Form 9-331 C
May 1963

Form approved.
Budget Bureau No. 42 R1425.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

30-045-23876

APPLICATION FOR PERMIT TO DRILL, DEEPEN, OR PLUG BACK

5. LEASE DESIGNATION AND SERIAL NO.: NOO-C-14-20-5318

6. IF INDIAN, ALLOTTEE OR TRIBE NAME: Navajo

1a. TYPE OF WORK: DRILL X DEEPEN PLUG BACK

7. UNIT AGREEMENT NAME

b. TYPE OF WELL: OIL WELL X GAS WELL SINGLE ZONE MULTIPLE ZONE

8. FARM OR LEASE NAME: Pinabete Arroyo

2. NAME OF OPERATOR: Patrick Petroleum Corporation of Michigan

9. WELL NO.: 1

3. ADDRESS OF OPERATOR: 1655 Colorado Nat'l Bank - 950-17th St. - Denver, Co 80202

10. FIELD AND POOL, OR WILDCAT: Wildcat

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.*) At surface: 1990' FSL, 2120' FEL - NWSE Section 17 - T26N - R14W. At proposed prod. zone

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: NW/4SE/4 Sec 17-T26N-R14W

12. DISTANCE IN MILES AND DIRECTION FROM NEAREST TOWN OR POST OFFICE*: ±18 miles southwest of Farmington, New Mexico

13. COUNTY OR PARISH: San Juan 14. STATE: New Mexico

15. DISTANCE FROM PROPOSED* LOCATION TO NEAREST PROPERTY OR LEASE LINE, FT. (Also to nearest drlg. unit line, if any): 1990 | 16. NO. OF ACRES IN LEASE: 1920 | 17. NO. OF ACRES ASSIGNED TO THIS WELL: ~~80~~ 40

18. DISTANCE FROM PROPOSED LOCATION* TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR, ON THIS LEASE, FT.: 4950' | 19. PROPOSED DEPTH: | 20. ROTARY OR CABLE TOOLS: Rotary

21. ELEVATIONS (Show whether DF, RT, GR, etc.): 5984' GR | 22. APPROX. DATE WORK WILL START*: October, 1979

23. PROPOSED CASING AND CEMENTING PROGRAM

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	SETTING DEPTH	QUANTITY OF CEMENT
12¼	8-5/8"	24.0	250'	175 sx "B" w/2% CaCl, ¼#/sx Flocele. Circ. to surf.
7-7/8"	4½"	10.5	4950'	185 sx 50/50 Pox w/2% gel, 10% salt

We propose to drill a well to test the Mesa Verde formation and any shallower zones of significance. If productive, the well will be cased as shown and completed. If dry, it will be plugged and abandoned in accordance with U.S.G.S. and State of New Mexico requirements.

RECEIVED
OCT 01 1979
U. S. GEOLOGICAL SURVEY
FARMINGTON, N. M.

OCT 4 1979
OIL CON. COM.
DIST. 3

Paul T. Guyon — 9-27-79

ok Frank

NMOCC

EXHIBIT III A

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

P. O. BOX 2088
SANTA FE, NEW MEXICO 87501

Form C-102
Revised 10-1-78

All distances must be from the outer boundaries of the Section

Operator	Lease	Well No.
PATRICK PETROLEUM CORP. OF MICHIGAN	PINABETE A	1

Unit Letter	Section	Township	Range	County
J	17	29N	14W	San Juan

Actual Footage Location of Well:
1990 feet from the South line and 2220 feet from the East line

Ground Level Elev.	Producing Formation	Pool	Dedicated Acreage:
5984	Gallup	~~Bisti Lower Gallup~~ Wildcat	40 Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

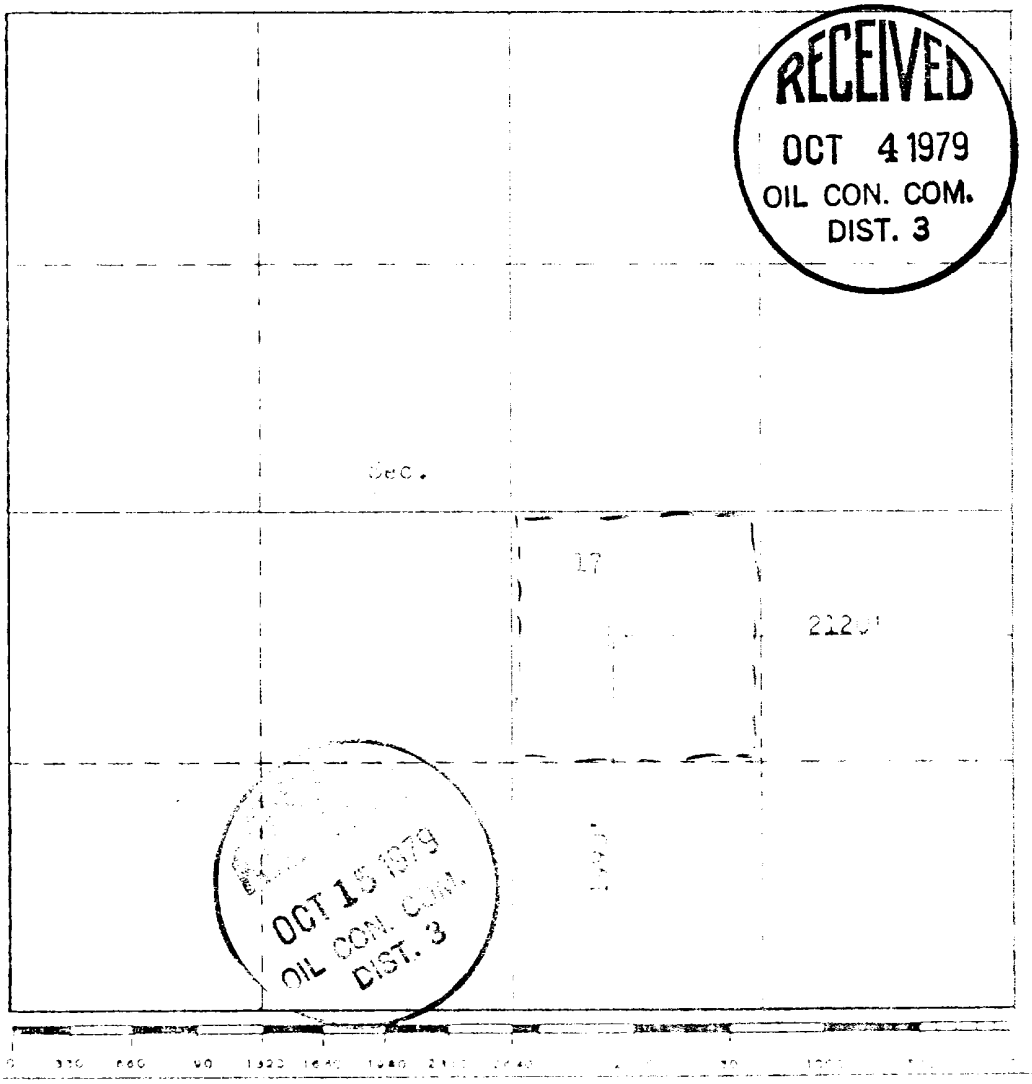
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consolidated by communitization, unitization, force-pooling, etc?

☐ Yes ☐ No If answer is "yes," type of consolidation _____

If answer is "no," list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary.) _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission.



RECEIVED
OCT 4 1979
OIL CON. COM.
DIST. 3

RECEIVED
OCT 15 1979
OIL CON. COM.
DIST. 3

CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief.

Name: Paul T. Gayer

Position: Division Engineer

Company: Patrick Petroleum Corporation of Michigan

Date: October 10, 1979

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

Date Surveyed: July 25, 1979

Registered Professional Engineer and/or Land Surveyor

Fred B. Kerr Jr.

FRED B. KERR, JR.
3950

TEN POINT PROGRAM

Pinabete Arroyo #1

1. Surface Formation: Ojo Alamo

2. The Estimated Formation Tops:

Formation	Depth ('KB)	Subsea
Ojo Alamo	Surface	+6002
Kirtland	350	+5652
Fruitland	685	+5317
Pictured Cliffs	1062	+4940
Lewis	1175	+4827
Chacra	1375	+4627
Cliffhouse	1855	+4147
Point Lookout	3438	+2564
Upper Mancos	3673	+2329
Gallup	4485	+1517

3. Estimated Depths of Water, Oil, Gas and Mineral Bearing Formations:

Substance	Anticipated Depth
Coal	Scattered throughout from surface to TD.
Water	Surface to ±150'.
Oil and/or Gas	Fruitland 685' - possible show of oil or gas
	Lewis 1175 - Chacra 1375 - Cliff-house 1855 - Upper Mancos 3673, possible shows of oil or gas.
	Gallup 4485' - possible commercial oil production.

4. Casing Design:

Purpose	Depth	Size OD	Weight	Grade	Type
Surface	0- 250'	8-5/8"	24#/ft	K-55	ST&C
Production	0-4950'	4-1/2"	9.5#/ft	K-55	ST&C

All casing will be new.

5. Pressure Control Equipment:

Exhibit VI details blowout preventer stack consisting of a 10" 3000 psi WP double ram hydraulic with Payne closing unit. The BOP will be tested to 1000 psi after nippling up and thereafter each 24 hours with tests recorded in Daily Drilling Reports.

6. Drilling Fluid:

Depth	Fluid Properties
0 - 250'	Gel and lime slurry with sufficient viscosity to insure a clean hole for running surface pipe.
250'-4450'	Clear water with a flocculant.
4450'-4950'	Low solids, lightly treated mud system with MW 8.8-9.2 ppg, Vis 38-40, FL 10cc.

7. Auxiliary Equipment:

Other equipment which will be used includes a kelly cock and a hot wire gas detector on the Mud System. A sub with a full opening valve will be on the floor when the kelly is not in use.

8. Testing, Logging and Coring:

A. A drill stem test of the Gallup Formation is planned. Other formations will be tested as deemed necessary and prudent.

B. The Logging Program is as follows:

SP-DIL with Focused Log	From base of surface casing to TD.
GR-CNL-FDC & GR-Sonic	From ±4200' to TD plus other zones of interest.

C. No coring is planned.

9. Potential Hazards

No abnormal pressures, abnormal temperatures or hydrogen sulfide gas are anticipated in the course of drilling this well.

10. Operating Timetable

Drilling is planned to commence after October 1, 1979 and completion to follow within 40 days of the spud date.

PTG/saq

I. GENERAL STATEMENT OF ENVIRONMENTAL IMPACT

The proposed well will be drilled to a depth of 4950' to test the Gallup Formation. It will be necessary to move in a rotary drilling rig to drill the well. Surface casing 8-5/8" OD will be set and cemented at about 250'. If production is discovered, 4½" OD casing will be set and cemented over the pay zone. A completion unit will then be moved in to complete the well. Production facilities will be constructed upon successful completion of the well.

Roads will be built only as necessary to assure access to temporary and permanent facilities. The exhibits attached show the location of these facilities and the required roads. All roads and excavations made for production facilities will be restored to their original condition when no longer required.

No changes will be made to the drainage pattern of the land. Likewise, no changes will be made to topography or terrain except as necessary to level the drill site and sites for production facilities.

II. DRILLING OPERATIONS

A. Preliminary Environmental Review

Approval to stake the location was granted by the Farmington District Engineer of the U.S.G.S. on July 13, 1979.

B. Application for Permit to Drill

1. Location: 1990' FSL, 2120' FEL, J 17 - 26N - 14W - San Juan County, New Mexico, from attached survey plat, Exhibit III.
2. Elevation: 5984' above sea level from attached survey plat, Exhibit III.
3. Surface Formation: Ojo Alamo
4. Drilling Tools: See attached rig inventory, Exhibit VII A.
5. Proposed Depth: 4950'
6. Geologic Markers: See attached well prognosis, Exhibit VIII.
7. Mineral Bearing Formations: Coal - scattered from surface to TD. Water - surface to ±150'. Oil or Gas - Fruitland @ 685', Pictured Cliffs @ 1062', Lewis @ 1175', Chacra @ 1375', Cliffhouse @ 1855', Upper Mancos @ 3673', Gallup @ 4485'.
8. Casing Program: New casing will be used according to Item 23 of Form 9-331C, attached.
9. Cementing Program: See attached form 9-331C.
10. Pressure Control Equipment: See diagram of BOP Equipment attached for specifications, Exhibit VI. BOP Equipment will be checked and reports made on a daily basis.

II. DRILLING OPERATIONS (Continued)

B. Application for Permit to Drill (Continued)

11. Mud Program: See attached mud recommendation, Exhibit IX.

12. Testing, Logging, Coring: See attached Geological Prognosis, Exhibit VIII. Operator will Drill Stem Test any hydrocarbon shows as deemed necessary.

13. Potential Hazards: No abnormal pressures or temperatures are anticipated. Any hazards of a gaseous nature can be handled by the equipment in Item 10 above.

14. Starting Date and Duration: This project can start after October 1, 1979 and is expected to take approximately 40 days.

15. Other: As far as can be ascertained, there are no potable water zones below 150' subsurface. We, therefore, plan to set 250' of surface casing and circulate cement to surface.

III. MULTI-POINT SURFACE USE AND OPERATIONS PLAN

1. Existing Roads

A. Maps: Appropriate section of a San Juan County road map and U.S.G.S. quadrangle maps are attached as Exhibits I and II.

B. Proposed Route: Exit New Mexico State Highway 371, 14 miles south of Farmington, New Mexico (as measured from the intersection of the L. E. Murray Thru-Way, Pinon Street and New Mexico Highway 371 in Farmington). Turn right off the paved highway on to San Juan County Road B1 and follow it west 4.9 miles to the point where B1 bends to the left (south) and becomes County Road C14. Continue west across the intersection on to an unimproved dirt road and follow it 6.2 miles to the location.

C. Access Roads: New roads will not be required since the location is immediately adjacent to the existing road.

D. Existing Roads: All existing roads in the vicinity of the proposed well are unimproved ranch-type dirt roads.

E. N/A

F. Maintenance of Roads: Existing roads will be maintained as necessary to keep them passable.

2. Planned Access Roads

No new roads are planned.

3. Existing Wells

Within a two mile radius of the proposed well there are three abandoned wells and two producing oil wells. There are no known water, temporarily abandoned, disposal, injection or drilling wells. See Existing Well Map, Exhibit V.

III. MULTI-POINT SURFACE USE AND OPERATIONS PLAN (Continued)

4. Existing Production Facilities

A. There are no tank batteries, production facilities, oil or gas gathering lines, injection lines or disposal lines owned or controlled by lessee or operator within a one mile radius of the proposed well.

B. In the event production is established, production facilities including tanks, lines, treater and other equipment will be constructed at the well site.

An earthen dike utilizing soil from the immediate vicinity will be constructed around the storage tanks to contain oil in the event a tank leak occurs. Proper fencing (five strand barbed wire) will be installed to prevent wildlife from entering the production facilities or tank battery. All fill and load lines will be contained by fencing. Wire will be laid across pits to prevent wildlife entry.

C. Any disturbed areas no longer needed will be returned to their original contours and reseeded in accordance with U.S.G.S. and landowner's requirements.

5. Location and Type of Water Supply

All water will be purchased from and hauled by a local state licensed oil field water trucking company. Access roads will be those shown in Exhibit II.

6. Source of Construction Materials

Only native construction materials will be used and will come from the drill site.

7. Methods for Handling Waste Disposal

A. Drill cuttings and drilling fluids will be contained in an earthen reserve pit.

B. Well fluids will be produced into a test tank until such time as construction of treating facilities is completed.

C. A waste hole for sewage discharge from the trailer will be drilled.

D. Garbage and other waste materials will be contained in a trash pit fenced with small mesh wire. Trash will be burned periodically and the remains buried when the well is completed.

E. All trash, garbage, etc., will be gathered and burned or buried upon completion of drilling operations. Mud pits will be allowed to dry out and then adequately filled, tamped and leveled. All garbage and sewage pits will be filled as soon as the rig leaves the location.

8. Ancillary Facilities

No camps or airstrips are planned.

III. MULTI-POINT SURFACE USE AND OPERATIONS PLAN (Continued)

9. Wellsite Layout

Exhibit VII B is attached showing the location of mud tanks, reserve pit, trash pit, pipe rack, living facilities and soil stockpile. Rig Orientation, parking area and access road are also shown. The pits will not be lined.

10. Plans for Restoration of Surface

A. The reserve pit area will be fenced and allowed to dry for several weeks. Pits will be backfilled, leveled, contoured and reseeded in accordance with BIA or surface owner's requirements.

B. Seeding will be done in the spring of 1980 when the frost is out of the ground and before September 15, 1980 as required by BIA or surface owner.

C. Pits will be fenced as in "A" above.

D. Any oil in the pit will be removed or the pit will be flagged overhead as required.

E. The estimated starting date for rehabilitation operations is June, 1980 and the estimated completion date is September 15, 1980.

11. Other Information

A. The topography of the area is basically gentle rolling hills with salt brush, rice grass, sage and other native grasses in sandy soil.

B. The well site is located on the Navajo Indian Reservation. Surface use includes limited grazing of domestic livestock.

C. The reserve pit will be oriented parallel with and to the west of a wash which runs into Pinabete Arroyo approximately 1.5 miles to the southwest. There is a small pond which sometimes contains water located southwest of the drillsite about 1.0 mile. There are no known water wells, streams or occupied dwellings and no known archeological, historical or cultural sites in the immediate vicinity of the proposed drilling location. An archeological survey has not yet been made, however, a report will be submitted when this survey is completed.

12. Lessee's or Operator's Representative

Mr. Paul T. Gayer will be the representative of Patrick Petroleum Corporation of Michigan.

Office: 1655 Colorado National Bank Building
950 - 17th Street
Denver, Colorado 80202
(303) 573-1207

Home: (303) 278-2505

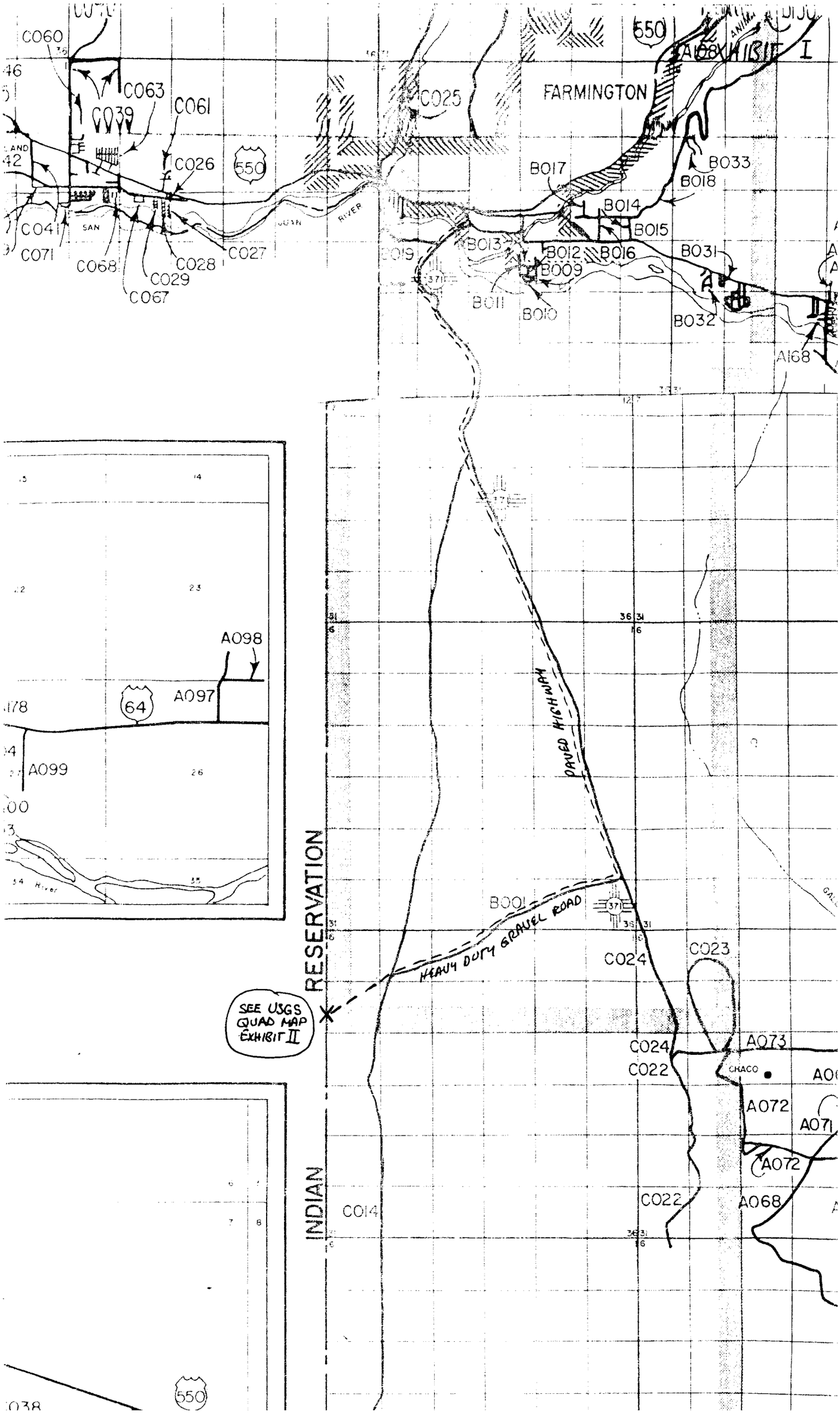
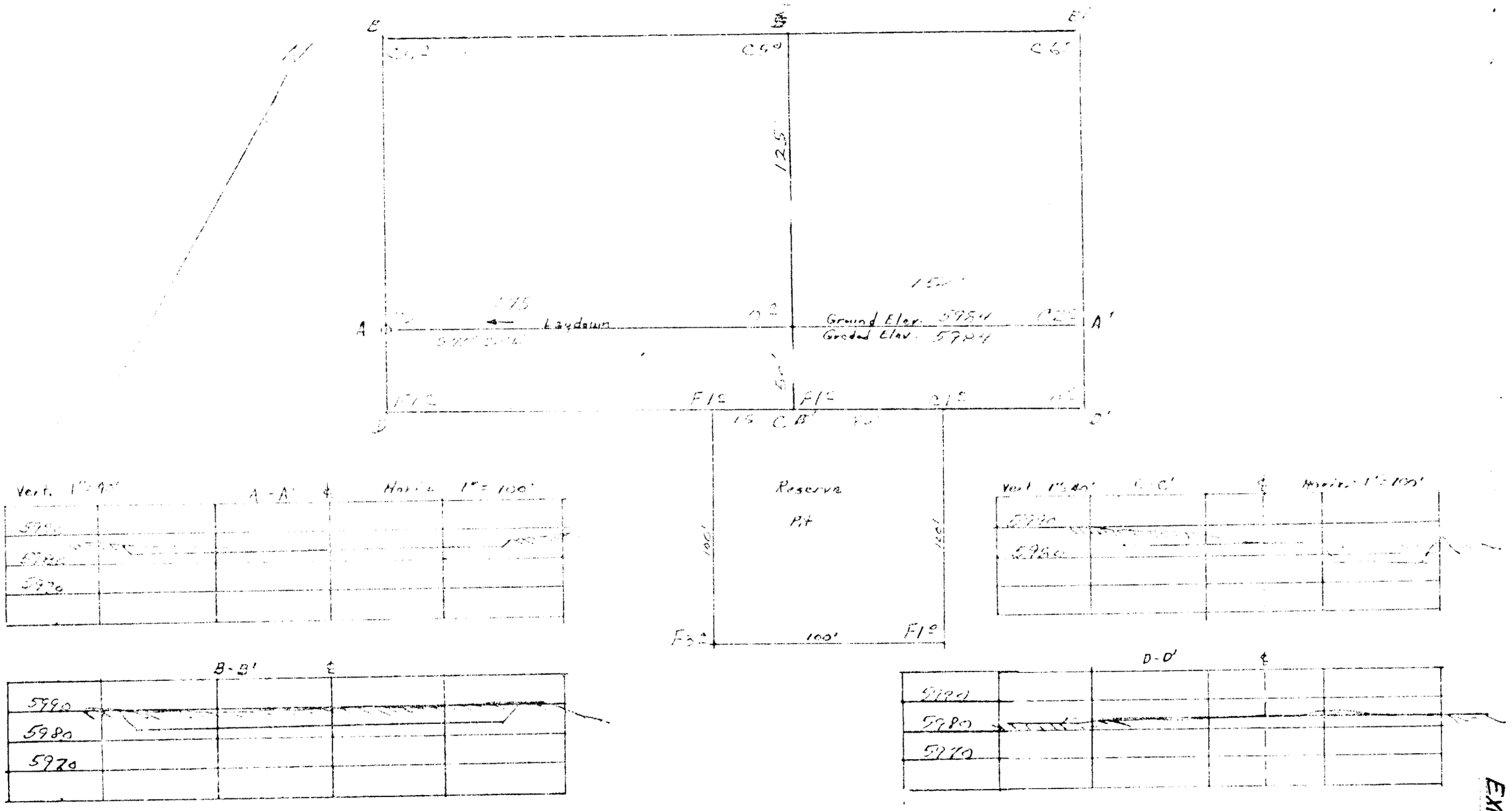


EXHIBIT I
C060
C063
C039
C061
C025
FARMINGTON
550
C026
B017
B033
B018
B014
C041
SAN
JUAN
RIVER
B015
C071
C068
C028
C027
B019
B013
B012
B016
B031
C029
B009
C067
B011
B010
B032
A168
A098
A097
64
A099
RESERVATION
PAVED HIGHWAY
B001
HEAVY DUTY GRAVEL ROAD
C024
C023
SEE USGS QUAD MAP EXHIBIT II
C024
A073
C022
CHACO
A072
A071
A072
C022
A068
C014
INDIAN
550


CATTLEGUARD
SEE COUNTY ROAD MAP EXHIBIT I
CATTLEGUARD
UNIMPROVED DIRT ROAD
CATTLEGUARD
LOCATION

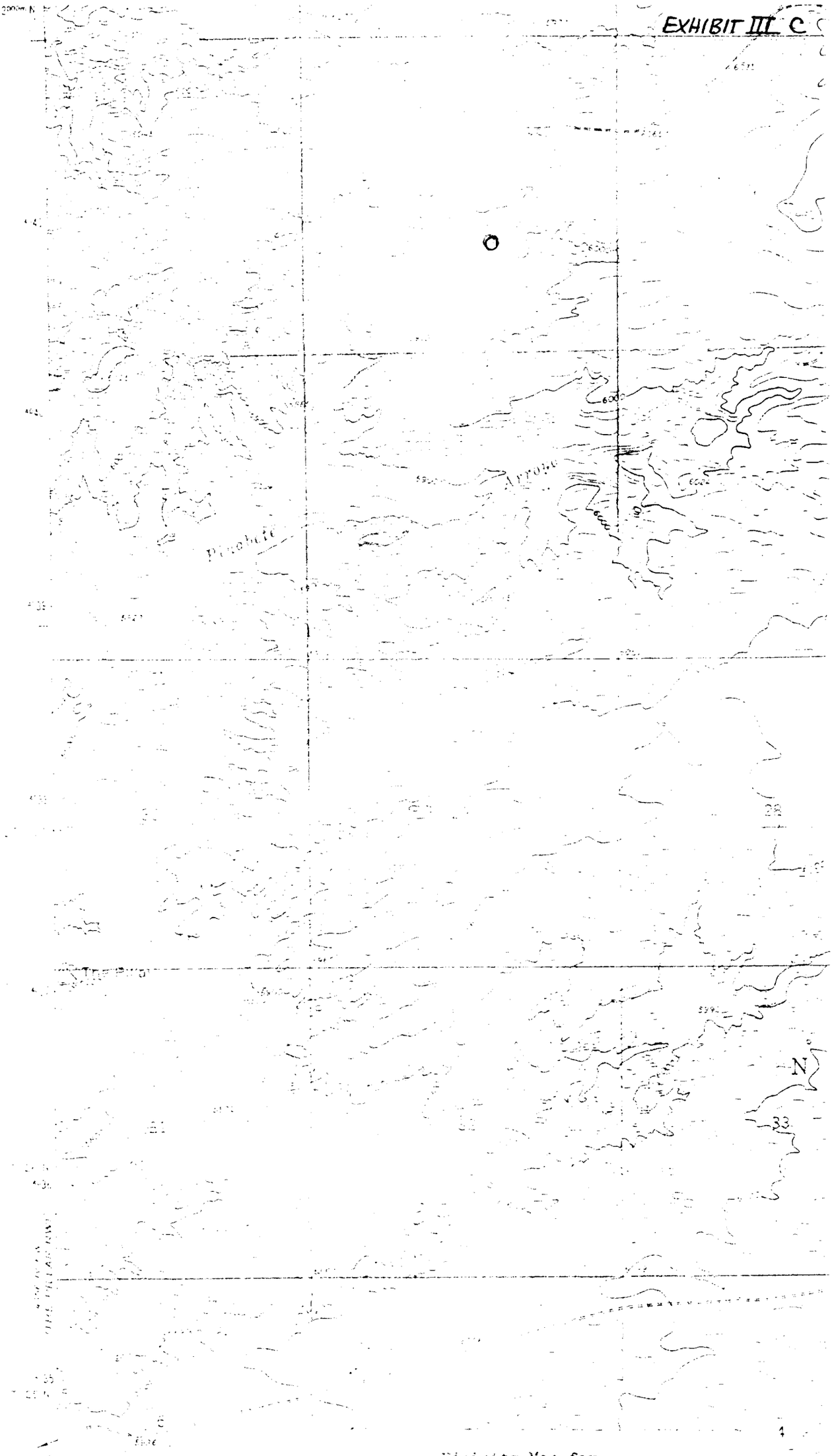
EXHIBIT II



KERR LAND SURVEYING
Date: 7/25/99

EXHIBIT III
B.

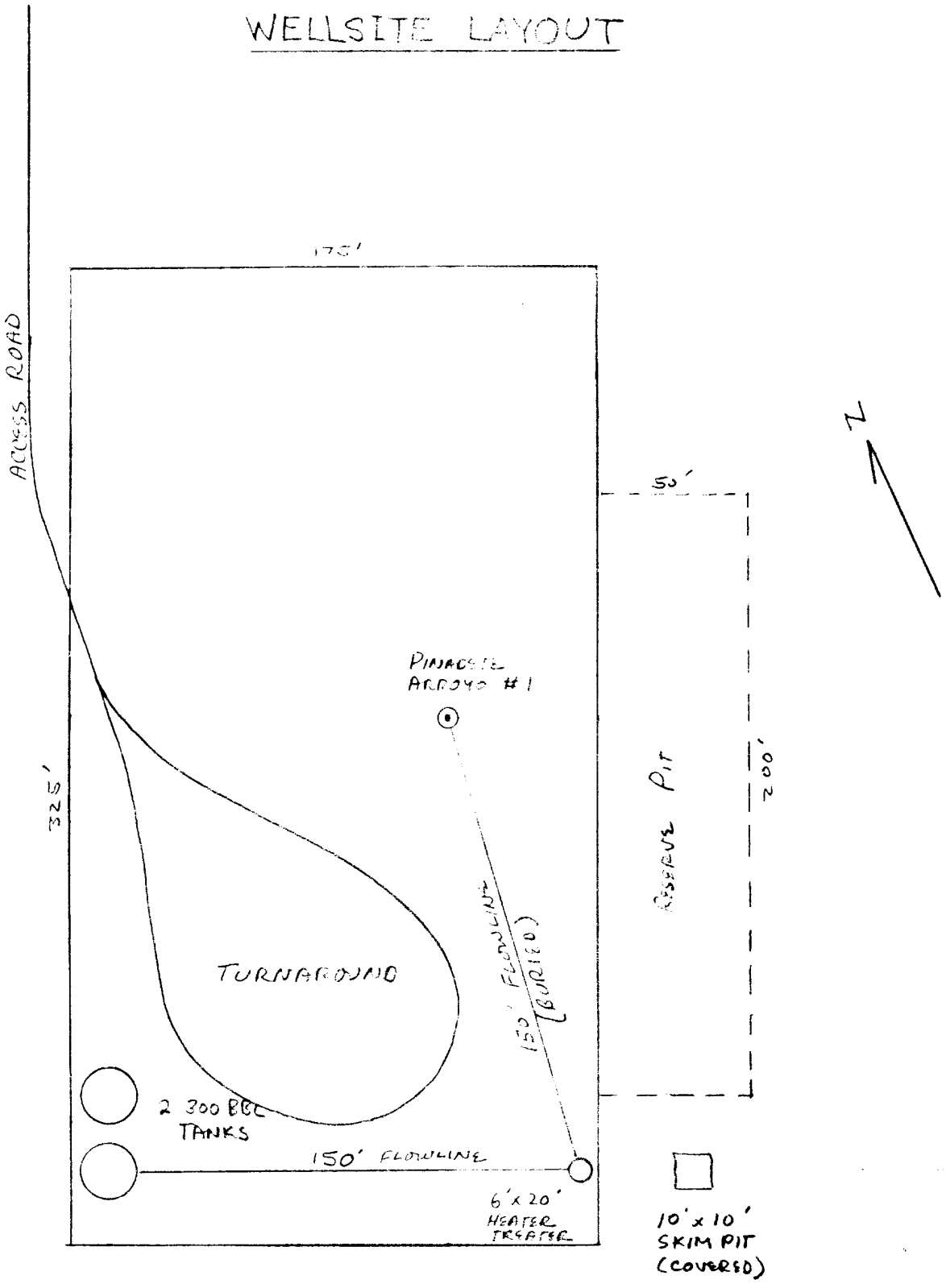
EXHIBIT III C



Vicinity Map for
PATRICK PETROLEUM CORP. #1 PINABETE ARROYO
1990'FSL 2120'FEL Sec 17-T26N-R14W
SAN JUAN COUNTY, NEW MEXICO

EXHIBIT IV

WELLSITE LAYOUT

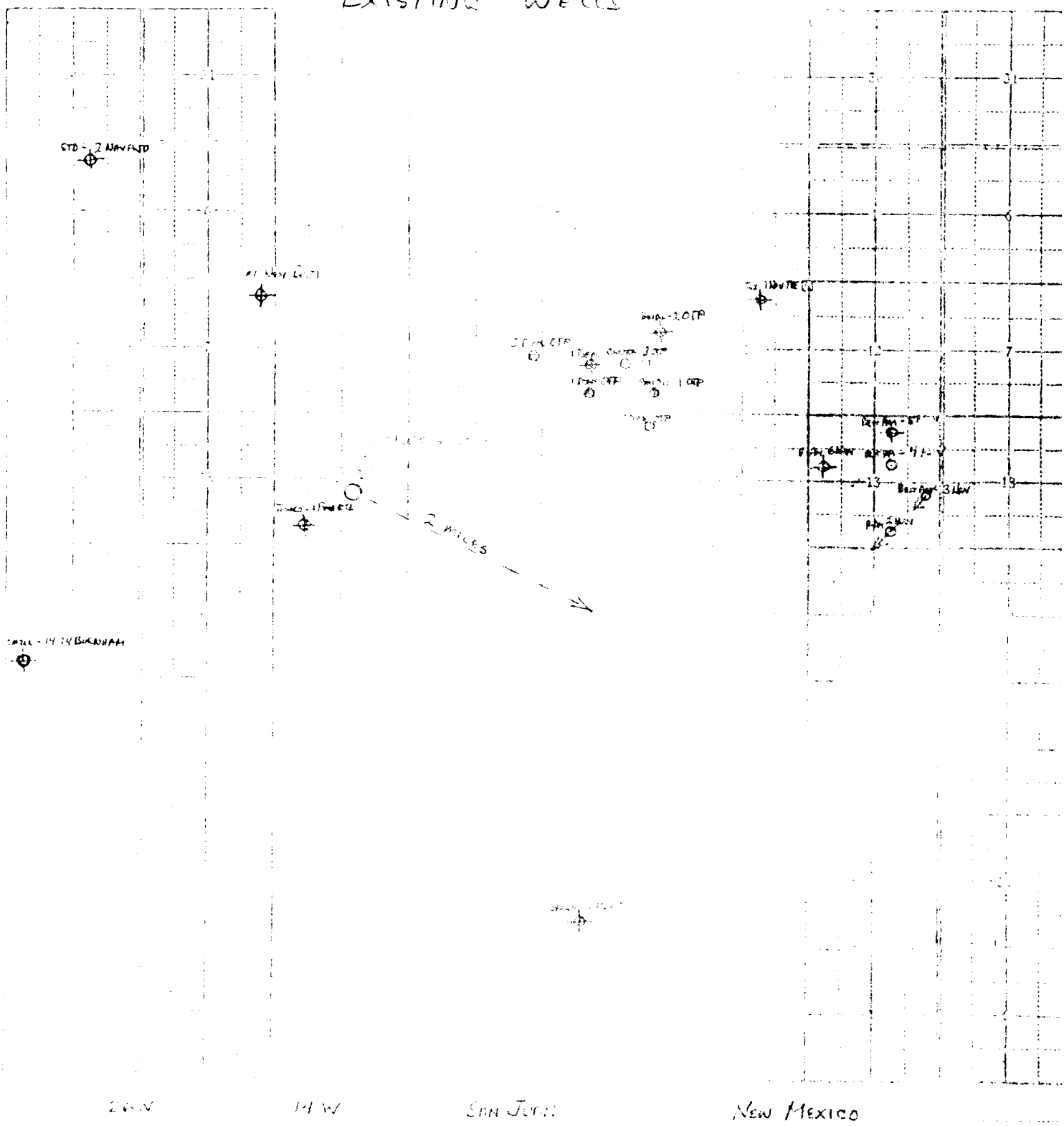


SCALE 1" = 50'

EXHIBIT V

PINNACLE AREA

EXISTING WELLS



LEGEND

- PRODUCING WELL
- PLUGGED WELL
- WATER INJECTION WELL

EXHIBIT VII A

1200 SECURITY LIFE BUILDING
DENVER, COLORADO 80202

TELEPHONE
303 - 629-1050

RIG NO. 20

DRILLING RIG SPECIFICATIONS AND EQUIPMENT

RIG	Ideco BIR-550 H-37 Back-In Rambler with 12V-71 Engine and 103' - 224,000# capacity mast
SUBSTRUCTURE	11' high - 224,000# capacity
ROTARY TABLE	17 1/2" Ideco
PUMP #1	Emsco DA-500 7 1/2" x 16" 500 h.p. powered by 1 16V-71 GMC Diesel Engine
PUMP #2	Gardner-Denver PZK 7 1/4" x 14" 255 h.p. powered by 2 - 671 GMC Diesel Engines
MUD PIT	1 - 12' wide, 5' high, 54' long, 500 bbl. with Desilter and Shale Shaker
BLOWOUT PREVENTER	10" Double Gate Type U, Shaffer
LIGHT PLANT	1 - 75 kw and 1 - 50 kw in light plant house
WATER TANK	400 bbls.
FUEL TANK	2,500 gal.
DRILL PIPE	4 1/2" XH - 7,500 ft.
DRILL COLLARS	20 - 6" x 2"

June 1976

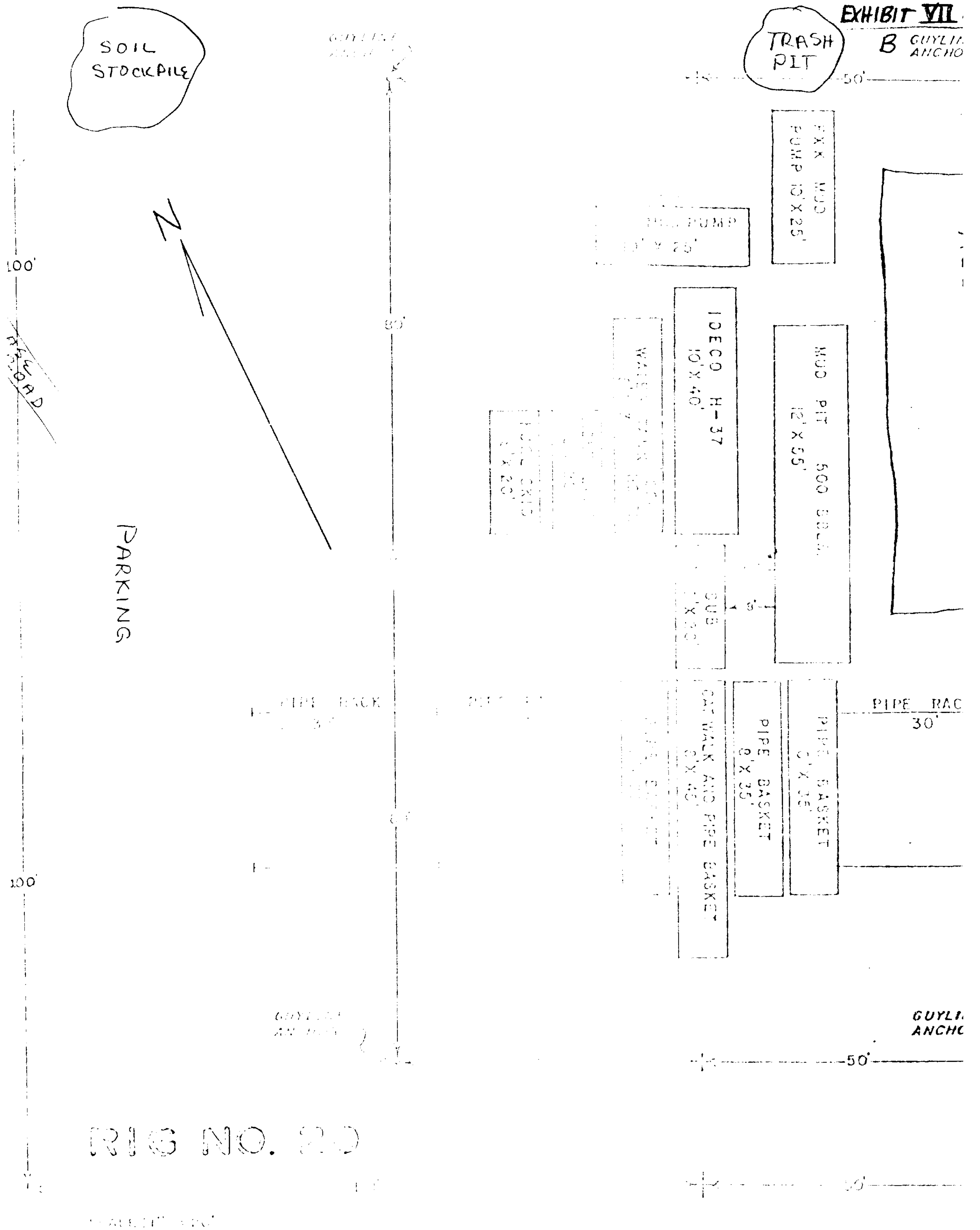


EXHIBIT VII
B
SOIL STOCKPILE
TRASH PIT
50'
N
100'
80'
PARKING
FXK MUD PUMP 10'X25'
PUMP
10' X 25'
IDECO H-37
10'X40'
MUD PIT 500 BBLS.
12'X55'
SUB
6'
PIPE RACK
30'
PIPE BASKET
8'X35'
PIPE BASKET
8'X35'
CAT WALK AND PIPE BASKET
6'X45'
GUYLI
ANCHO
50'
100'
RIG NO. 20

EXHIBIT VIII

[illegible]

Prospect Name: PINABETE ARROYO

Well Name & No.: Patrick Petroleum #1 Pinabete Arroyo

Location: NWSE Sec. 17-T26N-R13W

County & State: San Juan, New Mexico

[illegible]: Approx. 5990' (Topo Map)

[illegible]: 4800'

[illegible]: Gallup sandstone

[illegible]tive:

Est. Formation Tops:	w/12' KB [illegible]	[illegible]
Ojo Alamo	Surface	+6002
Kirtland	350	+5652
Fruitland	685	+5317
Pictured Cliffs	1062	+4940
Lewis	1175	+4827
Chacra	1375	+4627
Cliffhouse	1855	+4147
Point Lookout	3438	+2564
Upper Mancos	3673	+2329
Gallup	4485	+1517

Sample Program:

30' samples from 200'-3500'

10' samples from 3500'-TD.

[illegible]:

1-man unit base surface casing to TD

[illegible] Program:

[illegible] w/[illegible] - sf. csg - TD

[illegible]-Sonic } +4200' to TD plus other zones of interest

[illegible]/FDC }

[illegible]:	[illegible]	[illegible]		[illegible]	[illegible]
	None			[illegible]	4485'

DRILLING PROGRAM

Hole Size	Interval
12-¼"	sf.-200'
7-7/8"	200'-4800'

[illegible] PROGRAM

Size	Interval	Weight	Grade
8-5/8"	200'	24.0#	K-55
4-½"	4800'	9.5#	K-55

[illegible]

Interval	Type	[illegible]	[illegible]			[illegible]
0 - 200	[illegible]	9.0	[illegible]	[illegible]		
200 - 4400	[illegible]	8.4-8.5	26-28	[illegible]		w/Flocculant
4400 - 4800	Gel	9.0-9.2	38-40	<10		Low Solids

EXHIBIT IX

Magcobar

DATE: July 26, 1979

COMPANY: PATRICK PETROLEUM

ATTENTION: Mr. Paul Gaver

WELL: Pinabete Arroyo #1

LOCATION: Section 17, 26 North - 14 West
San Juan County, New Mexico

COPIES:

PREPARED BY: Ken Armstrong
Technical Service Engineer

/ee

Magcobar

Dresser Industries, Inc.

SUGGESTED CASING PROGRAM

COMPANY: PATRICK PETROLEUM WELL NAME: Pinabete Arroyo #1

LOCATION: Section 17, 26 North - 14 West COUNTY, STATE: San Juan County, New Mexico

SUGGESTED CASING PROGRAM:

INTERVAL	HOLE SIZE	CASING SIZE
0-250'	12-1/4"	8-5/8"
250-4950'	7-7/8"	4-1/2"

SUGGESTED MUD PROPERTIES:

Mud Type: Spud Mud

Depth	Weight	Viscosity	Fluid Loss	Treatment Remarks	
0-250'	9.0	32-38	N/C	pH	8.5-9.0

Drill this interval with a Magcogel-Lime slurry with sufficient viscosity to insure a clean hole for running surface casing.

The viscosity of this mud system should be kept to a minimum with Magcogel and Lime, most of the viscosity coming from the Lime. The viscosity should be raised above this range only if hole conditions warrant the necessity.

Solids removal equipment should include a SWACO Super Screen, a D-Sander, and a D-Silter.

Lost circulation is not expected in this interval. Should lost circulation occur, sweep treatments of Mud Fiber, Mica and Chip Seal should be used. Severe lost circulation should be treated with cement or blind "X" squeezes.

Estimated Interval Drilling Time - 1 Day

Mud Additives	Purpose
Magcogel	Viscosifier
Lime	Flocculant, pH control
Mica, Mud Fiber, Chip Seal	Lost circulation material (if needed)

Estimated Interval Mud Cost - $351.00

NOTE: SEE REVERSE SIDE FOR [illegible]

Magcobar | DRESSER

SUGGESTED DRILLING FLUID PROGRAM

SUGGESTED MUD PROPERTIES: Mud Type: Water/Benex

Depth	Weight	Viscosity	Fluid Loss	Treatment Remarks
250-4500'	8.4-8.5	26-28	N/C	pH 9.0 Solids 1-2%

After the 8-5/8" surface casing has been set at [illegible]', drilling should continue with clear water. The depth at which water will no longer be effective can only be approximated in this program. However, hole conditions should dictate any mud up.

The water should be kept as clear as possible to be effective. The reserve pit should be circulated to give added settling time. The reserve pit should contain at least two dividers so that maximum settling will ensue.

The SWACO Super Screen should be continued in this interval as was described in the previous interval with the finest mesh screens as will handle the volume.

Select-Floc should be added at the flowline to aid with drilled solids flocculation. Select-Floc should be added at one pound for every 50' of hole drilled. This flocculant will surround the drilled solids making them larger and heavier which makes them easier to remove.

For optimum penetration rates, maximum hydraulics should be observed. Procedures for designing hydraulics are many and varied with the most common emphasizing maximum hydraulic horsepower at the bit with a Newtonian fluid. An optimum flow rate should be determined for adequate hole cleaning. Then the maximum hydraulic horsepower at the bit should be designed. The more hydraulic horsepower which is available at the bit, the more work will be done by the fluid to increase penetration.

Prior to making trips, sweeps of Magcogel and Lime should be used to clean the hole. Running sweeps periodically and prior to tripping should keep the hole clean so that a mud up can be prolonged. Keeping the hole clean will also help avoid stuck pipe and associated hole troubles.

When hole conditions indicate inadequate hole cleaning, mud up of the system should ensue.

Estimated Interval Drilling Time - 7 Days

Magcobar DRESSER

250-4500'

Mud Additives

Purpose

Magcogel — Viscosity, sweeps
Lime — Flocculation - pH control
Select-Flo — Drill solids flocculation

Estimated Interval Mud Cost - $1,300.00

Magcobar DRESSER

SUGGESTED MUD PROGRAM

SUGGESTED MUD PROPERTIES:

Mud Type: Low Solids - Lightly Treated

Depth	Weight	Viscosity	Fluid Loss	Treatment	Remarks
4300-4950'	8.8-9.2	38-40	Below 10 cc	P.V.	As per A.F.D.
				Y.P.	As per A.F.D.
				pH	9.0-9.5
				Solids	3-6%

This interval should be drilled with a low solids, lightly treated mud system. This system should be treated for control of rheology and any encountered contaminants.

Cypan may be used to bring the fluid loss to the moderate range of 8-10 cc/30 min. for maximum stability through the pay zone.

This section can be drilled effectively if proper rheology is maintained. Annular Flow Dynamics is a simple, practical method for predicting and controlling rheology and hydraulics in drilling fluids systems. It is primarily oriented towards improving drilling practices in sloughing shale situations. By using the A.F.D. technique, it is possible to determine and possibly predict certain drilling fluid parameters for maximum performance. By use of a logarithmic plot of viscometer data, the following can be determined: the type flow (laminar or turbulent); effective annular viscosities at any pump rate and for any flow properties; accurate annular pressure losses; upper and lower limits on both flow properties and pump rates for optimum hole stabilization and minimum equivalent circulating densities; and values for "n" and "K". "n" is the slope of the effective viscosity line. The slope of this line is directly related to the cleaning capacity of the drilling fluid. The lower the "n" value, in an unweighted mud, the better the cleaning capacity would be. In weighted muds, optimum "n" values will vary because of the effects barite has on effective viscosity. "K" is a value which measures consistency of drilling fluids -- the more viscous a fluid, the higher the "K" value. "K" is also directly related to solids, as higher consistency values are indicated with increasing amounts of solids.

The Annular Flow Dynamics worksheet can also be used to calculate surge and swab pressures. Running the pipe in the hole at higher speeds causes very high surge pressures on the formation. The drill string acts as a plunger when run in the hole very fast. The pressures which are put on the formation are equivalent to the hydrostatic pressure plus the surge pressure. Lost returns after trips can often times be avoided if care is taken while running the drill string in the hole. Swab pressures, the opposite of surge pressures, are prevalent when the drill string is pulled out of the hole. These pressures lighten the hydrostatic head and can allow gas to enter the well bore. Swab pressures are usually ignored

Magcobar DRESSER

ESTED
NG FLUID
GRAM

4500-4950'

unless near balanced conditions are seen, but can be responsible for excessive fill on trips. The lightening of the hydrostatic head can cause the hole to fall in. The pipe should be pulled and run at slow enough speeds so both surge and swab pressures are minimized.

Solids control is important in this interval as optimum drilling is directly related to the amount of drilled solids present. A SRA3 Super Screen with as fine a mesh screen as will handle the volume should be used. A 6T4 D-Silter should follow the screen to remove those solids which the shaker has not removed. A high speed centrifuge run backward should be used to remove the remaining solids. This solids removal equipment should minimize the amount of dilution which is necessary. Lowering the amount of solids which the system contains will in turn lower the maintenance cost.

Lost circulation may be encountered in this interval; if it occurs, sweep treatments of Nut Plug, Mica and fibrous materials should be used. A combination of lost circulation materials will act as sedimentation does in sealing the bottom of lake beds. Prolonged use of lost circulation material is not recommended as its presence in the drilling fluid can greatly increase the annular pressure losses. These results are documented in a paper written by Messrs. R. K. Clark and J. E. Fontenot of Shell Oil Company describing actual field results in reference to pressure losses. After several attempts with sweeps of lost circulation material have failed, squeezes of either Diaseal "M" or cement should be used to cure the problem.

Estimated Interval Drilling Time - 2 Days

MUD SYSTEM

Product	Quantity/bbl.	Reason
Magcogel	15 #/bbl.	To viscosify the mud and to aid in fluid filtration.
Cypan	0.3 #/bbl.	To control the lower fluid loss requirements.
Caustic Soda	1 #/bbl.	To aid the electrochemical environment of the mud and some corrosion control.