CORING, LOGGING AND STIMULATION PLAN
FOR
E.G.S.P. MICHIGAN WELL NO. 2
OTSEGO COUNTY, MICHIGAN

Submitted to

U.S. Department of Energy
Morgantown Energy Technology Center

Under Contract No. DE-AC21-79MC08382

by

GRUY FEDERAL, INC.
2500 Tanglewilde, Suite 150
Houston, Texas 77063

June 12, 1980

GRUY FEDERAL, INC.
CONSULTANTS IN ENERGY SYSTEMS

2500 TANGLEWILDE, SUITE 150
HOUSTON, TEXAS 77063
713/785-9200

2001 JEFFERSON DAVIS HWY., SUITE 701
ARLINGTON, VIRGINIA 22202
703/892-2700

June 4, 1980

U.S. Department of Energy
Morgantown Energy Research Center
P. O. Box 880
Morgantown, West Virginia 26505

Attention: John Cunningham

Subject: Proposal for Coring, Logging, and Stimulation
EGSP - Michigan No. 2, Otsego County
Contract No. DE-AC21-79MC08382

Dear Mr. Cunningham:

Enclosed is Gruy Federal, Inc.'s cost proposal relative to the Coring, Logging, and Stimulation Tasks at the Otsego County location. This proposal, dated June 3, 1980, supports the technical proposal also included and is for $124,734 in estimated costs and $4,989 in proposed fee.

Questions relative to the cost proposal should be directed to Gayland E. Daugherty, Vice-President, Finance on Extension 300 in our Houston office. Richard N. Lane, President, Gruy Federal, Inc. is authorized to conduct negotiations on changes to this contract. He may be reached at either 713/785-9200 in Houston or 703/892-2700 in Arlington.

Sincerely,

W. Emerson Gamble

W. Emerson Gamble
Manager, Contract Administration
and Pricing

WEG/js

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FIGURES

SECTION I

Section I of the proposal includes the geological prognosis and coring, logging and stimulation tasks.

E.G.S.P. CORE DRILLING SITE
MICHIGAN NO. 2

INTRODUCTION

The Devonian shales of the Appalachian, Illinois and Michigan basins (Fig. 1) have been under intensive study as potential sources of large volumes of natural gas since the early 1970's.

Gruy Federal, Inc. of Houston has been chosen by the U.S. Department of Energy as principal contractor for the collection of core samples and related petrophysical data from the Devonian shales at a number of sites distributed over 11 states in the 3 eastern sedimentary basins.

In the state of Michigan the carbonaceous, bituminous, and combustible nature of the lower Antrim shale (Upper Devonian) has been known for more than 140 years. Antrim shale gas has been produced in Michigan for many years, and early documentation of the potential oil content of the shales is to be found in a report by Smith published in 1912.

Mr. Murell L. Welch, oil and gas producer, Mt. Pleasant, Michigan, and Gruy Federal, Inc. have expressed initial agreement to core the Upper Devonian black Antrim shales in northern Michigan (Fig. 2) at the State Chester No. 18 site located in SW1/4, SE1/4, NW1/4 of Sec. 18, Township 29N, Range 2W in Chester Township, Otsego County (Fig. 3a). A plat map of the location is given in Fig. 3b.

Mr. Welch is currently developing an Antrim shale gas field that encompasses some 6 sections in the northern half of Chester Township (Fig. 4). The Antrim formation is generally encountered at depths ranging from about 1400 to 1500 feet in the immediate area.

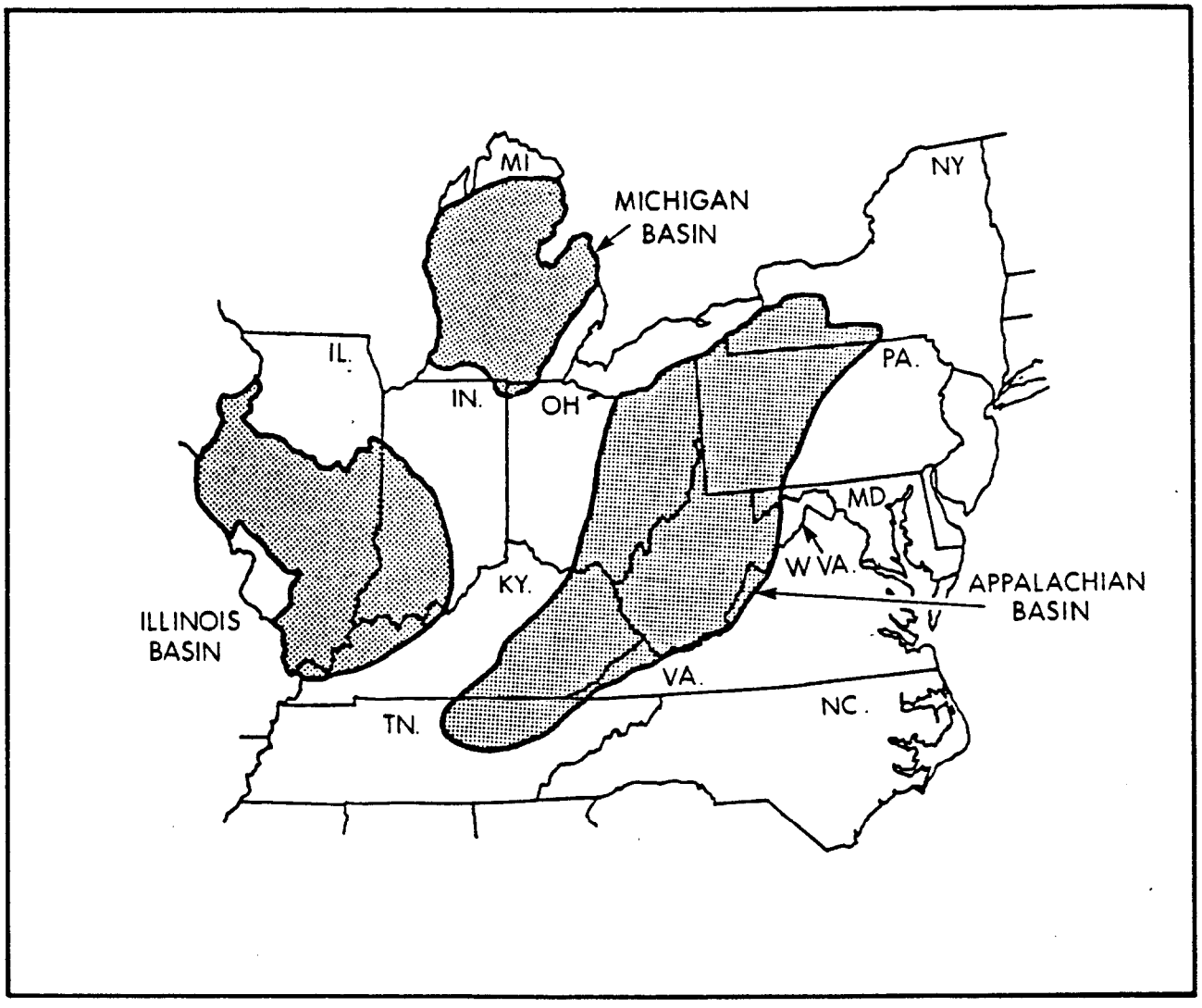


FIGURE 1 EASTERN GAS SHALE BASINS

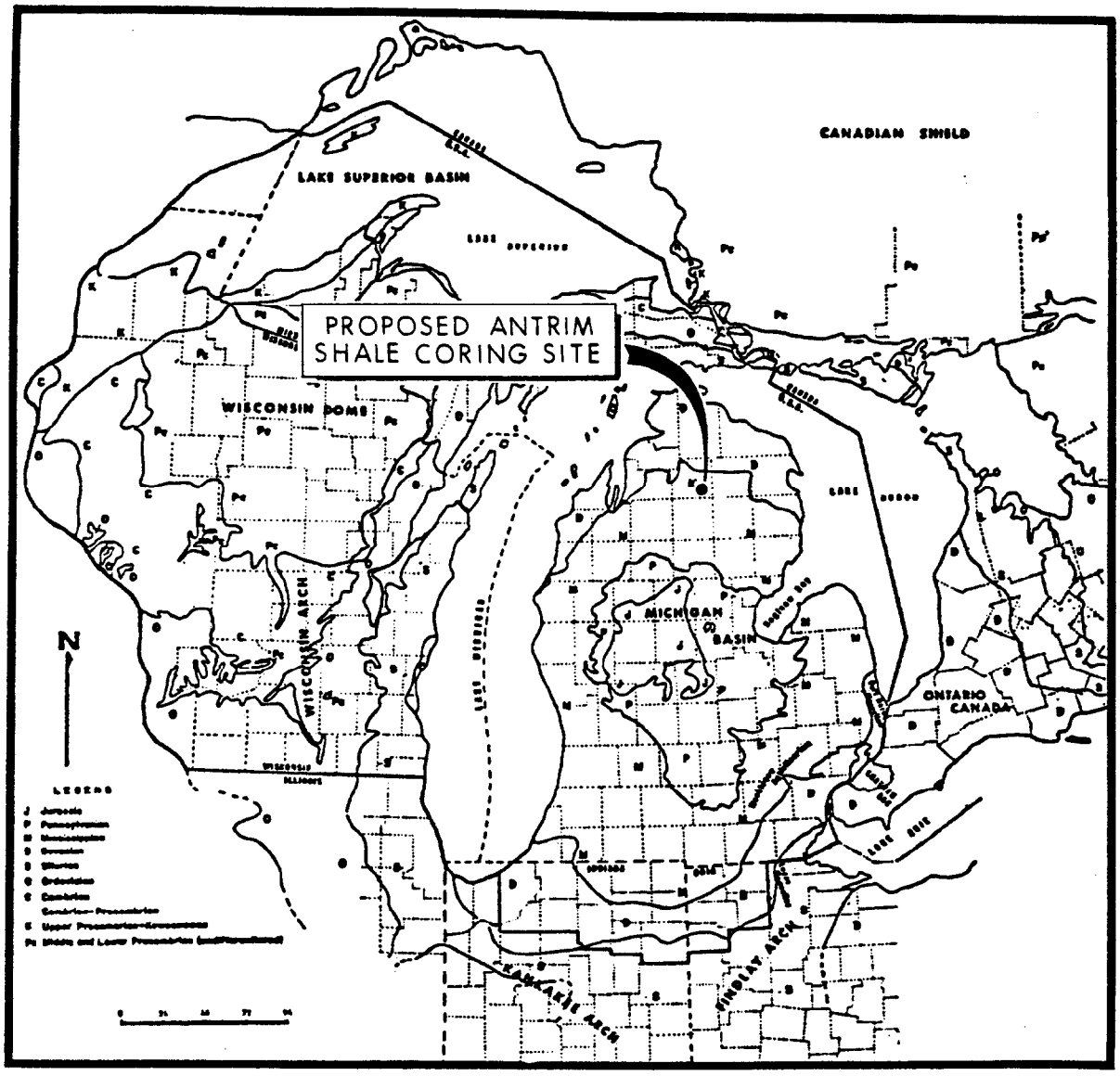


Figure 2 - Location of Antrim Shale coring site in Otsego County, Michigan.

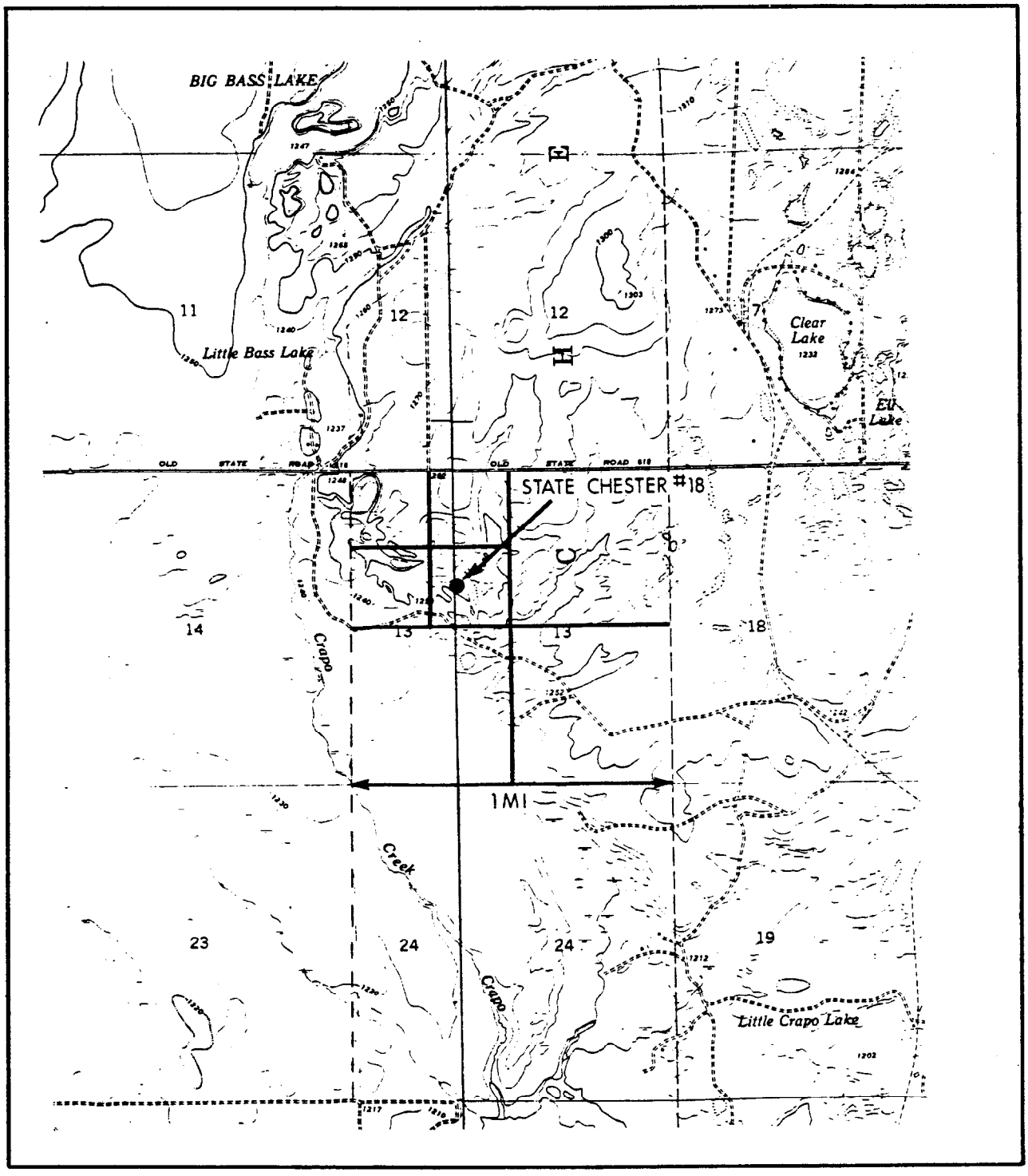


Figure 3a - Location of the State Chester no. 18 proposed core site in Chester Township, Otsego County, Michigan.

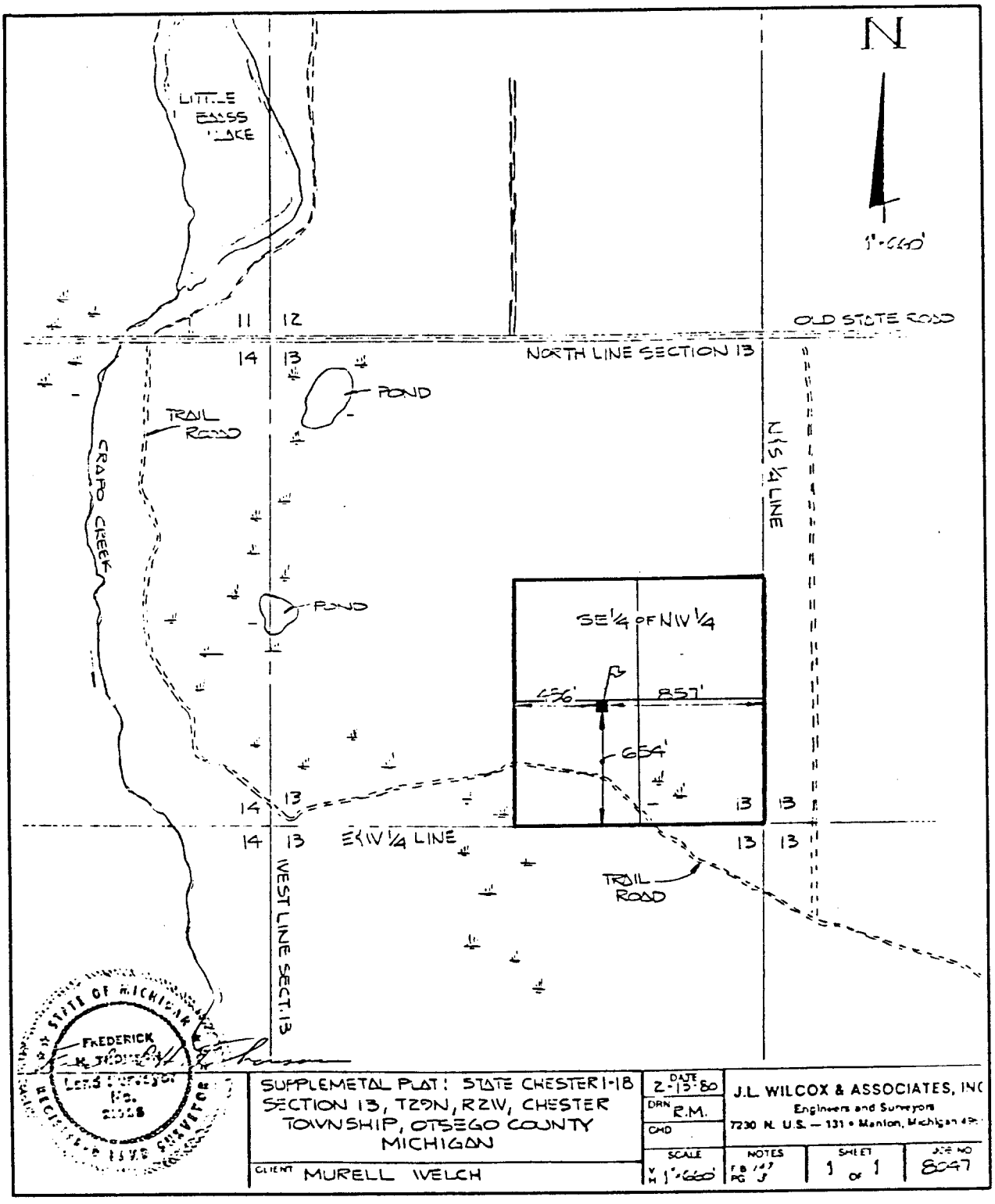


Figure 3b - Plat map for State Chester 1-18, Chester Township, Otsego County, Michigan.

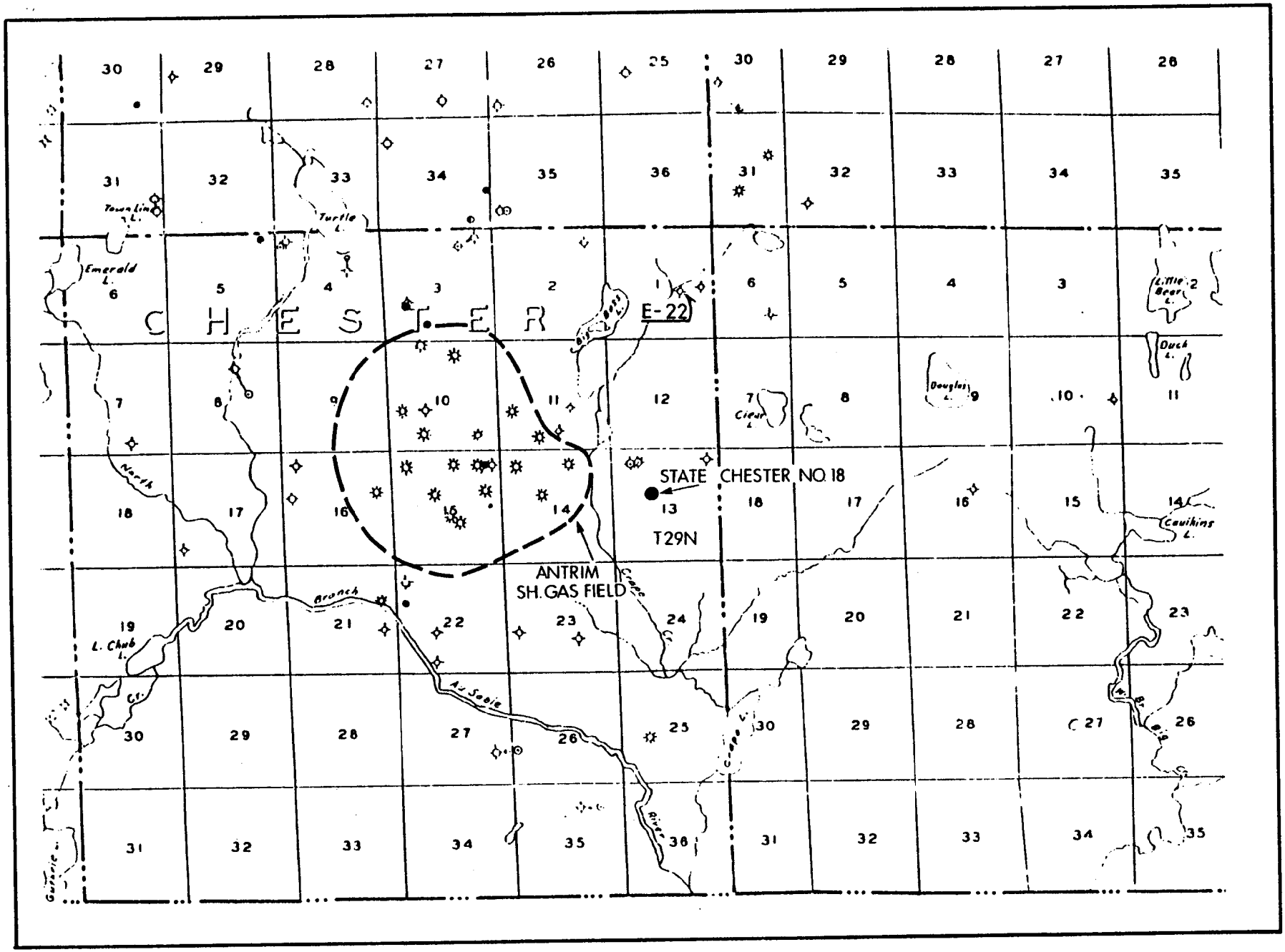


Figure 4 - Antrim Shale gas field in Chester Twp., Otsego County, Michigan.

Geology

(1) Regional

The prospective site lies within Michigan's northern Niagaran (Silurian) pinnacle reef fairway (Fig. 5), a region along the rim of the Michigan Basin which has witnessed considerable exploratory activity in the past few years. Nearby communities are Johannesburg, 5-3/4 miles northeast, and Otsego Lake, 9 miles due west.

The regional depocenter of the Ellsworth (western Michigan)-Antrim (eastern Michigan) sequence in the Michigan Basin is found about 24 miles to the southwest, where the aggregate thickness of these shales is on the order of 650 feet (Cohee, 1951).

Rising along its regional strike to the northeast at a rate of about 46 feet per mile, the Antrim shale ultimately subcrops beneath some 450 feet of glacial drift approximately 10-1/2 miles northeast of the proposed location.

The Antrim shale in the subsurface is described as consisting of "dark gray to black, hard, thin-bedded, brittle carbonaceous shale interbedded with some gray shale in the lower part. Dark brown bituminous limestone concretions ranging up to five feet in diameter are common near the base of the Antrim" (Ells, 1979; Cohee, 1951). In the western part of the Michigan Basin, basal beds of the Antrim grade upwards from black shale into grayish black shale and then into the greenish-gray shales of the Ellsworth Formation. Some of the transitional shale beds are brown. From west to east the shales of the Ellsworth grade laterally into grayish-black shales and then black shales of the upper portion of the Antrim. The general stratigraphic relationships of the Upper Devonian/Lower Mississippian section in Michigan are shown in Fig. 6.

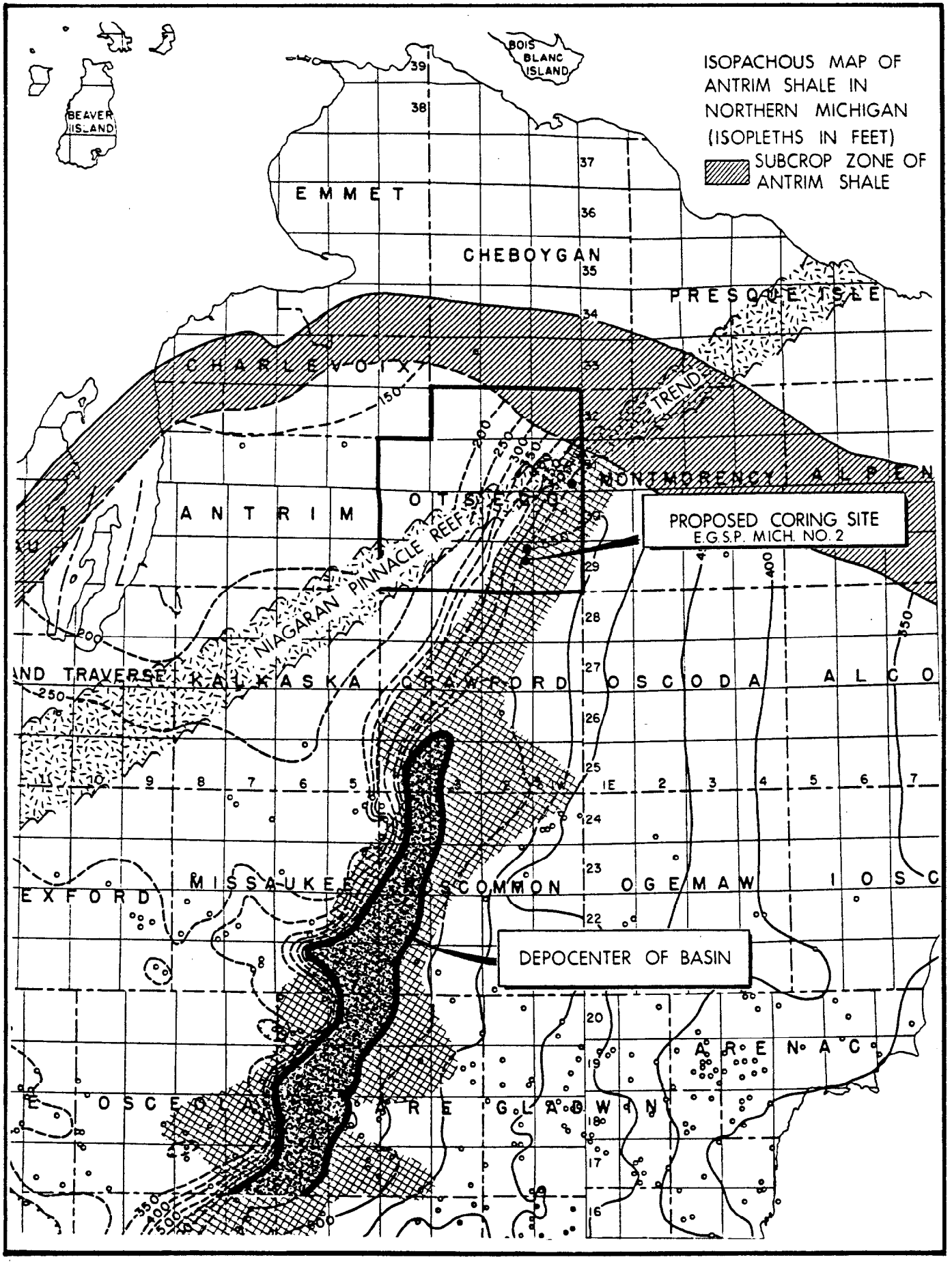


Figure 5 - Location of proposed coring site in northern Michigan.

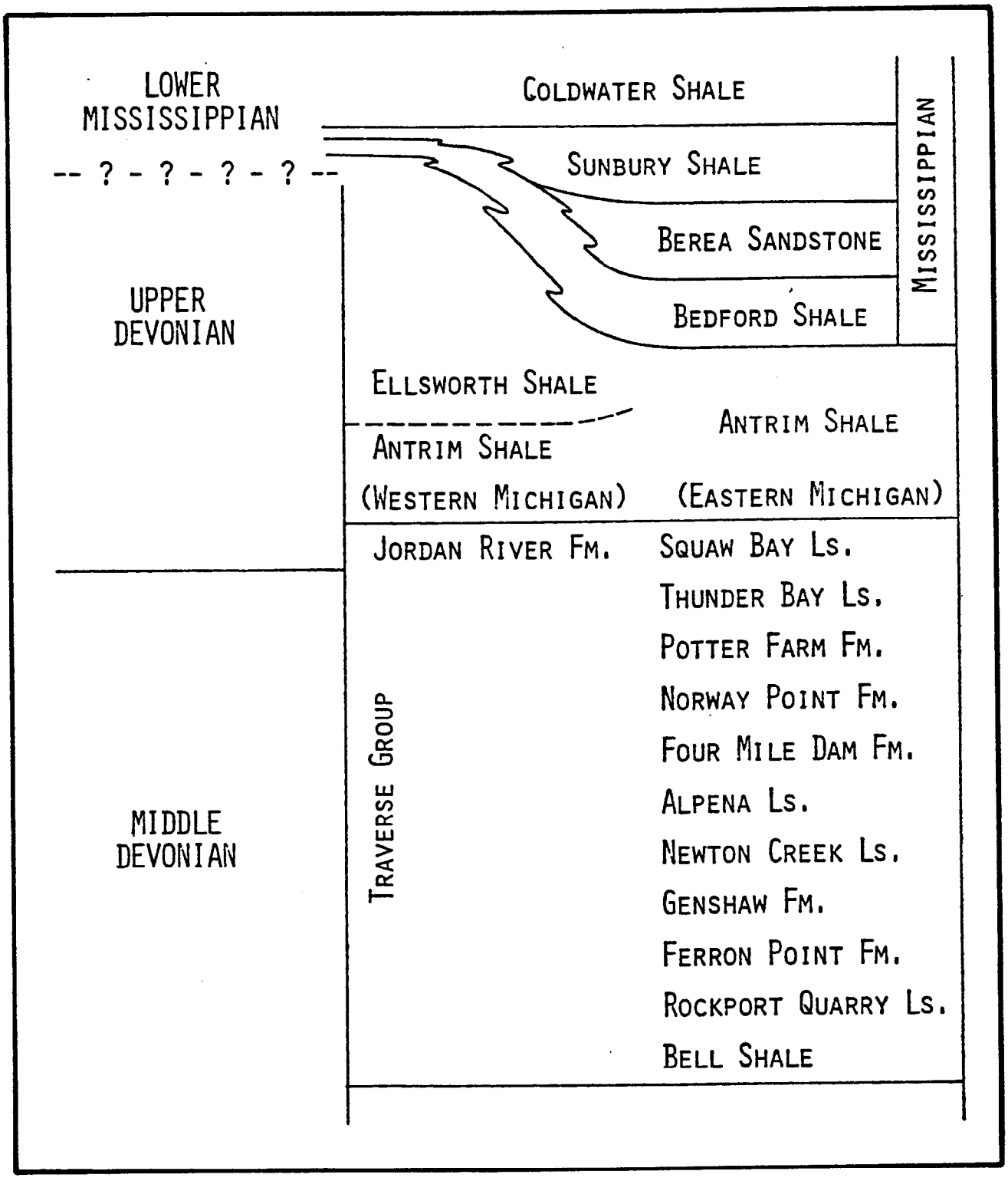


Figure 6 - Chart showing the general relationship of western and eastern upper Devonian and lower Mississippian formations in Michigan. The Antrim Shale is considered Devonian. (from Ells, 1979)

(2) Local

According to Ells (1979), the shale section overlying the Traverse Group at the Miller Bros. & Michigan Oil Co., Kaylee No. 1-1 (E-22), 1.9 miles north (See Fig. 4), does not contain any portion of the Ellsworth Shale. Overlying the estimated 425-foot section of Antrim Shale at that location are 106 feet of combined Sunbury and Bedford shales. Since the lower Bedford in parts of the basin has color characteristics similar to that of the Antrim, the contact between these two formations is not readily discernible. The lowermost dark gray shales of the Bedford are often referred to as "false" Antrim (Figure 7).

Ells (1979) has subdivided the Antrim Shale into six units based on the relative gamma ray responses of the beds that make up the vertical sequence (Figure 7). At the Kaylee No. 1-1 (E-22) well, the most radioactive portion of the Antrim has a net thickness of about 145 feet and is comprised (in ascending order) of units 1C, 1A, and 2, each of which is characterized by high radioactive signatures. Unit 1B is generally less radioactive than units 1A and 1C.

Petrographical and X-ray mineralogical studies on the Antrim shale carried out by Michigan Technological University personnel indicate that the shale is comprised of 50 to 60 percent illite, 5 to 15 percent kaolinite, and minor amounts of pyrite, chlorite, calcite, and dolomite (Hockings, Ruotsala and Bennett, 1979). Evaluations of the mass properties indicate that the shale has an average porosity of 6 percent and a very low permeability (<2.0 millidarcies). Pore sizes range from 0.01 to 0.1 micrometers. The density of unroasted samples averaged 2.6 gm/cc.

The Traverse Group, lying immediately below the Antrim, is comprised in part of gray, brown, and black shales and shaly limestone.

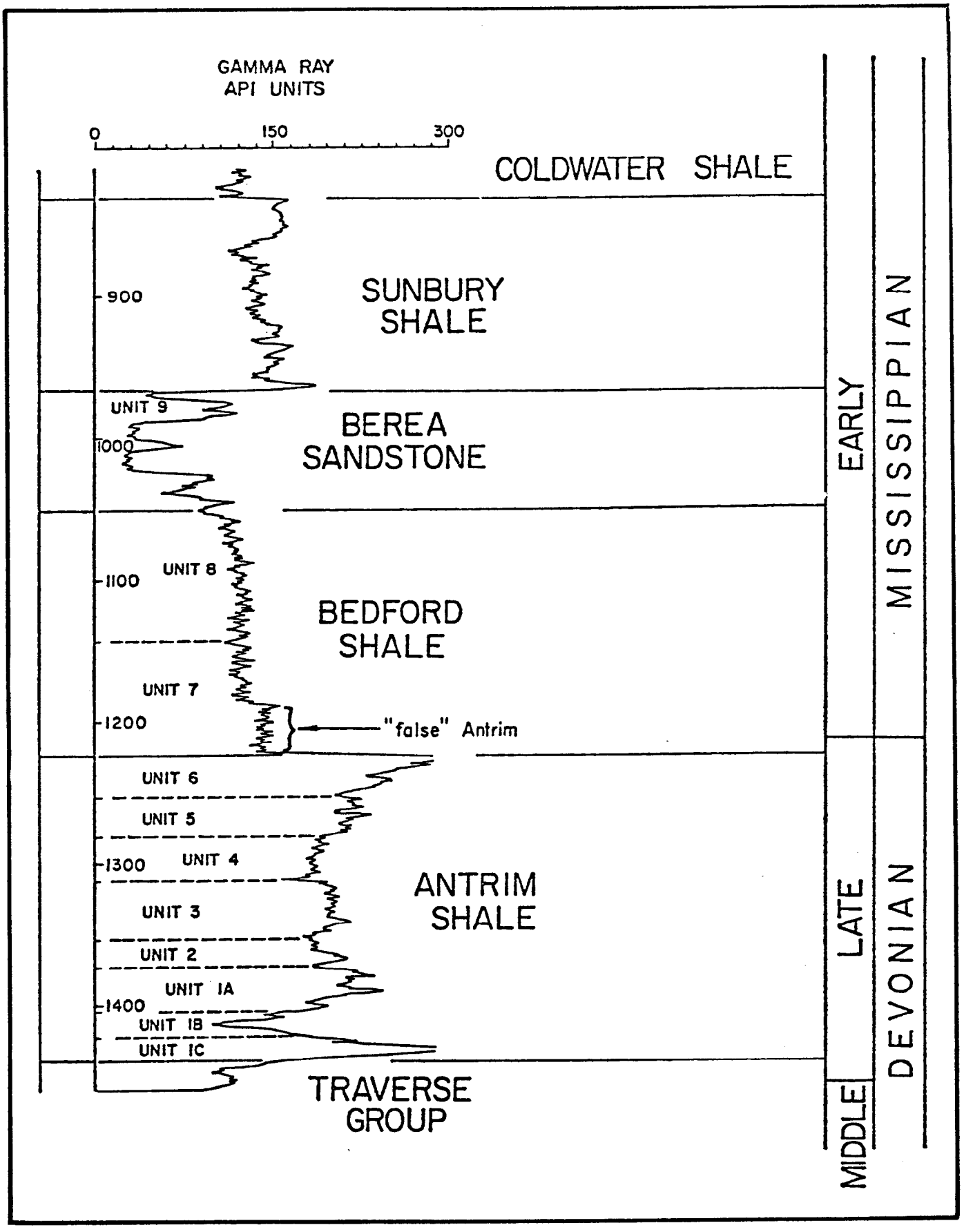


Figure 7 - Portion of gamma ray log curve from a well drill in Sanilac County, Eastern Michigan.

Geological Prognosis

In developing the prognosis for the expected top of the Antrim Shale at the proposed coring site, gamma ray logs and/or completion tickets for the following wells located in Chester Township (T29N, R2W), Otsego County were used:

Murell L. Welch, State Chester No. 1 - C/NW/NW, Sec. 14 (GL 1238 ft)
Murell L. Welch, State Chester No. 2 - C/NW/NE, Sec. 10 (GL 1250 ft)
Murell L. Welch, State Chester No. 3 - C/NW/NE, Sec. 15 (GL 1240 ft)
Murell L. Welch, State Chester No. 4 - C/SE/NW, Sec. 14 (GL 1234 ft)
Murell L. Welch, State Chester No. 5 - W1/2/NE/NE, Sec. 15 (GL 1237 ft)
Murell L. Welch, State Chester No. 6 - C/SE/NW, Sec. 15 (GL 1239 ft)
Murell L. Welch, State Chester No. 7 - C/SE/SW, Sec. 10 (GL 1242 ft)
Murell L. Welch, State Chester No. 8 - C/NW/NW, Sec. 15 (GL 1240 ft)
Murell L. Welch, State Chester No. 9 - C/NW/NE, Sec. 14 (GL 1242 ft)
Murell L. Welch, State Chester No. 10 - C/SE/NE, Sec. 15 (GL 1235 ft)
Murell L. Welch, State Chester No. 11 - C/NW/SW, Sec. 10 (GL 1248 ft)
Murell L. Welch, State Chester No. 12 - C/SE/SW, Sec. 11 (GL 1240 ft)
Murell L. Welch, State Chester No. 13 - C/NW/SE, Sec. 15 (GL 1235 ft)
Murell L. Welch, State Chester No. 15 - C/NW/SW, Sec. 11 (GL 1245 ft)
Murell L. Welch, State Chester No. 16 - W1/2/SE/SE, Sec. 10 (GL 1242 ft)
Murell L. Welch, State Chester No. 1-13 - E1/2/NW/NW, Sec. 13 (GL 1257 ft)
Shell Oil Co. N-1, State Chester-Welch - NW/NW/SE, Sec. 15 (GL 1236 ft)
Miller Brothers & Michigan Oil Co., Kaylee No. 1-1(E-22) - NE/NW/SE, Sec. 1 (GL 1265 ft)
Brazos Oil Co., State Chester No. 1E-1 - W1/4/NW/SW, Sec. 23 (GL 1219 ft)
Dow Chemical Co., State Chester No. WN-1 - SE/NW/SE, Sec. 23 (GL 1212 ft)

Fig. 8 is a structure map drawn at the top of the black Antrim shale based on information derived from the above wells. Available geological control which is relatively sparse in the southeastern quarter of the map area

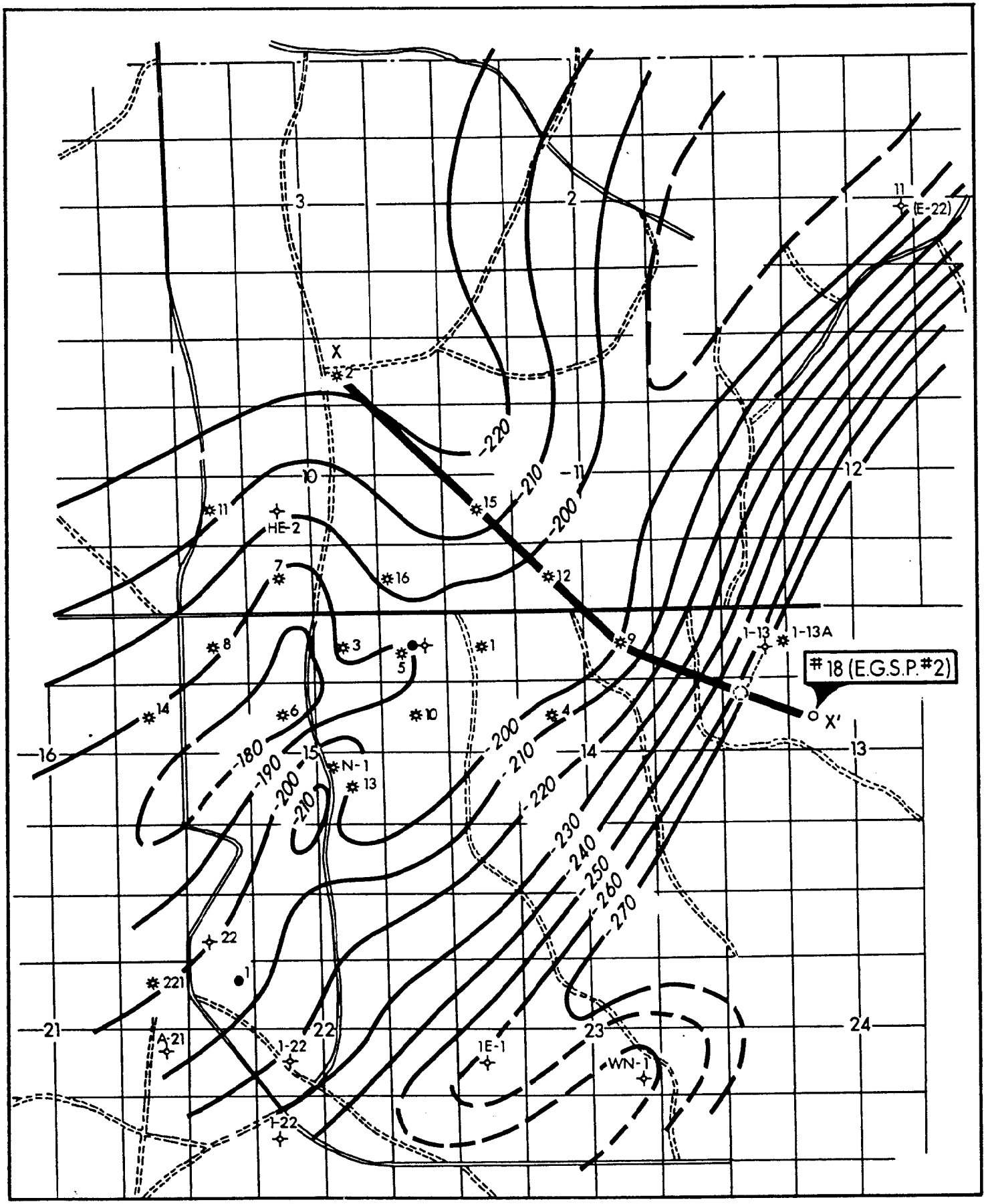


Figure 8 - Structure map, top of the Antrim Shale, Chester Township, Otesgo County, Michigan.

suggests an abrupt change in the general gradient of the Antrim surface along the eastern margin of the gas field. The position of this sloping surface corresponds fairly well with the southeastern edge of the Silurian platform-margin barrier reef belt that strikes northeast-southwest across northern Michigan. Whether this correspondence is attributable to geographic coincidence or geologic compatibility cannot be determined because of the lack of adequate well control in the southeastern part of the mapped area.

Section X-X' (Fig. 9) drawn across the regional strike of the Antrim shale depicts the change in slope mapped out in Fig. 8. The subsurface projection of the Antrim surface to the proposed core well site (State Chester No. 18) indicates a possible top for the black, radioactive Antrim shale section at -290 feet (subsea) or approximately 1545 feet deep.

The geologic prognosis is given as follows:

Stratigraphic Unit	Depth	(Subsea) ft.*
Base of glacial drift (bedrock)	700	(+555)
Bedford Shale	1150?	(+105)
'Light' Antrim Shale	1240	(+015)
Top of coring interval	1425∘	(-170)
Black Antrim Shale	1545	(-290)
Traverse Group	1725	(-470)
Bottom of coring interval	1730∘	(-475)

* Ground elevation: 1255 ft. a.m.s.l.

∘ Proposed core interval: 1425 (-170) ft. to 1730 (-475) ft. = 305 ft.

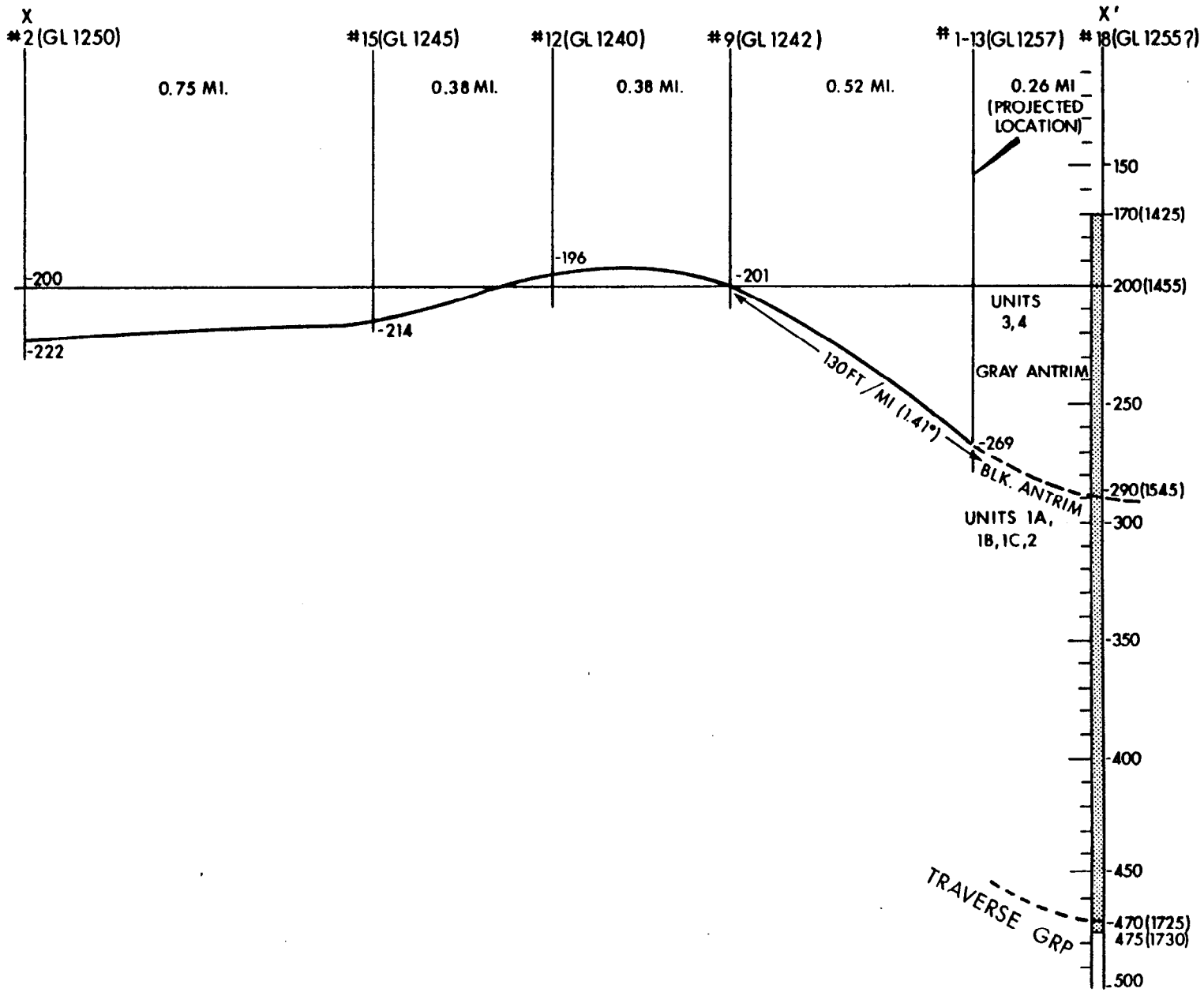


Figure 9 - Section X-X' across strike of the Antrim Shale in Northern Michigan.

REFERENCES CITED

Cohee, C. V. and others (1951). Thickness and Lithology of Upper Devonian and Carboniferous Rocks in Michigan. U.S. Geological Survey, Oil and Gas Inv. Series, Chart OC-41.

Ells, Garland (1979). Stratigraphic Cross Sections Extending from Devonian Antrim Shale to Mississippian Sunbury Shale in the Michigan Basin. Report of Investigation 22, Michigan Department of Natural Resources, Geological Survey Division, 186 pp + 22 cross sections.

Hockings, W. A., Ruotsala, A. P., and Bennett, G. W. (1979). X-Ray Mineralogy and Physical Properties of Antrim Shale Samples from Sanilac Co., Michigan. Topical Report Dow/SR-32, Dow Chemical Company (DOE Contract No. EX-76-C-01-2346), 21 pp + 2 appendices.

Smith, R. A. (1912). The Occurrence of Oil and Gas in Michigan. Michigan Geological and Biological Survey, Publication 14, Geol. Series 11.

CORING, LOGGING AND STIMULATION

If the site is acceptable and the DOE agrees to fund the project, coring, logging and stimulation of the Devonian shales will be accomplished as follows:

TASK I - CORING

The well will be cored from about -170 to -475 feet (subsea) to obtain 305 feet of oriented core. This interval begins high enough within the Antrim shale section to permit sampling part of the 'light' Antrim, the transition zone, and the lower, black radioactive portion of this formation.

The proposed coring program is as follows:

1) The drilling contractor will drill a 7-7/8 inch hole to the coring point.

2) When the coring point is reached, the coring company will be responsible for obtaining 3-1/2 inch oriented cores (using a 7-27/32" OD diamond bit) from approximately -170 to -475 feet (subsea). The exact top and bottom of the cored interval will be determined by a Gruy geologist on location; however, the core should reach into the top of the Traverse Group Limestone. Cores will be retained in plastic sleeves.

   (a) Gruy personnel will be on site during coring operations to provide engineering consultation and to ensure that the cores are properly cut and handled.

   (b) If significant difficulties are encountered with core recovery, or if the operation proceeds at a significantly slower pace than anticipated, (less than 50 feet per day) Gruy will notify the DOE Technical Project Officer.

TASK II - LOGGING

When the coring operation is completed, enough rat hole will be drilled to allow logging the full Devonian shale section. One suite of wet-hole logs is required by the DOE to ensure that the information obtained at this site will be comparable with that already obtained in the Eastern Gas Shales Project. The following digitally recorded logs will be run:

- GR-FDC-Caliper - from TD to surface,
- GR-CNL - from TD until minimum operation charge is reached,
- DIL-LL8 - from TD until minimum operation charge is reached,
- BHC - from TD until minimum operation charge is reached,
- Variable Density Sonic with Wave Train Displayed - from TD until minimum operation charge is reached,
- FIL - from TD until minimum operation charge is reached,
- NGT - from TD until minimum operation charge is reached,
- Corriband Kerogen Analysis - a computer processed log of the cored interval.

Upon completion of the coring and logging program, the cored interval will be reamed out if necessary to the operator-specified hole diameter of 7-7/8 inches.

A brief discussion of the logging devices and the information each is expected to provide follows.

1) Gamma ray - this device records the natural radioactivity of the formations. In sedimentary formations it normally reflects the shale content. It may be run either in open or cased hole and serves as an excellent correlation device.

2) Compensated Formation Density - this is a pad-type, dual-detector, borehole-compensated porosity device. When run in combination with the compensated neutron log (CNL), its other potential uses are:

- identification of lithology and minerals present
- detection of gas
- determination of hydrocarbon density
- evaluation of complex lithologies.

Density data may be integrated with sonic log information to yield the mechanical properties of the formation matrix. While not conclusive in itself, the density "rho" correction curve may indicate zones of fracturing.

Density logs cross-plotted against the gamma-ray logs of organic-rich intervals run in the same holes have been shown to be linear (Schmoker, 1977). Thus a plot can be produced from the well that allows calibration for the more commonly available gamma-ray logs.

3) Caliper: the caliper simply records borehole diameter, but it is important for a number of reasons:

- determination of corrections required to calibrate other log responses
- determination of porous/permeable zones, indicated by the presence of mud cake
- identification of fractured zones, where the borehole may be rugose or enlarged or both.

The caliper system is an integral part of the compensated density-neutron system.

4) Compensated Neutron - this is a dual-detector, borehole-compensated porosity device, run in combination with the formation density, gamma ray, and caliper logs. Its uses are:

- to delineate porous intervals and determine their porosity
- to identify gas-bearing zones
- to identify lithology and evaluate shale content

5) Dual Induction/Laterolog 8 - this is a focused resistivity device, which records three resistivity measurements obtained from three different depths of investigation. From the resistivity profile obtained, the depth of filtrate invasion and the true undisturbed formation resistivity may be obtained. This device is used to determine water saturation, porosity, or water salinity when two of the three parameters are known. While not conclusive, this log sometimes provides evidence of fractures (Pirson, 1967).

6) Borehole-Compensated Sonic - this is a recording of the time required for a compressional sound wave to traverse one foot of formation. When used in conjunction with other porosity devices, the sonic log yields accurate information on lithology. Integrated sonic transit times are used as time-depth correlations for seismic applications. Sonic "cycle skipping" can sometimes give indication of fractures.

7) Variable density log - this is a particular presentation of the cement bond log. When run in open hole, the variable-density presentation of the sonic wavetrain may indicate fracturing. When run in its normal cased-hole mode, the log is used to:

- evaluate the effectiveness of the casing-formation cement bond
- locate the top of cement
- check the effectiveness of squeeze cementing.

A casing collar log is normally run in conjunction with this device, where applicable. When combined with sonic and density data, information from this log allows determination of the mechanical properties of the formation matrix.

8) Fracture Identification - 4-arm dipmeter: this device is run to determine:

- formation dip and direction
- structural identification
- hole geometry
- location and evaluation of significant fracturing

If necessary, the information may be processed to yield a hole survey and to convert log depths to true vertical depths.

9) Natural Gamma Ray Tool - a radioactive survey tool which helps to select the perforation intervals for stimulation treatment.

Gruy will have experienced personnel on location to make preliminary assessments of the logs as they are received from the logging contractor.

TASK III - STIMULATION

Stimulation of the radioactive portion of the Antrim shale will consist of a 20-shot perforation schedule at intervals to be determined after evaluation of the geophysical logs. Preliminary engineering requirements have specified the use of 12,000 barrels of water, 50,000 gallons of 25% liquid-content foam, 50,000 pounds of 20/40 mesh sand, and 1,000 pounds of 80/100 mesh sand.

SECTION II

Section II of the Proposal contains the following items.

1. A signed copy of the original agreement between Murell L. Welch of Mt. Pleasant, Michigan and Gruy Federal, Inc. of Houston, Texas.

2. A Contract Pricing Proposal (Form 60).

3. A summary of the estimated subcontract costs (Exhibit 1).

4. Supporting documentation, as necessary for select subcontract cost items (Attachments to Exhibit 1).

GRUY FEDERAL, INC.

PROJECT AGREEMENT FOR

E.G.S.P. CORE SITE MICHIGAN NO. 2

Welch's State Chester No. 18,
SW/4, SE/4, NW/4,
Sec. 13 T29N R2W
Chester Township
Otsego County, Michigan

Otsego COUNTY, Michigan

THIS AGREEMENT made and entered into this 6th day of May, 1980, by and between Murell L. Welch (hereinafter referred to as "Contractor") of Mt. Pleasant, Michigan and Gruy Federal, Inc. (hereinafter referred to as "Gruy") of Houston, Texas.

WITNESSES THAT:

WHEREAS, Gruy, under contract with the United States Department of Energy, desires to obtain cores and logs from the Devonian shale in the Appalachian, Illinois and Michigan basins for the purpose of characterizing potential sources of unconventional gas in said basins, and

WHEREAS, Contractor is the holder of certain surface and subsurface rights in and to the lands described herein below and is willing to permit Gruy to drill, core, log and test, or cause to be drilled, cored, logged and tested, a test hole or holes, (hereinafter referred to as "the hole") on said land,

NOW, THEREFORE, for and in consideration of the premises, provisions, promises, covenants, terms and conditions herein contained, and with the parties intending to be legally bound hereby, it is hereby agreed as follows:

DEFINITIONS

A. INCORPORATED DOCUMENTS: The following exhibits are attached hereto and incorporated herein by reference, including:

(1). Exhibit A - Proof of insurance obtained and maintained by Contractor pursuant to the provisions of part VI, A.

(2). Exhibit B - The two page document entitled, "Additional Provisions (A.R.I.), Accounts, Records and Inspection".

(3). Exhibit C - The twenty~~-five~~ four 24 (~~25~~) page document entitled, "Gruy Federal, Inc., General Provisions", being the regulations and provisions promulgated and imposed by the United States Department of Energy relevant to the subject project.

(4). Exhibit D - Any additional documents or exhibits to be attached and/or incorporated herein by reference are described herein below in Article XIV.

B. OPERATOR: Gruy Federal, Inc., its officers, employees, agents, and representatives.

C. CONTRACTOR: Murell L. Welch, its officers, employees, agents, and representatives.

D. SUBCONTRACTOR: Any person, company, partnership, corporation, or other entity whose products or services are acquired or secured by Gruy or Contractor for the performance of any act or function under this Agreement, or relevant thereto.

E. DRILL: Shall mean the drilling of a test hole capable of being cored, logged and possibly tested for the purpose of characterizing the potential of the Devonian shale as a source of unconventional gas. Drilling shall not be construed to include or require that Gruy drill and/or complete any hole to the extent necessary to provide a well capable of producing oil or gas.

F. CORED: Shall be construed to include all types and methods of coring which, in the sole and absolute discretion of Gruy,

are necessary or useful in achieving the objectives of this Agreement.

G. LOGGED: Shall be construed to include any and all methods of logging determined in the sole and absolute discretion of Gruy to be necessary or useful in achieving the objectives of this Agreement.

H. STIMULATION: Shall mean the running of a cement bond log and a casing correlation log, perforating of the casing and a fracture treatment which may utilize foam consisting of nitrogen and water as the sand carrying medium and the running of after treatment logs to evaluate the stimulation.

I. TESTED: Shall be construed to include any and all methods of testing which, in the sole and absolute discretion of Gruy, are determined to be necessary and useful in achieving the objectives of this Agreement.

ARTICLE I

A. Gruy is a party to a contract with the Department of Energy, Washington, D.C. ("DOE") Contract No. DE-AC05-79MC08382 to carry out a program for the coring, logging and testing of a number of holes in the Appalachian, Illinois, and Michigan basins in an attempt to define further the Devonian shale as an unconventional energy source. Attached hereto as Exhibits "B" and "C" are a summary of the General Provisions to which Gruy and all of its Contractors and Subcontractors are bound. The contents of Exhibits "B" and "C" are incorporated herein by reference.

B. (1) Contractor shall commence, or cause to be commenced, on or before July 1, 1980, the actual drilling of a test hole on a location on Welch's State Chester Lease SW/4, SE/4, NW/4, Section 13, Township 29N, R2W, Chester Township, Otsego County, Michigan, and thereafter to continue the drilling of said test hole with due diligence, dispatch and in a workmanlike manner to the depth of:

(a) 750 feet or,

(b) to the base of the glacial drift, or

(c) to a depth at which there is encountered lost circulation, mechanical failures (including getting stuck in the hole) or other abnormal conditions which make further drilling impracticable after a good faith effort has been made to overcome same,

whichever depth is the least.

(2) Contractor is responsible for mobilization and demobilization of a proper rotary drilling rig and the drilling costs associated with drilling through the glacial drift. Contractor is also to pay for and be responsible for the purchasing, running, and cementing of 8-5/8" surface pipe through the glacial drift.

(3) Contractor represents that it has a title approved, valid existing oil, gas and mineral lease or leases, lease amendments or additional legal agreements necessary to perform this Agreement and to do this work on this drillsite tract.

ARTICLE II

A. Contractor wishes to cooperate with Gruy in this Devonian shale evaluation effort. Contractor and Gruy agree as follows:

1. Gruy's testing, coring, logging, and stimulation program of the kerogen-bearing Devonian shale section, estimated top 1,400 feet, will be undertaken in the same target zone that the contractor would, for its own interest, drill the subject well. The formation to be tested, cored, logged, and stimulated is known, locally, as the Antrim shale. Gruy will core the Antrim section from approximately 1,400 feet to approximately 1,700 feet (300 feet) or to a point 5 feet into the Traverse Group.

2. Gruy will provide experienced engineering and/or drilling personnel to work with Contractor's technical and operating staff in the planning and execution phases of the testing, coring, logging, and stimulation program. Gruy will be responsible for designating the testing, coring, logging, and stimulation points and intervals. Gruy will pay for a mud logger with trailer.

3. Gruy will designate Contractor as field operating Contractor for purposes of hole operations during the testing, coring, logging, and stimulation program, with Contractor providing normal field and hole supervision.

B. Contractor at its sole cost, risk and expense, shall timely commence or cause to be commenced the actual drilling of the subject hole and, thereafter shall continue the drilling of same to the initially prescribed drilling depth of 750-feet. Thereafter, commencing at that depth, Contractor, acting for and on behalf of Gruy, will make a good faith effort to carry out the planned testing, coring, logging, and stimulation program in the manner specified in paragraph "C. 1" through "C. 7" below:

C. 1. Charges for rig time, those incurred for drilling approximately 30 feet of rat hole to accommodate the logging tools, for costs for stiff foam including possible disposal costs of same, and any mud or chemicals required for the testing, coring, logging, and stimulation program and the charges of the testing, coring, logging, and stimulation service companies will be paid by Gruy. Rig time during unusual situations such as regaining lost circulation, freeing stuck pipe, or while engaged in fishing operations will also be paid by Gruy on an actual cost basis. Hole size will be 7-

2. Gruy, in its sole and absolute discretion and at its expense, shall select and employ competent testing, logging, coring, and stimulation, subcontractors, subject

to DOE approval, make them available at location to carry out the testing, coring, logging, and stimulation program. Intervals logged in excess of the minimum logging charge (approximately 2,000 feet) will be at Contractor's expense. Contractor understands and agrees that said program is to be conducted on a 7-days per week, 24-hour per day basis and that rig crews and equipment will be required to be available on that basis.

3. Contractor shall be obligated to make a good faith effort to carry out the designated testing, coring, logging, and stimulation program in accordance with established oil field procedures.

4. Contractor shall, in addition to the responsibilities outlined in Article I, Paragraph (2), furnish the location, pits, blowout preventer, drilling mud, water, fuel, pipe, connections, etc., necessary to drill the well. Contractor further agrees to furnish, run, and cement a string of 4½" production casing through the Antrim shale interval to facilitate the stimulation of that formation. It is understood that additional chemicals or mud which may be necessary to facilitate the coring and logging program will be the responsibility of Gruy. Contractor further agrees to furnish all pipeline, compressor and other necessary wellhead equipment to put the well on production. Contractor also agrees to test the well and put it on immediate production. Gruy may desire to perform a test on the well using their test equipment. If this additional testing is done, it will be at Gruy's expense except that Gruy cannot pay Welch for gas flared during the testing operation. The proper completion of the well will probably require the running of a string of 2-3/8" tubing, Contractor will be responsible for the costs of purchasing and running same.

5. Gruy shall have the right in its sole and absolute discretion, at any time to direct Contractor to cease the testing, coring, logging, or stimulation program whether any one, more, or no cores have been taken, logs run, or an attempt to stimulate is undertaken, for reasons of borehole conditions, state of fluids, absence of the Antrim shale or otherwise.

6. Once the testing, coring, logging, and/or stimulation operations have been completed or terminated in the manner contemplated herein, Contractor shall assume responsibility for all further operations and costs of the hole, including operations for drilling, testing, completing, or plugging and abandoning of the hole.

7. If, for any reason other than the negligence of Contractor or the drilling subcontractor, or the employees, servants or agents of either Contractor or the drilling subcontractor, the testing, coring, or logging operations cause the hole to be junked or lost, Gruy shall pay Contractor the sum of thirty-four thousand ($34,000) dollars as liquidated damages for the loss of the hole, which said sum shall be the total limit of Gruy's liability to Contractor for such loss. In the event of a junked or lost hole, no payment therefor over and above the liquidated damages of thirty-four thousand ($34,000) dollars shall be paid by Gruy, notwithstanding the provisions of Article VI, B herein below.

ARTICLE III

Neither Gruy nor the United States Department of Energy shall have any interest in the hole (except for any material purchased by Gruy for

the account of DOE, which is placed in or on the hole) or in the oil and gas lease, minerals, production, or energy recovered from the hole, or in any surface or subsurface equipment therein or thereon purchased by the contractor.

ARTICLE IV

No liability shall be imposed upon Contractor for failure to drill the hole as provided for herein; however, upon failure to do so in timely fashion, this Agreement shall become null and void and all liabilities and obligations hereunder terminated,

ARTICLE V

Contractor agrees to promptly furnish Gruy with an authority for expenditure (AFE) for the costs of drilling the proposed test hole, with a hole program and a copy of its contract with the drilling subcontractor.

ARTICLE VI

A. Contractor shall obtain and, at all times while the operations are being carried on hereunder, maintain in effect, and furnish documentary proof of, insurance by reliable and a responsible insurance company or companies as to the following risks:

1. Workman's Compensation insurance to fully comply with the laws of the State of Michigan.
2. Employer's liability insurance with limits of not less than $100,000 per employee, and $250,000 per accident.
3. Automobile public liability insurance with limits of not less than $100,000 per person and $300,000 per accident.
4. General public liability insurance with limits of not less than $100,000 per person and $200,000

per accident and general property damage insurance with limits of no less than $200,000.

B. Gruy advises Contractor that it carries general liability insurance in the amount of twenty million ($20,000,000.00) dollars. Gruy agrees that, within the limits of liability noted here and in paragraph II, C (7) hereof, it will indemnify Contractor against liability for damages resulting from, or arising out of the coring, testing and logging programs or the additional drilling required to accomplish same, including possible plug back operations. Nothing in this provision (Article VI B) shall require Gruy to compensate Contractor for junked hole or lost hole losses or claims except as provided therefor in Article II, C (7) herein above.

ARTICLE VII

The rights and liabilities of the parties, hereto, shall be individual and not joint or collective. Each party, hereto, shall be responsible for its share of obligations as set out herein, and shall be liable only for its share of the costs incurred with respect to the property and performance as provided herein.

ARTICLE VIII

Whenever notice is required or permitted under the terms of this Agreement, same shall be in writing and shall be deemed to have been effective when received if sent by telegram, registered mail or delivered by hand addressed to the respective parties as follow:

IF TO CONTRACTOR:
Name: Murell L. Welch
Address: 217 Hersee Building
City: Mt. Pleasant, Michigan 48858

Attention: Mr. Murell L. Welch
Business Phone: 517/773-2953
Residence Phone: 517/772-3078

IF TO GRUY:	Name:	Gruy Federal, Inc.
	Address:	Airport Office Park, Building No. 2 400 Rouser Road
	City:	Coraopolis, PA 15108
Attention:		Mr. Robert B. Steffy
Business Phone:		(412) 262-1071
Residence Phone:		(412) 364-0438

ARTICLE IX

Contractor warrants to Gruy that Contractor is the holder of full right, title and interest, in fee simple, to all necessary surface and mineral rights in the above-described lands; that no other person or entity holds any right, title, or interest in or to the surface or sub-surface rights in the above-described land that might be injured or jeopardized by the terms of this Agreement, or by performance of the terms of this Agreement; and that Contractor will indemnify Gruy for, and hold Gruy harmless from, any and all claims resulting from the execution or performance of this Agreement, which might arise from any known,or unknown, holder of any right, title, or interest of any kind or nature whatsoever in the above-described lands.

ARTICLE X

This Agreement constitutes the whole and entire agreement between the parties relevant to the matters set forth herein and supersedes all prior or presently existing agreements relevant thereto, whether written or oral. This Agreement shall not be amended or modified in anyway except by a separate, subsequent written instrument executed by all the parties hereto, specifically referring to the provisions of this Agreement to be amended or

modified, and specifically setting forth the nature of the amendment or modification to be made.

ARTICLE XI

This Agreement shall be executed in multiple duplicate originals, anyone of which shall be of full force and effect. This Agreement shall be construed and enforced under the laws of the State of Michigan.

ARTICLE XII

If any provision of this Agreement shall be found to be illegal, invalid or otherwise unenforceable, then the remaining provisions of this Agreement shall remain in full force and effect commensurate with said remaining provisions and the spirit and intent of this Agreement, as though said illegal, invalid, or unenforceable provision had not been included herein.

ARTICLE XIII

This Agreement shall not be assigned, transferred, given as a pledge or security, or otherwise encumbered by either party without the signed written consent of the other party, subject to the approval of the United States Department of Energy. This Agreement shall be binding on the heirs, personal representatives and successors of the parties. This Agreement and all performance thereunder, shall be subject to approval

by the United States Department of Energy.

ARTICLE XIV

ADDITIONAL PROVISIONS

WHEREFORE, Contractor and Gruy, intending to be legally

bound hereby have subscribed their hands, names and seals on the dates indicated below.

GRUY FEDERAL, INC.

DATE: 4/24/80 BY: James H. Hartsock
James H. Hartsock
Vice President, Engineering

DATE: 4/24/80 BY: Robt B. Steffy
Robert B. Steffy
Manager, Pittsburgh Operations

DATE: 5/6/80 BY: Murell L. Welch
Murell L. Welch

ACKNOWLEDGMENT

STATE OF Michigan)
) SS
COUNTY OF Isabella)

On this 6th day of May, 1980, before me, the issuing authority, personally appeared an individual proved to me to be Murell L. Welch, who being duly deposed and sworn, hereby states and affirms that he is the Owner of Murell L. Welch; that he is empowered and authorized to execute the accompanying Agreement for and on behalf of said Murell L. Welch; and that he has executed and signed the attached Agreement for

and on behalf of Murell L. Welch for the intent and purposes set forth therein.

Murell L. Welch

Sworn to and subscribed before me a notary public in and for the County of Isabella, State of Michigan.

Doris E. Lucas
Notary Public
My Commission Expires August 11, 1980

ACKNOWLEDGMENT

COMMONWEALTH OF PENNSYLVANIA)
) SS
COUNTY OF ALLEGHENY)

On this 24 day of April, 1980, before me, the issuing authority, personally appeared an individual known to me to be Robert B. Steffy, who being duly deposed and sworn, hereby states and affirms that he is the Manager Pittsburgh Operations of Gruy Federal, Inc.; that he is empowered and authorized to execute the accompanying Agreement for and on behalf of said Gruy Federal, Inc.; and that he has executed and signed the attached Agreement for and on behalf of Gruy Federal, Inc. for the intent and purposes set forth therein.

Robert B. Steffy

Sworn to and subscribed before me a notary public in and for Allegheny County, Commonwealth of Pennsylvania.

Susan S. Zurawsky
Notary Public

Susan S. Zurawsky, Notary Public
Brentwood Borough, Allegheny County
My Commission Expires Mar. 15, 1982
Member, Pennsylvania Association of Notaries

CONTRACT PRICING PROPOSAL

(RESEARCH AND DEVELOPMENT)

Office of Management and Budget Approval No. 29-R0184

This form is for use when *(i)* submission of cost or pricing data (see FPR 1-3.807-3) is required and *(ii)* substitution for the Optional Form 59 is authorized by the contracting officer.

PAGE NO. | NO. OF PAGES

NAME OF OFFEROR	SUPPLIES AND/OR SERVICES TO BE FURNISHED
Gruy Federal, Inc.	ESGP - Michigan No. 2; Otsego County Coring, Logging, and Stimulation
HOME OFFICE ADDRESS	
2500 Tanglewilde, Suite 150 Houston, Texas 77063	
DIVISION(S) AND LOCATION(S) WHERE WORK IS TO BE PERFORMED	**TOTAL AMOUNT OF PROPOSAL** / **GOV'T SOLICITATION NO.**
Field Sites	$ 129,723 / DE-AC21-79MC08382

DETAIL DESCRIPTION OF COST ELEMENTS

			EST COST ($)	TOTAL EST COST[1]	REFERENCE[2]
1. DIRECT MATERIAL *(Itemize on Exhibit A)*					
a. PURCHASED PARTS					
b. SUBCONTRACTED ITEMS			121,692		
c. OTHER—(1) RAW MATERIAL					
(2) YOUR STANDARD COMMERCIAL ITEMS					
(3) INTERDIVISIONAL TRANSFERS *(At other than cost)*					
TOTAL DIRECT MATERIAL				121,692	Exh. 1
2. MATERIAL OVERHEAD[3] *(Rate* 2.5 *%X$* 121,692 *base=)*				3,042	Exh. A
3. DIRECT LABOR *(Specify)*	ESTIMATED HOURS	RATE/ HOUR	EST COST ($)		
TOTAL DIRECT LABOR					
4. LABOR OVERHEAD *(Specify Department or Cost Center)*[3]	O.H. RATE	X BASE=	EST COST ($)		
TOTAL LABOR OVERHEAD					
5. SPECIAL TESTING *(Including field work at Government installations)*			EST COST ($)		
TOTAL SPECIAL TESTING					
6. SPECIAL EQUIPMENT *(If direct charge) (Itemize on Exhibit A)*					
7. TRAVEL *(If direct charge) (Give details on attached Schedule)*			EST COST ($)		
a. TRANSPORTATION					
b. PER DIEM OR SUBSISTENCE					
TOTAL TRAVEL					
8. CONSULTANTS *(Identify—purpose—rate)*			EST COST ($)		
TOTAL CONSULTANTS					
9. OTHER DIRECT COSTS *(Itemize on Exhibit A)*					
10. TOTAL DIRECT COST AND OVERHEAD				124,734	
11. GENERAL AND ADMINISTRATIVE EXPENSE *(Rate % of cost element Nos.)*[3]					
12. ROYALTIES[4]					
13. TOTAL ESTIMATED COST				124,734	
14. FEE OR PROFIT 4.0%				4,989	
15. TOTAL ESTIMATED COST AND FEE OR PROFIT				129,723	

OPTIONAL FORM 60
October 1971
General Services Administration
FPR 1-16.806
5060-101

SUBCONTRACT COSTS
CORING, LOGGING, AND STIMULATION
EGSP MICHIGAN NO.2
OTSEGO COUNTY, MICHIGAN

				Reference
1.	General Liability Insurance Does not include loss of hole coverage		$ 485	
2.	Bulldozer to prepare and cleanup fracturing pit - 28 hours at $42/hour		1,176	
3.	Drill Rig Costs - 7 days at $4500/day Per James Bigard letter quote		31,500	A
4.	Work over Service Unit 1/2 day mobilization; 1/2 day demobilization 10 days in operation or 11 total days 11 days times 10 hours times $79.60/hour		8,756	B
5.	KCL 20-50# bags at $15.32/each bag		306	
6.	Water hauling - 30 hours at $35.00/hour		1,050	C
7.	Wet hole Logging - Schlumberger Extra copies of logs (10)		11,595 80	D
8.	Correlation Logging Additional Gamma Ray Logs		1,515 300	D
9.	Mud Logging - Minimum charge Rig up, rig down $150/each		2,900 300	E E
10.	Dowell Foam Acid Treatment.		4,123	F
11.	Dowell Foam Fracture Service		19,687	F
12.	Radioactive Tracer Costs		1,195	G
13.	Flow meter and Tracer Survey		5,070	H
14.	Perforation Costs Service Charge Pressure equipment charge Perforation - 20 shots Selective adaptors 20 x 70 Tool protection	540 180 800 1,400 35	2,955	D
15.	Rental Equipment See Attached Listing		4,705	J
16.	Coring and Survey Costs Bit use or damage costs 50% of $6,773		18,723 3,387	K K
17.	Miscellaneous and incidental costs		1,200	
18.	Sales taxes - 4% of $17,111		684	
	TOTAL SUBCONTRACT COSTS		$ 121,692	

JAMES BIGARD DRILLING COMPANY
[517] 772-5955

1315 N. MISSION ROAD
MT. PLEASANT, MICHIGAN 48858

May 28, 1980

Gruy Federal, Inc.
2500 Tanglewilde
Suite 150
Houston, Texas 77063

RECEIVED
JUN 2 - 1980
GRUY FEDERAL, INC.
HOUSTON, TEXAS

Attn: Calvin Bowie

INRE: Drilling
One Well
Otsego County

Gentlemen:

This Company, as Contractor, will furnish rotary drilling rig and equipment (which will include a 10' substructure, two blow-out preventors, two pumps, and two steel mud pits) all labor, oil, lubricants and fuel.

1. BIGARD agrees, as an independent Contractor and at its sole risk and cost, except as herein otherwise provided, to commence or cause to be commenced, operations in a workman-like manner in accordance with the laws of the State of Michigan Natural Resources Department.

2. During the drilling of said test well, BIGARD shall safeguard its drilling operations by maintaining adequate Workman's Compensation, Public Liability, and Property Damage.

3. It is understood and agreed that BIGARD shall clear the location of all debris resulting from BIGARD's drilling operations but OPERATOR shall pay for all damages to the landowner resulting from such drilling operations.

4. Contractor will provide a maximum of $3,000,000 cost of control insurance coverage subject to the conditions of the policy and the policy will contain a $75,000 deductible which will be reimbursed by the Operator.

Operator will pay all trucking costs for moving rig to location, plus $10,000.00 for rigging up rig and tearing down rig.

Daywork rates - $4,500 per 24 hour day with or without drill pipe
$4,500 per 24 hour day standby time with crews
$2,500 per 24 hour day standby time without crews

Operator will furnish all other items not specifically to be furnished by Contractor and without limiting the items to be furnished by Operator, the Operator will furnish and pay for the following:

1. Clear and level the drill site and clear roadway into location
2. Stake location and permit fee
3. Dig pits and furnish liner (if needed)
4. Any rights-of-way or easement to the location
5. Land and crop damages
6. All mud, chemicals (including salt or salt water) and lost circulation materials
7. All casing, equipment, and driving conductor casing
8. Cement and cementing service
9. Backfill the pits and level the well site
10. All fresh water
11. All cores, drill stem tests, logs and other special services
12. Temperature survey
13. All bits and reamers
14. All third party services

RECEIVED
JUN 2 - 1980

Very truly yours, GRUY FEDERAL, INC.
HOUSTON, TEXAS
JAMES BIGARD DRILLING COMPANY

James Bigard
President

Accepted and agreed to on this _____ day of _____, 1980.

_____

James Bigard, President

Beckman Production Services, Inc.

DRAWER 27
KALKASKA, MICHIGAN 49646
(616) 258-9524

GAYLORD, MICHIGAN 49735
(517) 732-9341

KALEVA, MICHIGAN 49645
(616) 362-3192

HARRISON, MICHIGAN
(517) 539-7126

Price Schedule Effective November 12, 1979

Single Drum Swabbing Unit	Per Hour....	$	21.50
Fuel charge, at our cost: 3 gallons per hour			
Double Drum Double Derrick Unit (includes sand line chg.)	Per Hour....		36.00
Fuel charge, at our cost: 4 gallons per hour			
Crew Chief	Per Hour....		13.40
Crew Man	Per Hour....	2 x	12.30
Pickup will be furnished with each unit for transportation to and from location.	Per Day.....		16.00
Power Tubing Tong Rental	Per Day.....		98.00
Power Rod Tong Rental (Includes 2-3/8 & 2-7/8 Tong Dies)	Per Day.....		98.00
1 Scott Air-Pack self-contained breathing equipment for use while flowing and testing wells containing H2S	Per Day.....		35.00
6" Double Hydraulic B.O.P. with closing unit	5 Day Minimum		700.00
	Each additional day.....		70.00
B.J. MYT Slip Type Elevators	5 Day Minimum		128.00
	Each additional day.....		12.80
Light Plant	Per Day.....		60.00
T.I.W. Safety Valve 2¼" E.U.E. 10,000 P.S.I. if used	Per Job.....		60.00
Rod Fishing Tools (plus cost to repair damaged parts)	Per Day.....		53.50
Guiberson Type J.Y. Stripper Heads, plus cost of rubbers	3 Day Minimum		75.00
	Each additional day.....		12.00
Rod Stripper Equipment	Per Job....		25.00
Pipe Racks - 30' Triangle	Per Set.....		
	5 Day Minimum		80.00
	Each additional day.....		11.00

There will be a minimum charge of 8 hours per day for unit and crew when crew drives to location and is shut down.
When crew must stay away from home overnight a charge of $35.00 per day per man will be made.
Company to furnish or reimburse for swab cups, oil saver rubbers, pipe dope, stripper rubbers, and all special tools.
Labor only will be charged at time and one-half on Sundays, and the following holidays: New Years, Memorial Day, Labor Day, July 4th, Thanksgiving and Christmas.

When full time supervision is requested by company — Per Day..... 175.00

ATTACHMENT C

DRAWER M CAMPBELLSVILLE, KENTUCKY 4271

April 2, 1980

Tel. 502/465-3675

EFFECTIVE PRICES FOR
TENN. # 9 FOR GRUY FEDERAL

1.	Double Wilson service Rig, equiped with swab, tubing tools bailer and 2 man crew.	$55.00 per hr.
2.	Extra Labor per man	12.00 per hr.
3.	Sand Pump (while in use)	6.00 " "
4.	Supervisior	200.00 per day
5.	Water or Vaccum Truck	35.00 per hr.
6.	Per Deim,	50.00 per day-per man

Assuming we work 10 hr per day for 10 days using the rig, supervisor and water truck your total charges would be.
$11,000.00

60 MILES TO WELL SITE

SCHLUMBERGER WELL SERVICES
5000 GULF FREEWAY, P.O. BOX 2175
HOUSTON, TEXAS 77001, (713) 928-2511

PLEASE REPLY TO
3628 SOUTH BLUE STAR DRIVE
TRAVERSE CITY, MICHIGAN 49684

May 19, 1980

Gruy Federal Inc.
2500 Tanglewilde - Suite 150
Houston, Texas 77063

RECEIVED
MAY 23 1980
GRUY FEDERAL, INC.
HOUSTON, TEXAS

Attention Calvin Bowie

Dear Mr. Bowie,

The following is the cost estimate that I gave you over the phone last Friday. This is for the Welch Estate Chester 18 well in Otsego County, Michigan:

OPEN HOLE LOGS

LOG	DEPTH	OPERATION	TOTAL
Set up			$ 890.00
Tool protection (6 x 45.)			270.00
CNL/GR	2000 x .41 = 820.	2000 x .39= 780.	1600.00
FDC/GR	2000 x .38 = 760.	2000 x .33= 660.	1420.00
DIL	2000 x .31 = 620.	2000 x .28= 560.	1180.00
BHC	2000 x .31 = 620.	2000 x .27= 540.	1160.00
TTI		2000 x .08= 160.	160.00
VDL		2000 x .27= 540.	540.00
Waveforms		2000 x .40= 800.	800.00
FIL	2000 x .33 = 660.	2000 x .33= 660.	1320.00
NGT	2000 x .34 = 680.	2000 x .35= 700.	1380.00
Kerogen Coriband		875.	875.00
			$11,595.00

CASED HOLE LOGS

LOG	DEPTH	OPERATION	TOTAL
1st Day - Set up			$ 540.00
Tool Protection			35.00
CBL/VDL/GR/CCL	2000 x .22 = 440.00	2000 x .25= 500.	~~940.00~~
* + Gamma Ray	.08 160.	.07 640.	$ 1515.00
	.30 600.	.72	300.00
2nd Day - set up			540.00
Tool protection (3 x 35.)			105.00
Perf. (3 3/8 Hyper II)	580.	10 x .22= 220.	800.00
Flowmeter	2000 x .24 = 480.	700.	1180.00
Gradiomanometer	2000 x .22 = 440.	700.	1140.00
Temperature	2000 x .22 = 440.	700.	1140.00
Gamma Ray	2000 x .21 = 420	2000 x .20= 400.	820.00
Pressure equipment		180.	180.00
			$5905.00

Ten (10) field prints and final prints of each log will be delivered free of charge. Additional field prints are $8.00 each and additional final prints are $6.00 each.

If you have any further questions, please call me at (616) 947-0480.

D. McCall
District Manager

DM/hs

Copy to: C. Klimo
R. Wydrinski - Gaylord

PRICE SCHEDULE

Northeastern
United States

Effective
May 1, 1980

TOOKE

The following prices are effective in these states: Michigan, New York, Pennsylvania, Illinois, Indiana, Kentucky, Ohio, Tennessee, West Virginia, Virginia and North and South Carolina.

Computerized Unit (CHAMP)

$1,100.00 Per Day or Any Part Thereof

20 Day Minimum	$22,000.00
Standby	$ 770.00
Holding	$ 495.00
Rig Up or Down	$ 1,100.00

Complete Hydrocarbon Logging Service w/PEP
(Pressure Evaluation Package)

$800 per day or any part thereof

20 Day Minimum	$16,000.00
Standby	$ 530.00
Rig Up or Rig Down	$ 800.00

Complete Hydrocarbon Logging Service

$420 per day or any part thereof

10 Day Minimum	$4,200.00
Standby	$ 280.00
Rig Up and Rig Down	$ 150.00
Mileage Charge	.45/Mile round trip

Limited Hydrocarbon Logging Service

$290 per day or any part thereof

10 Day Minimum	$2,900.00
Standby	$ 200.00
Rig Up and Rig Down	$ 150.00
Mileage Charge	$.45/Mile round trip

Gas Detection Lab

$90 per day or any part thereof

10 Day Minimum	$900.00
Rig Up or Rig Down	$150.00
Mileage Charge	$.55/Mile round trip
Service	$.55/Mile round trip + $150 per day
H_2S (Hydrogen Sulfide)	$ 35.00 per day
Chromatograph	$ 50.00 per day

ADDITIONAL SERVICES

(Prices applicable only for added services on Tooke Engineering manned units.)

- **Hydraulic Monitor**

Includes pump-stroke, pump-rate, pump-pressure, percentage of return flow, and trip monitor which counts fill-up strokes. System provides permanent record of pump performance and allows operator to automatically program sample collections and gas shows. Can monitor 44 different samples at one time.

$85.00

- **Pump Monitor**

Provides 2 counters to display strokes at bit and at surface, with one setable alarm on surface stroke counter for sample catching. Includes a digital display for pump rate with output for optional recorder.

$25.00

- **Pit Volume Totalizer**

Recording sensitive to ½" variance in pit level. Read-out in barrels or cubic meters. System includes three probes.

$55.00

- **Delta Chlorides**

Records the drilling fluid's Delta conductivity.

$30.00

- **Hydrogen Sulfide — H_2S**

Continuous monitoring and recording from three rig locations utilizing the General Monitor's Model 2170 hydrogen sulfide detection system.

$35.00

- **Drill Rate Plotter**

Developed by Tooke Engineering using solid state digital electronics with crystal controlled time base to report and record drill time in 1 foot, 2 foot, or 5 foot average at a rate of 1", 2" or 5", per hundred drill scale. Minimum scale detects variance in as fine as one second to a maximum of 2½ hour-foot drilled. Digital read-out will report total time on-bottom and total time off-bottom on each bit run. Alarmed for drilling breaks.

$30.00

DOWELL DIVISION OF DOW CHEMICAL U.S.A.

May 19, 1980

Mr. Calvin E. Bowie
Gruy Federal, Inc.
2500 Tanglewilde
Suite 150
Houston, Texas 77063

Dear Mr. Bowie,

The cost estimates enclosed are for a 75 Quality Foamed Acid treatment, a 75 Quality Foam Frac, a Plug to Abandon, and miscellaneous rental equipment. The equipment and services in this estimate is for your Welsh-Estate-Chester #18 in Chester Twp. of Otsego County, Michigan.

The prices on these estimates are from our current price list. If there should be a price increase, the actual price will be that published price in effect at the time the service is performed.

Thank you for the opportunity to submit these estimates for the services to this well. The services will be performed out of the Kalkaska District. The Foamed Acid treatment will require 80,000 SCF Nitrogen and the Foam Frac service will require 592,000 SCF Nitrogen.

The safety to your and our personnel and equipment is a major concern to Dowell. Through following our safety policies a very safe, professional, and successful treatment can be performed.

Thank you again for the opportunity to submit this price estimate. If I can be of any further assistance, please don't hesitate to call. I can be reached at (616)258-9921.

Sincerely,

Rusty Scott

R. G. (Rusty) Scott
District Manager
Dowell Division
Kalkaska, MI 49646

RECEIVED
MAY 23 1980
GRUY FEDERAL, INC.
HOUSTON, TEXAS

RGS/skk
enclosures

DOWELL DIVISION OF DOW CHEMICAL U.S.A.

FOAMED ACID TREATMENT

LIQUID SERVICE

Mileage - Pump Truck	50	miles	$ 88.50
1500 gallon Acid Trailer	1	ea.	74.00
Mileage - 1500 gallon trailer	50	miles	49.00
T. P. Pumper	1	ea.	440.00
Mud-Acid -- Regular 12-3	1500	gal.	1455.00
A200 Inhibitor	5	gal.	87.50
F78 Surfactant	8	gal.	160.00
DS 9 Ball Sealers	30	ea.	43.50
H. P. Ball Injector	1	ea.	95.00
Sub Total			$2492.50

NITROGEN SERVICE

Nitrogen Pumper	1	ea.	$ 800.00
1st. 25,000 SCF/100 SCF	250		NC
2nd. 25,000 SCF/100 SCF	250		325.00
3rd. 25,000 SCF/100 SCF	250		300.00
5,000 SCF/100 SCF	50		55.00
Round Trip Mileage - Pump	100	mi.	150.00
Sub Total			$1630.00

Total Foamed Acid $4122.50

DOWELL DIVISION OF DOW CHEMICAL U.S.A.

FOAM FRAC SERVICE

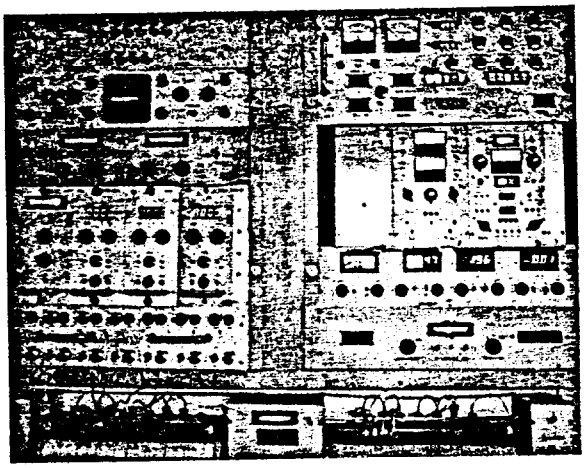
LIQUID SERVICE

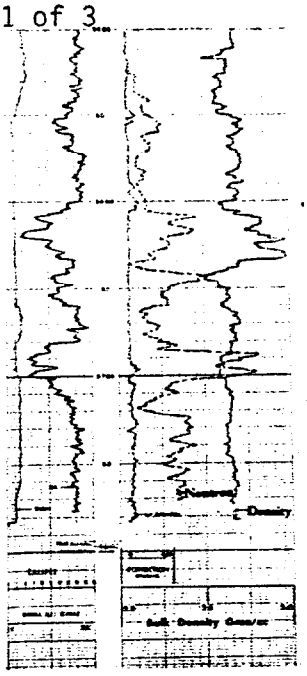
Mileage - 3 Units	150	mi.	$ 265.50
Hydraulic Horsepower	Minimum		1430.00
Surcharge - Pumping Equipment			143.00
Blender	1	ea.	635.00
T. P. Pumper	1	ea.	405.00
Fluid Handling Charge	12,500	gal.	625.00
Sand Concentration 0.0 - 6.0			300.00
Sand Concentration 6.1 - 9.0			150.00
F75 Low Surface Tension Agent	25	gal.	525.00
F78 Surfactant	38	gal.	760.00
L53 Clay Stabilizer	13	gal.	271.05
80-100 Mesh Sand	100	CWT	615.00
20-40 Mesh Sand	500	CWT	3075.00
Prop Pump Charge	600	CWT	150.00
Hauling 60,000 lbs. - 50 Miles	1500	t/m	1005.00
Sub Total			$10,374.55

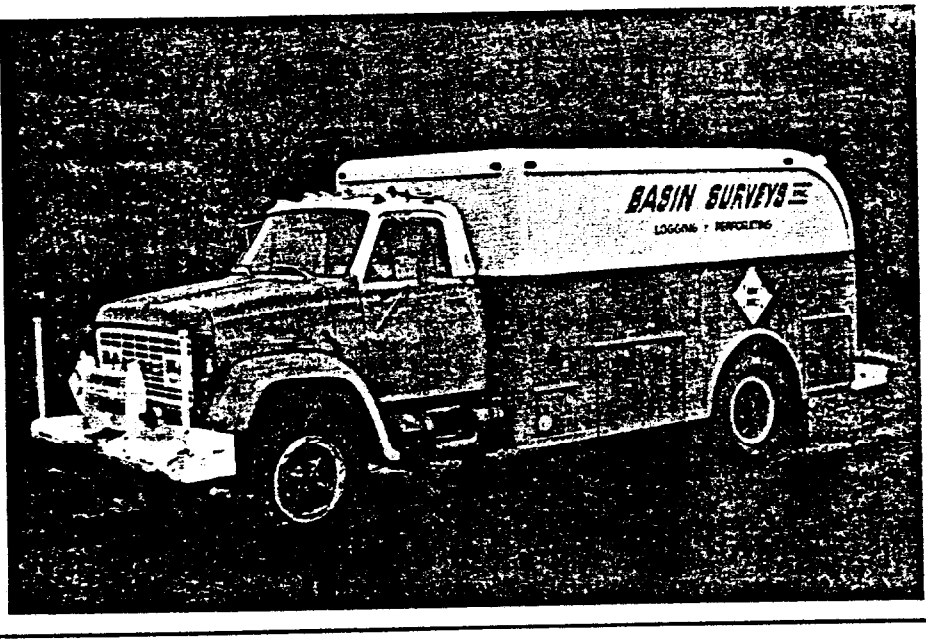
NITROGEN SERVICE

Round Trip Mileage - 4 Units	400	mi.	$ 600.00
Nitrogen Pumpers	3	ea.	2400.00
1st. 25,000 SCF/100 SCF Nitrogen			NC
2nd. 25,000 SCF/100 SCF Nitrogen			325.00
3rd. 25,000 SCF/100 SCF Nitrogen			300.00
517,000 SCF/100 SCF Nitrogen			5687.00
Sub Total			$ 9312.00

Total Foam Frac Service $19686.55







Basin Surveys, Inc.

1980

Terms and Conditions

1. It is expressly understood and agreed that work shall be done under the exclusive control, direction and supervision of well owner or his agent.
2. It is agreed by the parties hereto that the customer agrees to protect, indemnify and hold Basin Surveys, Inc., its agents and employees harmless from any claims, damages, or causes of action asserted by customer, customer's employees, or third person for personal injury or property damage in any way arising out of the performance of the work ordered by the customer except that Basin Surveys, Inc. shall be liable for injury caused by its intentional misconduct.
3. In the event any of Basin Surveys, Inc., tools or equipment are lost in the well while performing or attempting to perform services, the customer will pay for repairs to damaged equipment, the cost of recovering tools lost in the well and for tools not recovered.
4. The only warranty made by Basin Surveys, Inc. in connection with its interpretations, services or equipment is free from defects of workmanship, but the liability of Basin Surveys, Inc. for breach of this warranty, when such is shown, shall be limited to the replacement of the part or parts of the equipment shown to be defective. No other warranty or results, or performance of any type is made by Basin Surveys, Inc.
5. In rendering any service requested by the customer, Basin Surveys, Inc. does so under the instructions of the customer, the well, conditions within the well, the drilling or production equipment at the well, and the premises about the well are at all times in complete care, custody, and control of the customer or his agent. A representative of the customer must be present to supervise depths, ascertain well conditions and be responsible for all operations of Basin Surveys, Inc.
6. No employee, agent, or representative has authority to alter, extend, or exceed these terms and conditions.
7. Terms for payment of charges on accounts approved for credit are net cash tenth of month following invoice date. Interest at the rate of 7% per annum will be charged on past due accounts. In the event an account is placed in the hands of a collection agency or an attorney for collection, all collection fees and costs will be added to the account.
8. Any federal or state sales, use, occupation, or consumer taxes will be added to quoted prices.
9. Prices will be extended on ordered services and equipment shown on signed copy of this order in accordance with our current price schedule.
10. Customer acknowledges that he is aware of the facts that: the radioactive sources used in our services are potentially dangerous both to humans and animals; should the source be lost in the well hole that special precautions must be taken in "fishing" in order that the container of the source is not broken or damaged; and the radioactive source, if not recovered, must be isolated by cementing it in place or by some other appropriate means.
11. In making any interpretation of logs our employees will give Customer the benefit of their best judgment as to the correct interpretation. Nevertheless, since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or willful negligence on our part, be liable for any loss, costs, damages or expenses incurred or sustained by customer resulting from any interpretation made by any of our officers, agents or employees.
12. On jobs where our equipment is transported by a conveyance belonging to, or arranged for by the Customer, the Customer shall be responsible for the undamaged and safe return to the point of embarkation (or a point easily accessible to the point of embarkation) of all our equipment.
13. All of the preceding terms and conditions shall also apply in favor of any manufacturer or supplier of any equipment that we may use at the well.
14. Prices subject to change without notice.
15. All Field Service Order and Delivery Receipts are subject to correction at the main office.

Locations

Buckhannon, W. Va. 26201
Telephone: 304-472-2460

Charleston, W. Va. 25312
Telephone: 304-984-1281

Shelocta, Pa. 15774
Telephone: 412-354-2521

Parkersburg, W. Va. 26101
Telephone: 304-428-4781

Carmi, Illinois 62821
Telephone: 618-382-4083

Crossville, Tenn. 38555
Telephone: 615-484-9310

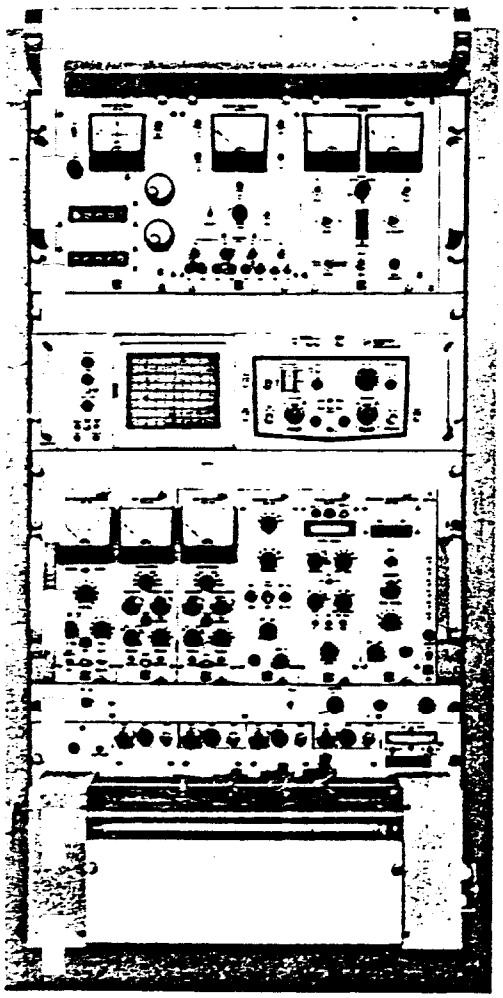
Bradford, Pa. 16701
Telephone: 814-362-7718

Wooster, Ohio 44691
Telephone: 216-264-3951

Effective Date

JANUARY 1, 1980

Simultaneous-Gamma Combination Tools



SERVICE CHARGE **$350.00**

GAMMA RAY—NEUTRON LOGGING

Depth Charge 0.15
per foot to deepest reading
$300.00 minimum
Logging Charge 0.17
per foot of total section logged
$255.00 minimum

GAMMA RAY LOGGING

Depth Charge 0.12
per foot to deepest reading
$240.00 minimum
Logging Charge 0.12
per foot of total section logged
$180.00 minimum

NEUTRON LOGGING

Depth Charge 0.13
per foot to deepest reading
$260.00 minimum
Logging Charge 0.13
per foot of total section logged
$195.00 minimum

RADIOACTIVE TRACER LOGGING

Depth Charge 0.12
per foot to deepest reading
$240.00 minimum
Logging Charge 0.12
per foot of total section logged
$180.00 minimum

TRACER MATERIAL CHARGE

$125.00 for first 5 MC
$100.00 for each additional 5 MC

GAMMA RAY—PERFORATING DEPTH CONTROL

Depth Charge 0.09
per foot to deepest reading
$180.00 minimum
Logging Charge 0.08
per foot of total section logged
$55.00 minimum

CALIPER LOGGING

Depth Charge 0.13
per foot to deepest reading
$260.00 minimum
Logging Charge 0.13
per foot of total section logged
$195.00 minimum

TEMPERATURE LOGGING

When run on same trip to well and in combination with other services, additional charge will be made for each of the above services run.

Depth Charge 0.07
$140.00 minimum
Logging Charge 0.05
$75.00 minimum

These charges will be added to other services to obtain minimum depth and logging charges.

TEMPERATURE LOGGING

Depth Charge 0.11
per foot to deepest reading
$220.00 minimum
Logging Charge 0.10
per foot of total section logged
$150.00 minimum

CEMENT TOP LOGGING

Depth Charge 0.11
per foot to deepest reading
$220.00 minimum
Logging Charge 0.10
per foot of total section logged
$150.00 minimum

See service order and delivery ticket for General Terms and Conditions.

Service Charge	$ 350
Depth Charge	240
Logging Charge	180
Tracers	125
3 Extra lots @$100	300
	$1195

Schlumberger

SCHLUMBERGER WELL SERVICES
5000 GULF FREEWAY, P.O. BOX 2175
HOUSTON, TEXAS 77001, (713) 928-2511

ATTACHMENT H

PLEASE REPLY TO
3528 SOUTH BLUE STAR DRIVE
TRAVERSE CITY, MICHIGAN 49684

May 19, 1980

Gruy Federal Inc.
2500 Tanglewilde - Suite 150
Houston, Texas 77063

RECEIVED
MAY 23 1980
GRUY FEDERAL, INC.
HOUSTON, TEXAS

Attention Calvin Bowie

Dear Mr. Bowie,

The following is the cost estimate that I gave you over the phone last Friday. This is for the Welch Estate Chester 18 well in Otsego County, Michigan:

OPEN HOLE LOGS

LOG	DEPTH	OPERATION	TOTAL
Set up			$ 890.00
Tool protection (6 x 45.)			270.00
CNL/GR	2000 x .41 = 820.	2000 x .39= 780.	1600.00
FDC/GR	2000 x .38 = 760.	2000 x .33= 660.	1420.00
DIL	2000 x .31 = 620.	2000 x .28= 560.	1180.00
BHC	2000 x .31 = 620.	2000 x .27= 540.	1160.00
TTI		2000 x .08= 160.	160.00
VDL		2000 x .27= 540.	540.00
Waveforms		2000 x .40= 800.	800.00
FIL	2000 x .33 = 660.	2000 x .33= 660.	1320.00
NGT	2000 x .34 = 680.	2000 x .35= 700.	1380.00
Kerogen Coriband		875.	875.00
			$11,595.00

CASED HOLE LOGS

LOG	DEPTH	OPERATION	TOTAL	
1st Day - Set up			$ 540.00	
Tool Protection			35.00	
CBL/VDL/GR/CCL	2000 x .22 = 440.00	2000 x .25= 500.	940.00	
* + Gamma Ray	.08 160.	.07 140.	$ 1515.00	
	.30 600.	.72 640.		
2nd Day - set up			540.00	540
Tool protection (3 x 35.)			105.00	70
Perf. (3 3/8 Hyper II)	580.	10 x .22= 220.	800.00	
Flowmeter	2000 x .24 = 480.	700.	1180.00	118
Gradiomanometer	2000 x .22 = 440.	700.	1140.00	114
Temperature	2000 x .22 = 440.	700.	1140.00	114
Gamma Ray	2000 x .21 = 420	2000 x .20= 400.	820.00	82
Pressure equipment		180.	180.00	18
			$5905.00	507

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accura correctness of any interpretations, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible fc loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or empl These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule.

GRUY FEDERAL, INC.

13. Rental Equipment

(a)	500 barrel Frac Tank rental (10 days)	$ 1,000
(b)	Tank Transportation	198
(c)	2 in. Frac Valve rental (10 days)	329
(d)	2 in. Choke Valve rental (10 days)	149
(e)	50 ft 2 in. treating pipe rental (10 days)	910
(f)	Choke nipple rental (10 days)	39
(g)	Pickup truck for service rig crew - 11 days @ $16/day	176
(h)	Mud pump rental for service rig - 3 days @ $278/day	834
(i)	Power tongs rental for service rig - 2 days @ $98/day	196
(j)	6" dbl. Hyd. B.O.P. rental for service rig - (10 days)	1,050
	TOTAL	$ 4,881

6421

CHRISTENSEN DIAMOND PRODUCTS, U.S.A.
Diamond Products Division
5708 WEST RAYMOND STREET / PARK FLETCHER / INDIANAPOLIS,
INDIANA 46241 U.S.A. / PHONE: (317) 248-9441

May 23, 1980

RECEIVED
MAY 28 1980
GRUY FEDERAL, INC.
HOUSTON, TEXAS

Mr. Calvin Bowie
GRUY FEDERAL INC.
2500 Tanglewilde, Suite 150
Houston, Texas 77063

Dear Calvin:

In regard to your request for coring 400 feet of plastic sleeve oriented coring in Chester Township, Otsego County, Michigan, on the Welch Estate Chester #18, CHRISTENSEN DIAMOND PRODUCTS, U.S.A. is happy to send you the following quotes, prices and estimates which supersede our letter of May 19, 1980.

PRICES FOR ORIENTED CORING

A.	6-1/4" x 4" Core Barrel with 7-27/32" x 3-1/2" Core Bit - 305 Feet at $16.00 per foot	=	$ 4,880.00
B.	Mileage Transportation of Equipment - Estimate of 300 mile Roundtrip at $0.85 per mile	=	255.00
C.	Engineer Service, 1st Engineer - Estimate of five days at $300.00 per day	=	1,500.00
D.	Per Diem, 1st Engineer - Estimate of five days at $55.00 per day	=	275.00
E.	Engineer Service, 2nd Engineer - Estimate of five days at $300.00 per day	=	1,500.00
F.	Per Diem, 2nd Engineer - Estimate of five days at $55.00 per day	=	275.00
G.	Price for Core Barrel Orienting Equipment - (Includes orienting shoes, catcher, knives, extension and alignment tools) - Estimate 305 feet at $7.50 per foot	=	2,287.50
H.	Plastic Sleeve (30 foot sections) - 330 feet at 5.00 per foot	=	1,650.00
I.	All parts consumed at catalog list price (estimate)	=	650.00
J.	Reconditioning charge of equipment	=	100.00

All coring subject to A-CRA rental agreement

Mr. Calvin Bowie
May 23, 1980
Page 2

PRICES FOR ORIENTED CORING (Continued)

Total cost of 7-27/32" x 3-1/2" core bit will be	=	$ 6,772.50
Estimated bit damage, if any	=	3,386.25
TOTAL ESTIMATE, excluding any bit damage	=	$13,372.50

CORE ORIENTATION RENTAL PRICES

A.	Instrument Rental - Estimate of five days at $325.00 per day	=	$ 1,625.00
B.	Instrument Standby - Estimate of two days at $110.00 per day	=	220.00
C.	Core Orientation - Estimate of six cores at $150.00 per core	=	900.00
D.	Non-Magnetic Collar - Estimate five days at $100.00 per day	=	500.00
E.	Non-Magnetic Collar Standby - Estimate two days at $45.00 per day	=	90.00
F.	Loss-in-Hole Coverage - Estimate five days at $15.00 per day	=	75.00
G.	Engineer Service - Estimate five days at $300.00 per day	=	1,500.00
H.	Per Diem - Estimate five days at $55.00 per day	=	275.00
I.	Engineer Mileage - Estimate 300 miles at $0.55 per mile	=	165.00
	TOTAL ESTIMATE	=	$ 5,350.00

These are estimated prices only for coring and orienting.

Coring	=	$13,372.50
Survey	=	5,350.00
TOTAL		$18,722.50

CHRISTENSEN DIAMOND PRODUCTS, U.S.A. wishes to thank you for the privilege of furnishing this quote. Published prices and catalog are included.

If you have any questions, please feel free to call me at anytime, home or office.

Sincerely,

CHRISTENSEN DIAMOND PRODUCTS, U.S.A.

Randall L. Anselment

Randall L. Anselment, District Manager
Petroleum Diamond Products Division
District 1320

RLA/njt

Enclosures (6)