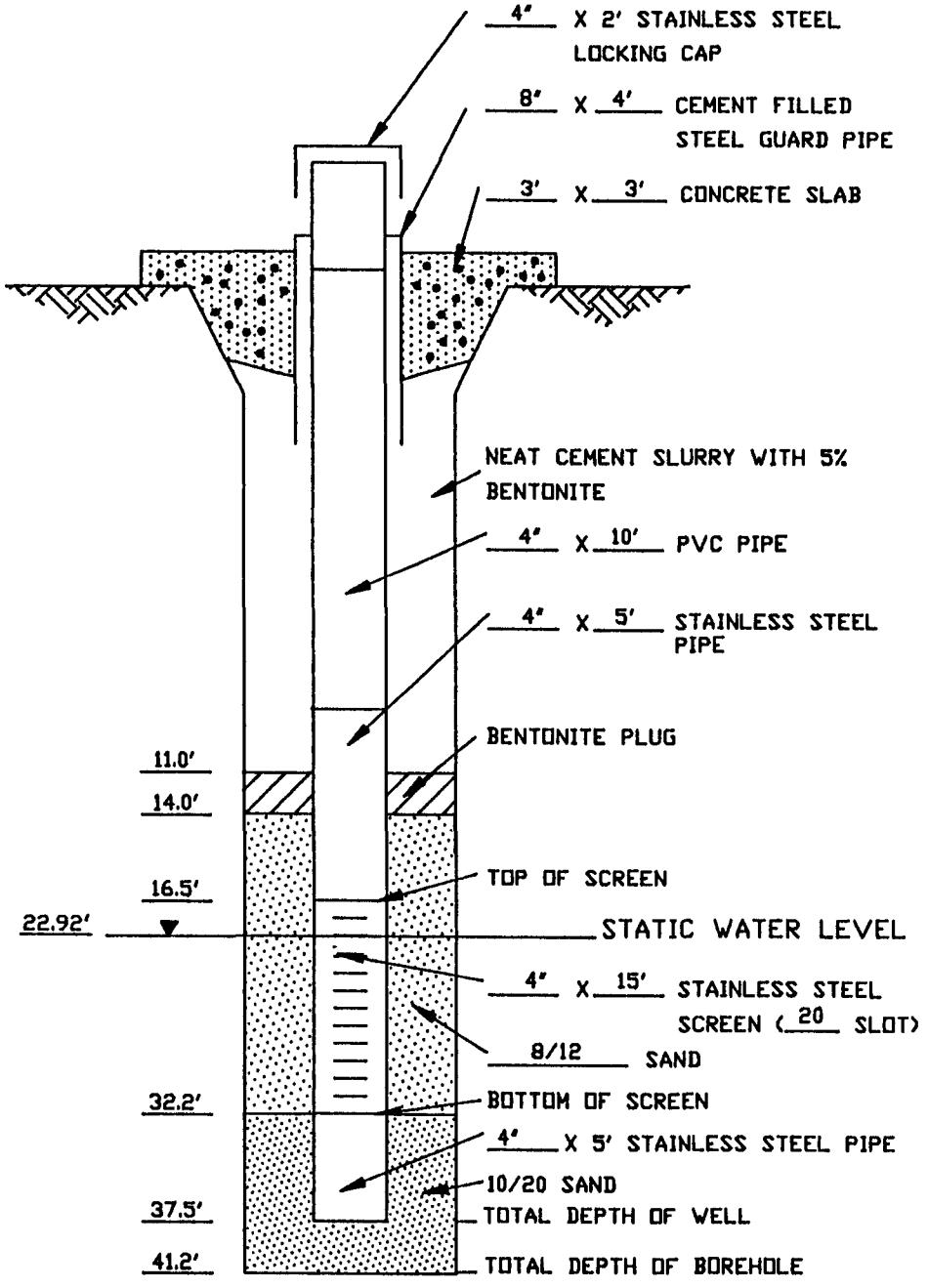
LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5					0'-27' Silt and Clay - Moderate brown (5 YR 4/4) to light brown (5 YR 5/6).
10					
15					
20					
25			1233		27'-30' Sand - Very pale or (5 YR 8/2) fine to coarse grained, angular to subangular predominantly quartz.
30					30'-40' Gravel and Sand - Light gray (N7). Sand is medium to coarse grained, subrounded to rounded. Gravel is subangular to rounded, up to 3" diameter.
35					
40			1415		41'-43' Clay - Pale olive (10 Y 6/2), plastic.
					43'-45' Gravel and Sand - As above.
45			1420		45'-51' Shale; Nacimiento Formation - Dusky yellow (5 Y 6/4) to olive gray (5 Y 3/2).
50			1455		
		T.D. 51'			



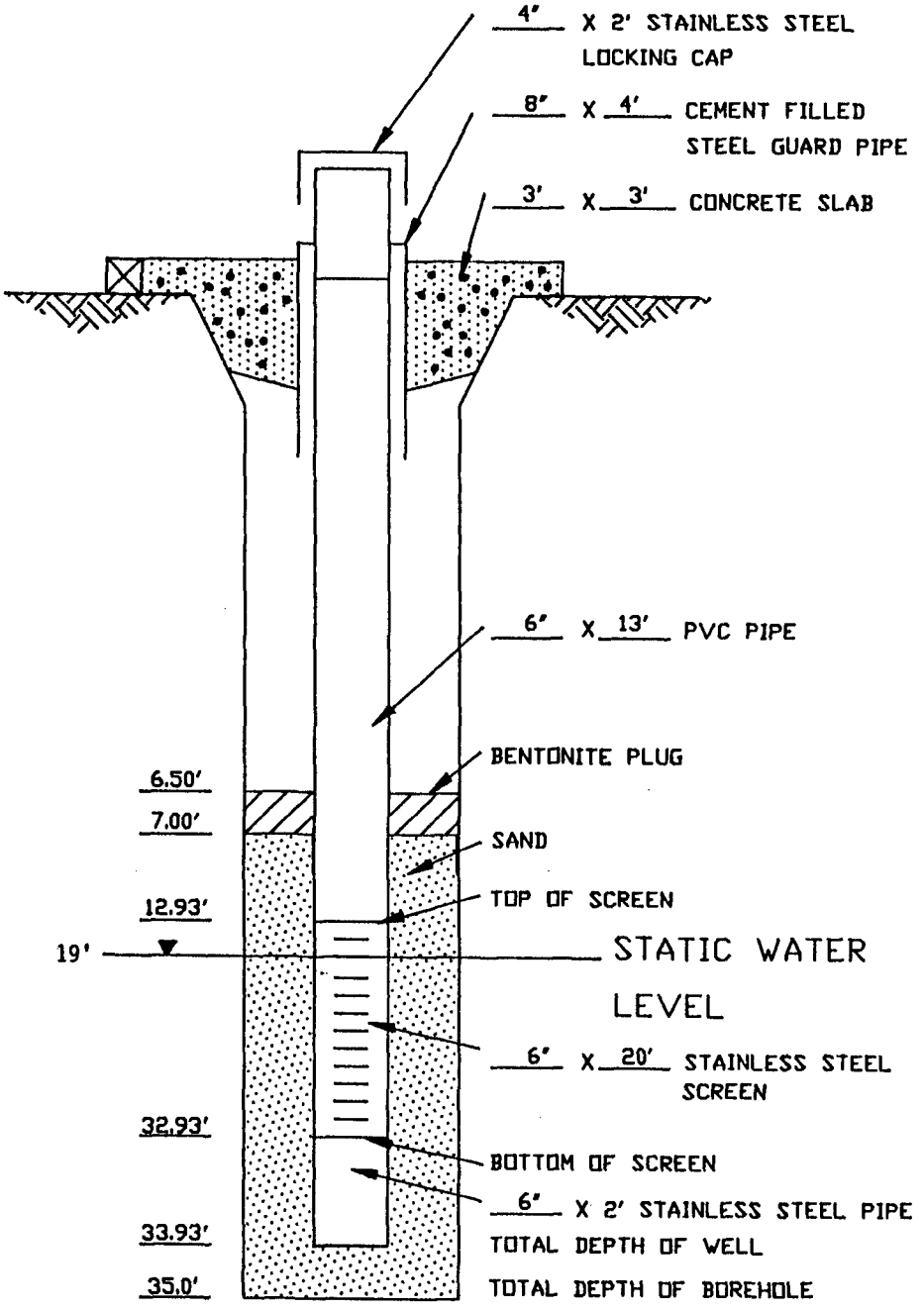
COMPLETION DIAGRAM

RECOVERY WELL RW-1

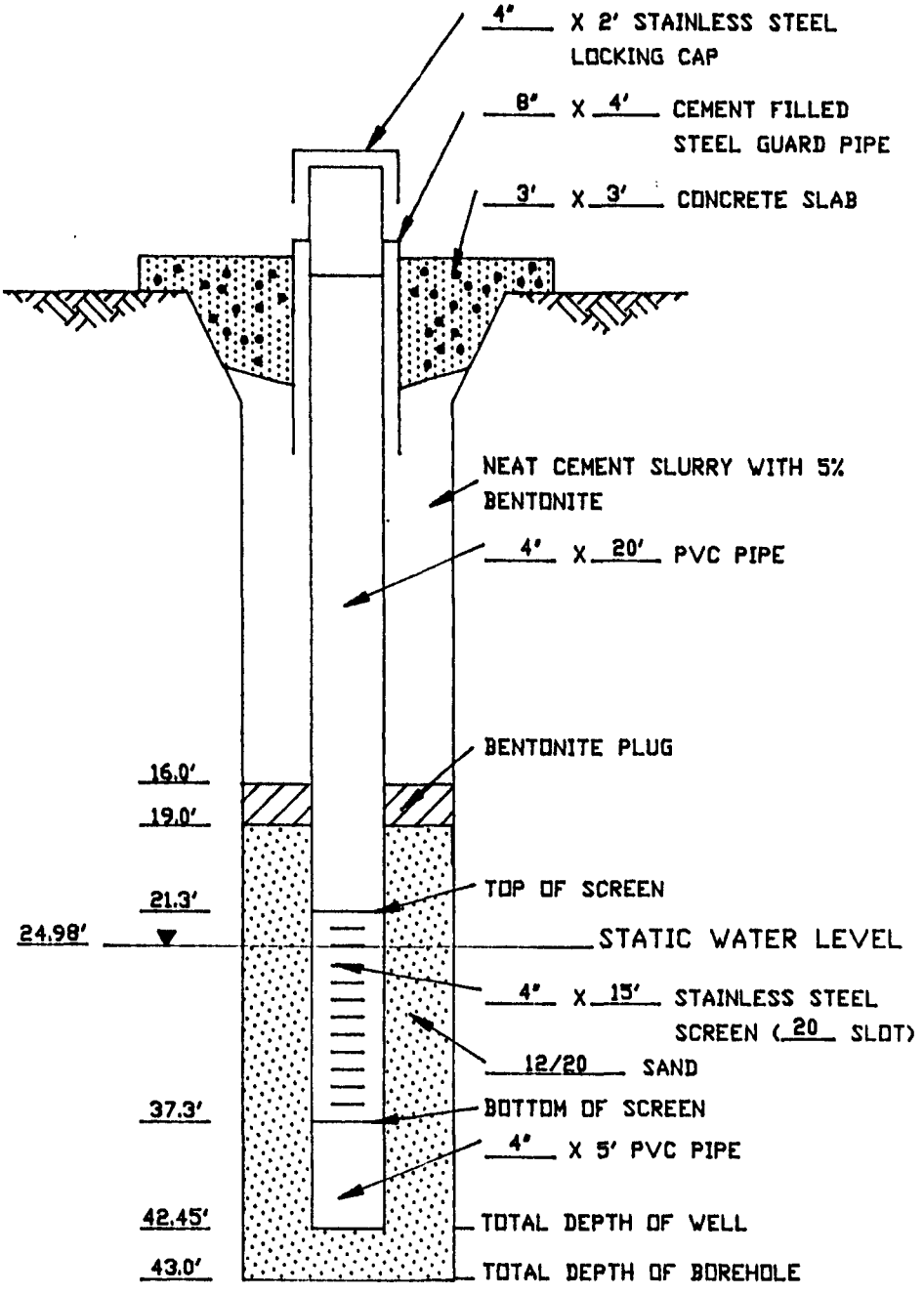


COMPLETION DIAGRAM

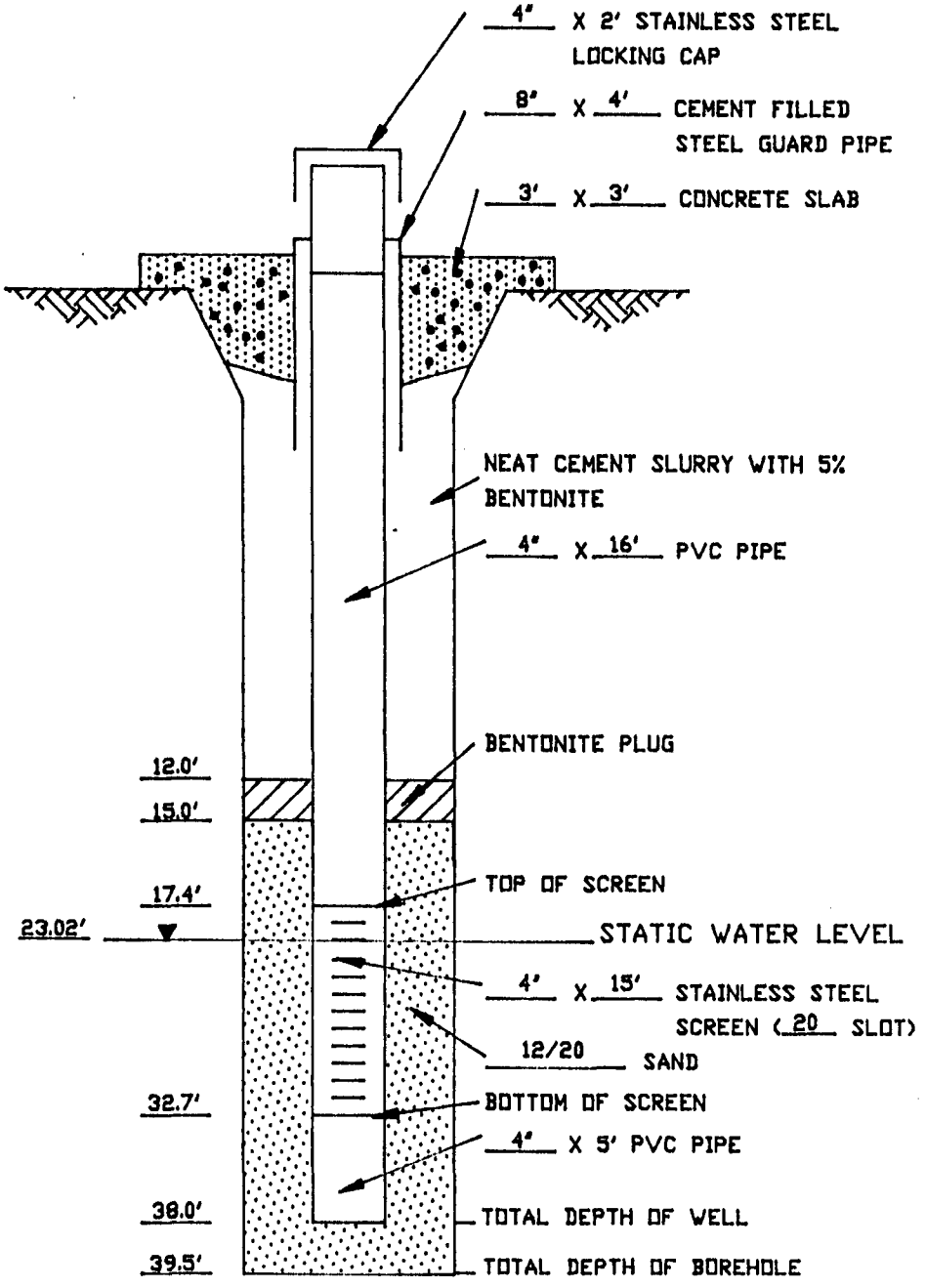
RECOVERY WELL RW-2



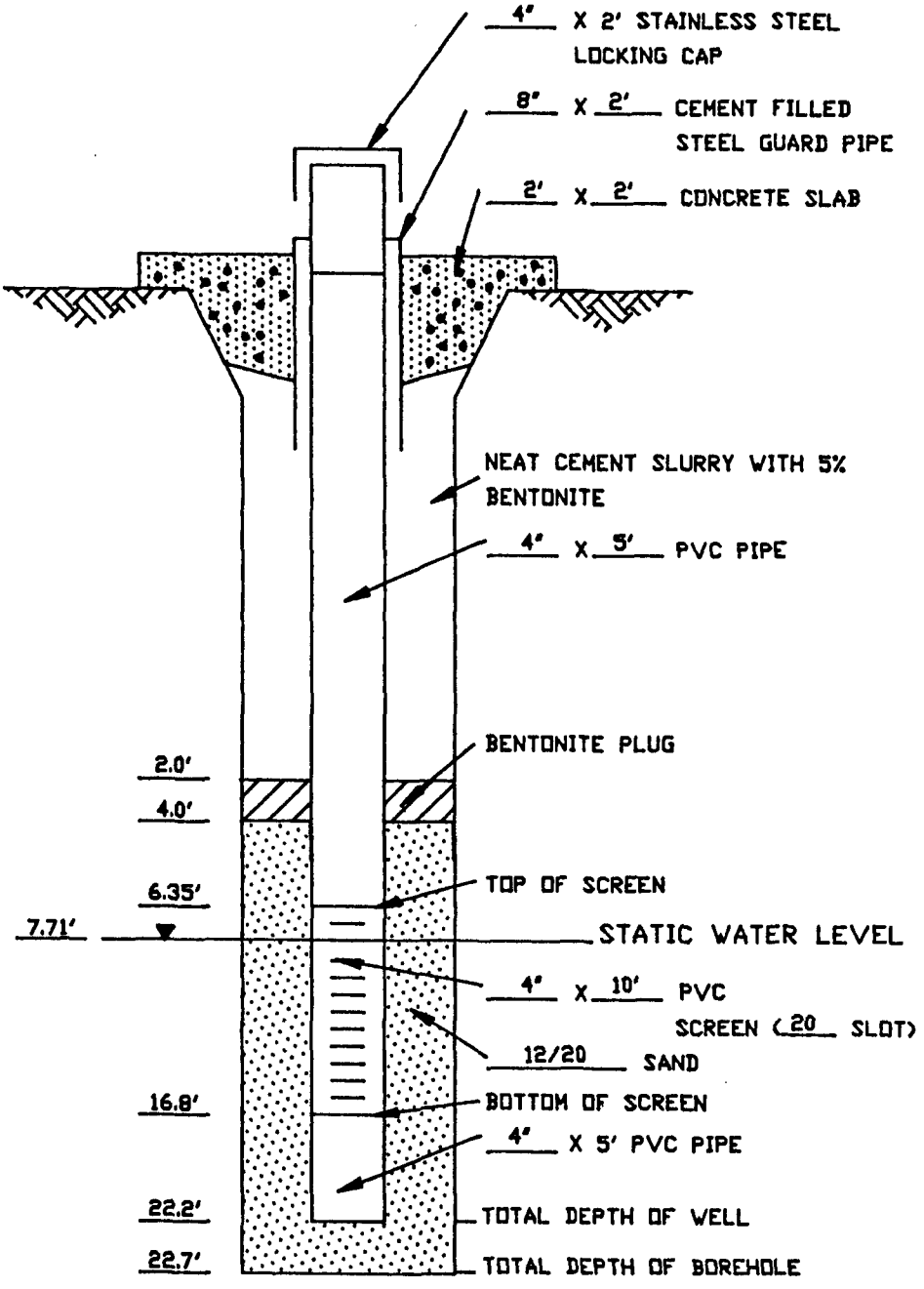
COMPLETION DIAGRAM
RECOVERY WELL MW-13 (RW-3)
(RECONSTRUCTED FROM VERBAL DESCRIPTION
SUPPLIED BY ENGINEERING-SCIENCE, 1987)



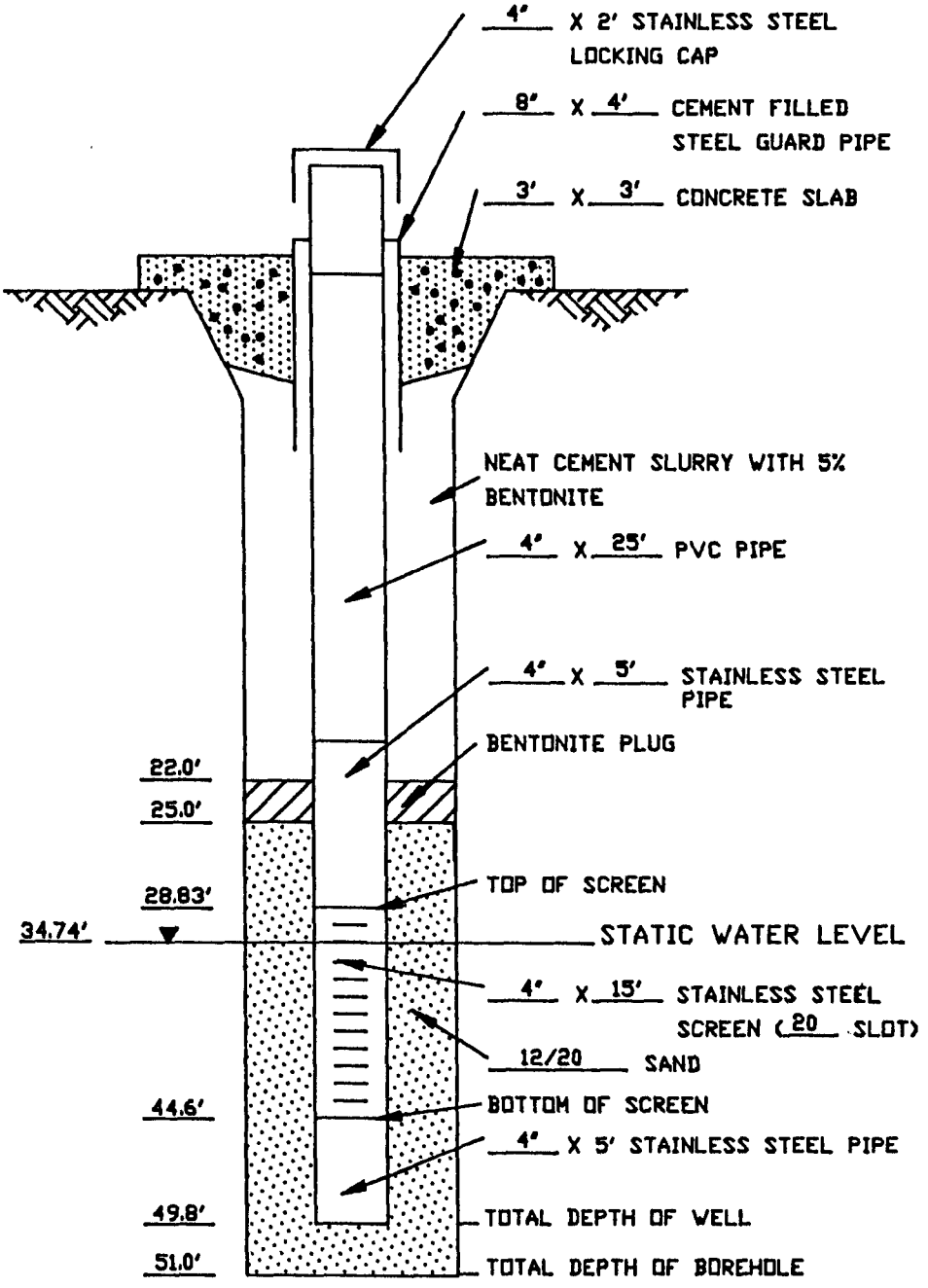
COMPLETION DIAGRAM
PIEZOMETER P-1



COMPLETION DIAGRAM
PIEZOMETER P-2



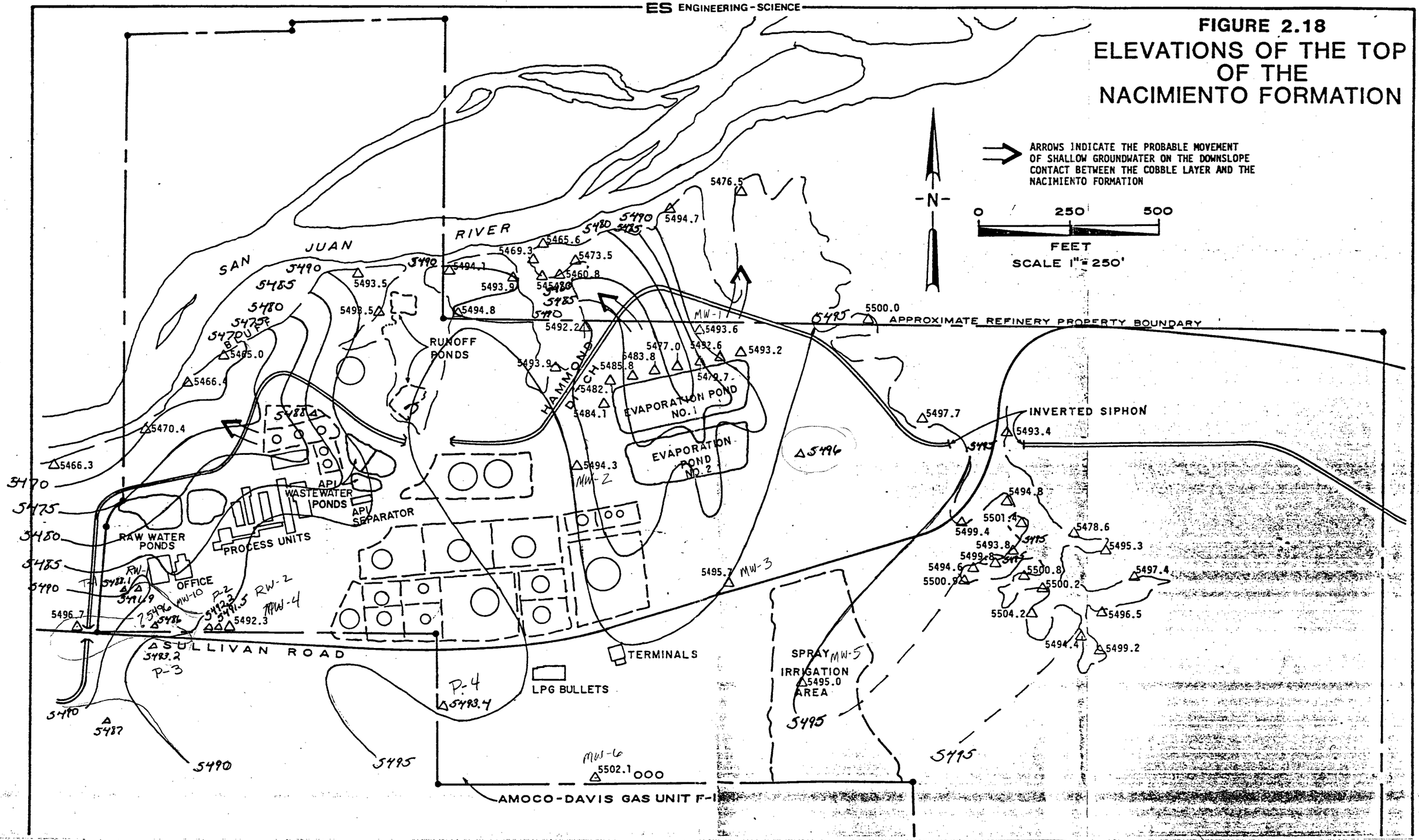
COMPLETION DIAGRAM
PIEZOMETER P-3



COMPLETION DIAGRAM
PIEZOMETER P-4

ES ENGINEERING - SCIENCE

FIGURE 2.18
ELEVATIONS OF THE TOP OF THE NACIMIENTO FORMATION



21 22 22

28

SOUTH SIDE ADDITION

US HIGHWAY 64

US HIGHWAY 44

SAN JUAN RIVER

RIO DE

EXTENDED

CITY LIMIT LINE OF BLOOMFIELD

RIVER

SAN JUAN

FEDERAL

FED

BLOOMFIELD REFINING CO.
B-1008 P-435

BLOOMFIELD REFINING CO.
B-1008 P-435
REFER TO 4-063-169-066-333

BLOOMFIELD REFINING CO.
B-1008 P-435

FRUITLAND COAL P-700

RIMROCK CANAL

SEN ABMENTA
B-361 P-264

RALPH CHAMBERLAIN
% MARY BOOTH & SAM BLAIR
B-879 P-390

SOUTHERN UNION GAS
B-770

KENNETH W. LARSEN
TRUSTEE
B-1060 P-505

ELOISE BAKER
B-965 P-587

EVAN C. SALMON
B-753 P-99

BETTY LEU SCHULTZ
B-918 P-84

RAJ HENDERSON
B-1044 P-79

DONALD C. LOONEY
B-1078
B-930

JENOVAH WITNESS CHURCH
B-779 P-596

ANN M. HUNTINGTON
GO LONNIE R. CAMPBELL
B-924 P-292

ALL I AM
HUNTINGTON P SUBDIVISION
PLAT B-1078 P-930

CITY OF BLOOMFIELD
B-304 P-150

JOE N KANE
099-165
C/O ODECO INC.
B-863 P-485

JOE NAVE
B-756 P-6

JAMES D. HUNTER
B-923 P-641
B-964 P-426

PAUL E. SANDOVAL
% BLACK SADDLE ESTATES

HW & MORROW

A.R. RUSHFIELD
TO
JOHN SMITH

A.R. RUSHFIELD
TO
A.W. SUBSTITUTE

THOMAS LARGO

STEVE HARRISON
LYDIA RUSTICE
ELMER HARRISON
MARION HARRISON
FRED HARRISON
JAMES HARRISON
CLOVIS HARRISON
MARION WHITESIDES
CHARLES HARRISON
MARION WHITESIDES

PROPERTY IDENTIFICATION MAP
SAN JUAN COUNTY
NEW MEXICO

SCALE (APP) 1"=100'

NOTE:
INFORMATION CONTAINED ON THIS MAP IS BASED SOLELY ON RECORDED DATA. (NO LIABILITY ASSUMED)

CODE NUMBER

2-063-169

LEGAL DESCRIPTIONS
SECTION 27 T 29N R 11W QUAD 1

DRAWN BY *P.W. 2 MAY 74*
CODED BY

27-29-11 ①

PROPERTY IDENTIFICATION MAP
SAN JUAN COUNTY
NEW MEXICO

SCALE (APP) 1"=100'

NOTE:
INFORMATION CONTAINED ON THIS MAP IS BASED SOLELY ON RECORDED DATA- (NO LIABILITY ASSUMED)

CODE NUMBER

2-063-169

LEGAL DESCRIPTIONS
SECTION 27 T 29N R 11W QUAD 4

DRAWN BY *Paul Smith*
CODED BY

NOTE: WE DO NOT KNOW WHERE CO. RD. 13 IS LOCATED.

27-29-11 ④

PREPARED BY
SAN JAUN COUNTY