Blue Book

Department of Environmental Quality
Office of Oil, Gas, and Minerals

01 – Special Orders of the Supervisor

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926
TELEPHONE: (517) 373-1256

TESTING AND REPORTING PROCEDURE FOR OIL WELLS

Effective April 1, 1973, the following procedure and testing restrictions shall be adhered to in completing discovery or development oil wells not subject to a specific proration order for a designated area.

Preliminary to the time that production testing is scheduled for a discovery or development well this office (Production and Proration Unit, Lansing Tel. (517) 373-1256) is to be notified as to the approximate date that testing will begin. Such notice must be given at the time that the well begins initial natural flow, or is on net oil production following treatment. From that point daily production should not exceed 200 barrels of oil and/or 200 MCF of gas per day for 30 consecutive days. However, flow rates may exceed 200 BOPD during a testing day providing cumulative daily take is limited to 200 barrels of oil and/or 200 MCF of gas. During the test period a record of daily oil and gas production, wellhead pressures, and choke settings is to be made and filed weekly on the attached form.

During the early phase of the testing program, bottom-hole pressure tests (static and flowing), and gas-oil ratio tests shall also be taken. If preliminary testing indicates the well will be completed as a pumper, bottom-hole pressure tests may be waived. If fluid sampling is conducted PVT analysis data should also be filed as part of the final report.

Upon completion of the 30-day test program, and filing of final test data, the company (operator) may call for continued testing under a negotiated rate or produce the basic allowable established for the area as provided in Special Order 1-73.

Should there be any questions regarding these instructions please give us a call.

Signed and ordered published this fifth day of February, 1973.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
SUPERVISOR OF WELLS

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926
TELEPHONE: (517) 373-1256

TESTING AND REPORTING PROCEDURE FOR DISCOVERY OIL WELLS

Beginning December 1, 1971 the following procedure and testing restrictions shall be adhered to in completing a discovery oil well, or development wells not yet subject to a proration order.

Preliminary to the time that production testing is scheduled for a discovery or development well this office (Production and Proration Unit, Lansing Tel. (517) 373-1256) is to be notified as to the approximate date that testing will begin. Such notice must be given at the time that the well begins initial natural flow, or is on net oil production following treatment. From that point daily production should not exceed 200 barrels of oil and/or 200 Mcf of gas per day for 30 consecutive days. However, flow rates may exceed 200 BOPD during a testing day providing cumulative daily take is limited to 200 barrels of oil and/or 200 Mcf of gas. During the test period a record of daily oil and gas production, wellhead pressures, and choke settings is to be made and filed weekly on the attached form.

During the early phase of the testing program, bottom-hole pressure tests (static and flowing), and gas-oil ratio tests shall also be taken. If preliminary testing indicates the well will be completed as a pumper, bottom-hole pressure tests may be waived. If fluid sampling is conducted PVT analysis data should also be filed as part of the final report.

Upon completion of the 30 day test program, and filing of final test data, the Company (Operator) may call for continued testing under a negotiated rate or petition for a formal hearing to consider a proration order.

Should there be any questions regarding these instructions please give us a call.

NATURAL RESOURCES COMMISSION
E. M. LAITALA
Chairman
CARL T. JOHNSON
HILARY F. SNELL
HARRY H. WHITELEY
CHARLES G. YOUNGLOVE

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926

A. GENE GAZLAY, Director

I-1b

TO WHOM IT MAY CONCERN

RE: SPECIAL ORDER 2-71 (AMENDED) THIRTY DAY TEST

"Special Order 2-71 (Amended)" entitled "Testing and Reporting Procedure for Oil Wells" was issued on 4-1-73. Compliance with this order has not been satisfactory and in some cases has been misinterpreted. Hence the following is to more thoroughly explain the intent of the order and to answer some of the questions that have arisen.

A. A thirty (30) day test period is thirty (30) consecutive calendar days. It is not to mean the production of 6,000 barrels and/or 6,000 Mcf of gas irrespective of time.

B. In those areas effected by Special Order No. 1-73 (General Spacing and Proration Order) a new well producing to gas sales will be allowed to produce at the rates outlined in that order. This, of course, does not waive the requirements of filing production and reservoir test data as called for under Special Order 2-71.

C. Under this order (2-71) the operator is expected to submit Bottom-hole pressure tests and any other data pertinent to the well even though he chooses not to conduct a test for the allotted 30 days. (e.g. 5 day test).

D. The operator is to notify this office when a well, covered by this order, is to be placed on production.

E. The maximum allowable, as the Order (2-71) states, is not to exceed 200 bbls. of oil and/or 200 Mcf of gas per day. The flow rates, for short periods of time, may exceed 200 bbls. of oil and/or 200 Mcf of gas as long as the total production is within the daily allowable.

F. Daily production data is to be filed weekly (on form R-7127) as the thirty day test progresses. Upon completion of the test period all other data is to be filed promptly with this office. (If reservoir fluid samples were taken please advise when this information can be expected to be filed.)

If there are any other questions that you may have regarding the above or Special Order 2-71 please direct your inquiry to our Production and Proration Unit (Tel. (517) 373-1256).

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
ASS'T. SUPERVISOR OF WELLS

GEOLOGICAL SURVEY DIVISION

MICHIGAN THE GREAT LAKE STATE

AES/sw

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

NO FLARE ORDER

At a public hearing held in Lansing, Michigan on January 21, 1981, after due notice and pursuant to Act No. 61 of the Public Acts of 1939, as amended, and the promulgated rules, testimony was presented to the Supervisor of Wells and the Advisory Board on the need or desirability of amending Special Order No. 3-71, amended, the NO FLARE ORDER, issued February 5, 1973, to include Oakland County.

Pursuant to the recommendation of the Advisory Board following full consideration of the testimony submitted and finding that Oakland County should be subject to Special Order 3-71, it is so ordered that effective February 6, 1981, all oil wells that produce from the Salina-Niagaran Formation in those counties north of Townline 20 North and the counties of Mason, Lake, Oceana, Newaygo, Muskegon, Ottawa, Kent, Allegan, Barry, Eaton, Calhoun, Ingham, Jackson, Livingston, Washtenaw, and Oakland, which as of the effective date of this order do not have a gas market connection, shall be closed in until a market connection is achieved or an exception is granted under one or more of the conditions set forth below.

CONDITIONS FOR EXCEPTIONS

(1) Isolated Wells

Operators of marginal wells, or wells capable of producing efficiently, but which are so extremely isolated that a market connection would be highly improbable or unduly delayed, may petition the Supervisor of Wells to produce such wells as an exception, subject to restrictions or requirements specified by the Supervisor of Wells.

(2) Discovery Wells and Development Wells

Discovery and development wells shall be allowed a 30-day test period as set forth under "TESTING AND REPORTING PROCEDURE FOR OIL WELLS" (attached). Upon conclusion of the 30-day test period, if a gas market connection has not been made, the well shall be closed in until such connection is made or approval has been granted by the Supervisor of Wells for the well to continue to produce as an exception.

(3) Special Conditions

Should there be unusual conditions, other than outlined herein which in the judgment of the operator an exception is justified, he may petition the Supervisor, setting forth these conditions under which he believes an exception should be granted.

(4) Hearing

The Supervisor, upon his option or by petition in contested cases, may call for public hearing to resolve factors of exception.

Signed and ordered published this sixth day of February, 1981.

Dated: February 6, 1981

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
ASSISTANT SUPERVISOR OF WELLS

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

NO FLARE ORDER

At a public hearing held in Lansing, Michigan, on January 25, 1973, after due notice as provided in Act No. 61 of the Public Acts of 1939, as amended, and in Rules of Procedure in Public Hearings promulgated thereunder, testimony was presented to the Supervisor of Wells and the Advisory Board on the need or desirability of amending Special Order No. 3-71 known as the NO FLARE ORDER, issued December 15, 1971, to include additional area.

Pursuant to the recommendation of the Advisory Board following full consideration of the testimony submitted and finding that additional area should be included, it is so ordered that EFFECTIVE 7:00 A.M., APRIL 1, 1973, all oil wells that produce from the Salina-Niagaran Formation in those counties north of Townline 20 North and the western, southwestern, and southern Michigan counties of Mason, Lake, Oceana, Newaygo, Muskegon, Ottawa, Kent, Allegan, Barry, Eaton, Calhoun, Ingham, Jackson, Livingston, and Washtenaw, which as of the effective date of this order do not have a gas market connection, shall be closed in until a market connection is achieved or an exception is granted under one or more of the conditions set forth below.

CONDITIONS FOR EXCEPTIONS

(1) Isolated Wells

Operators of marginal wells, or wells capable of producing efficiently, but which are so extremely isolated that a market connection would be highly improbable or unduly delayed, may petition the Supervisor of Wells to produce such wells as an exception, subject to restrictions or requirements specified by the Supervisor of Wells.

(2) Discovery Wells and Development Wells

Discovery and development wells shall be allowed a 30-day test period as set forth under "TESTING AND REPORTING PROCEDURE FOR OIL WELLS" (attached). Upon conclusion of the 30-day test period, if a gas market connection has not been made, the well shall be closed in until such connection is made or approval has been granted by the Supervisor of Wells for the well to continue to produce as an exception.

(3) Special Conditions

Should there be unusual conditions, other than outlined herein which in the judgment of the operator an exception is justified, he may petition the Supervisor, setting forth these conditions under which he believes an exception should be granted.

(4) Hearing

The Supervisor, upon his option or by petition in contested cases, may call for public hearing to resolve factors of exception.

Signed and ordered published this fifth day of February, 1973.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

OFFICE OF SUPERVISOR OF WELLS
December 15, 1971

NO FLARE ORDER

Effective 7:00 A.M. February 1, 1972 all oil wells that produce from the Salina-Niagaran Formation in those counties north of Town line 20 North and in the Southern Michigan Counties of Livingston, Ingham, Eaton, Calhoun, Jackson and Washtenaw, and as of the date of this order do not have a gas market connection, shall be closed-in until a market connection is achieved or an exception is granted under one or more of the conditions set forth below.

CONDITIONS FOR EXCEPTIONS

(1) Isolated Wells

Producers of marginal wells, or wells capable of producing efficiently, but which are so extremely isolated that a market connection would be highly improbable or unduly delayed, may petition the Supervisor of Wells to produce such wells as an exception, subject to restrictions or requirements specified by the Supervisor of Wells.

(2) Discovery Wells and Development Wells

Discovery wells or development wells not yet subject to a proration order shall be allowed a 30 day test period as set forth under "TESTING AND REPORTING PROCEDURE FOR DISCOVERY OIL WELLS" (Attached). Upon conclusion of the 30 day test period if a gas market connection has not been made the well shall be closed in until such connection is made or approval has been granted by the Supervisor of Wells for the well to continue to produce as an exception.

(3) Special Conditions

Should there be unusual conditions, other than outlined herein, which in the judgment of the producer an exception is justified, he may petition the Supervisor, setting forth these conditions under which he believes an exception should be granted.

(4) Hearing

The Supervisor, upon his option or by petition in contested cases, may call for public hearing to resolve factors of exception.

Arthur E. Slaughter

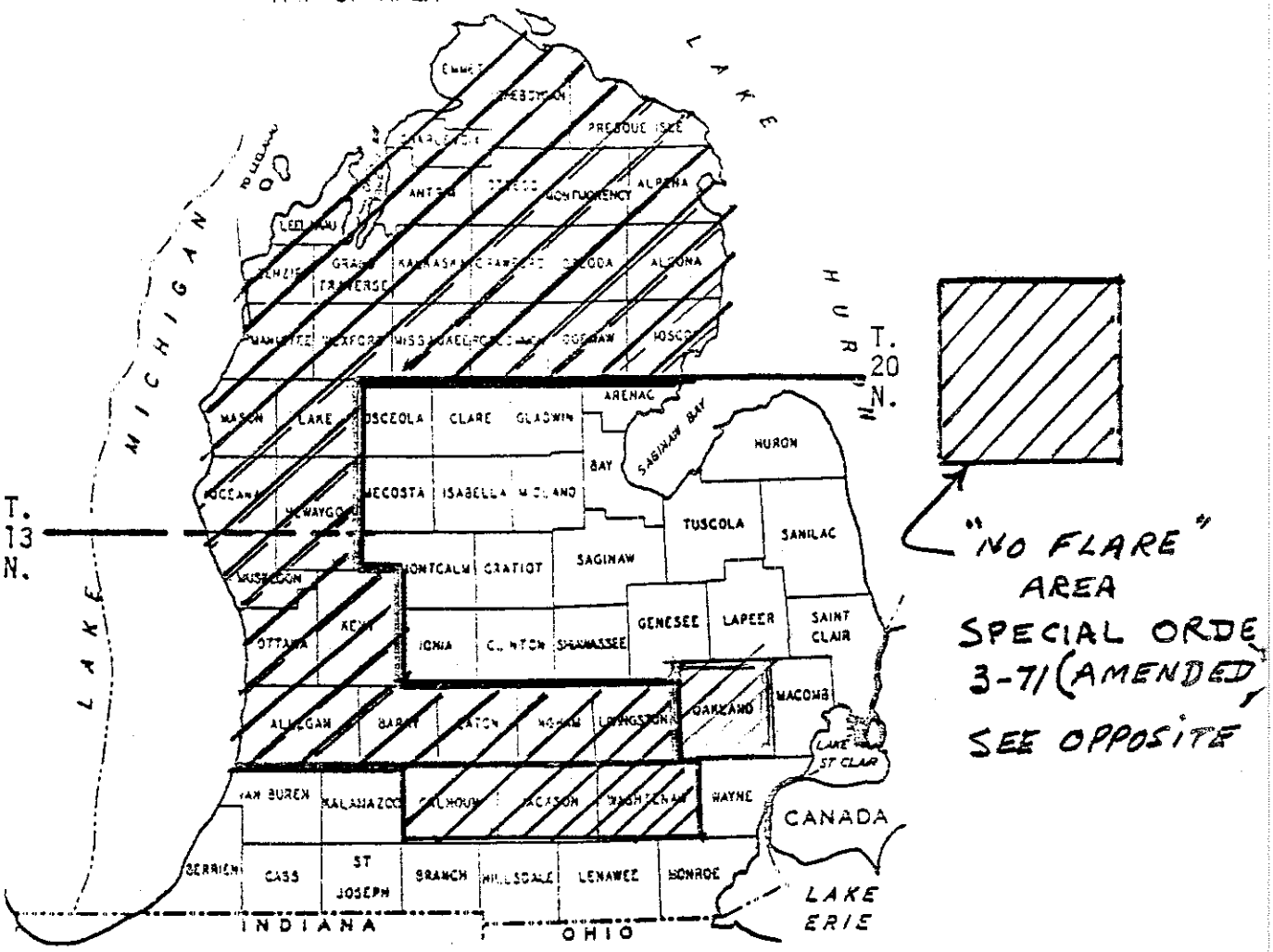
ARTHUR E. SLAUGHTER
SUPERVISOR OF WELLS

CAUSE NO. 23-1-73

SPECIAL ORDER NO. 1-73

Effective Date: April 1, 1973

MAP OF AREA

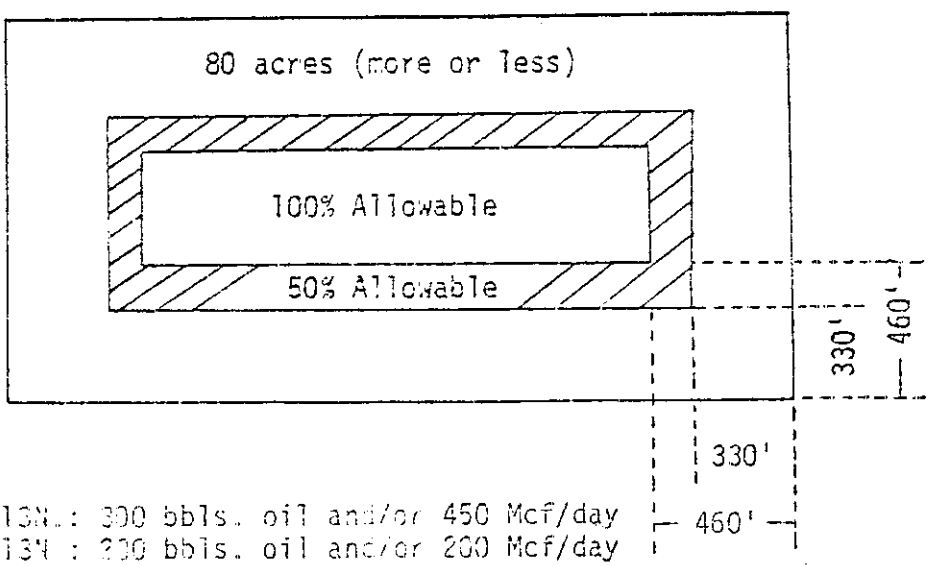


DRILLING UNIT

80 acres, more or less, by combining two (2) governmental surveyed quarter-quarter sections of land with a common boundary of approximately 1320 feet.

WELL SPACING

Not less than 460 feet from the unit line receives full allowable. From 460 feet to not less than a minimum distance of 330 feet from the unit line receives 50% allowable.



BASIC FULL ALLOWABLE

1) North of Townline 13N.: 300 bbls. oil and/or 450 Mcf/day
2) South of Townline 13N.: 200 bbls. oil and/or 200 Mcf/day

9000080

SPECIAL ORDER 1-72

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

CENTRAL TANK BATTERY FACILITIES

Central tank battery facilities must be designed to assure fluid measurements that conform to American Petroleum Institute's standards. Prior to construction or installation a detailed plan of the proposed facility shall be submitted to the Supervisor of Wells for approval. Subsequent additions, alterations, or changes that affect flow measurement or reporting methods shall require approval prior to implementation.

Metering requirements, reporting methods, tolerances and other necessary considerations are to be set forth for each facility at the time of approval.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
SUPERVISOR OF WELLS

February 1, 1972

GENERAL GUIDELINES
GOVERNING INSTALLATION AND OPERATION
CENTRAL TANK BATTERY FACILITIES

I

The following definitions will apply.

a. CENTRAL TANK BATTERY FACILITIES are production equipment designed to gather, comingle and market produced hydrocarbons from multiple leases.

b. WATER is water that has not been separated from the flow stream prior to measurement.

c. LACT is a Lease Automatic Custody Transfer Unit used to measure and market oil automatically.

d. PROVE is a technical test to determine the accuracy of a meter.

II

CENTRAL TANK BATTERY FACILITIES are to be designed to assure measurements that conform to the American Petroleum Institute's standards.

A. INDIVIDUAL LEASE MEASUREMENTS

Oil, gas and water shall be measured separately from each lease.

1. Oil: The total of all the individual lease oil meters shall be within 5% of the marketed pipe line runs and adjusted storage. For each new installation oil meters shall be proved each month in accordance with American Petroleum Institute's standards. As reliability of the meter is established the test frequency requirements may be decreased at the discretion of the Supervisor of Wells.

2. Gas: The composite volume of all individual lease meters shall be within 10% of the total of the volume of gas from the CENTRAL TANK BATTERY and lease fuel gas. These meters shall be calibrated or proved during each calendar quarter.

3. Water: The total of the individual lease water measurements should be within 10% of the actual produced water. Meters, or measuring devices, are to be proved each calendar quarter.

Documented results of all prover tests are to be reported within 14 days to the Supervisor of Wells by the operator.

B. FACILITY MEASUREMENTS

All oil, gas and water from the entire producing facility shall be measured as a total.

1. Oil: The LACT (or actual tank gauges) may be used for the total oil measurement. The proving of these facilities by the purchaser will normally be considered valid for the purpose of these rules.

2. Gas: Each CENTRAL TANK BATTERY FACILITY shall have a meter measuring the total gas from the facility. When the gas is sold directly to a gas company from the facility the sales meter will be permissible for the intent of this rule.

3. Water: The total water shall be measured.

III

Meter reading and production data of the CENTRAL TANK BATTERY FACILITY shall be reported on the forms provided. These reports shall be filed with this office by the 15th day of each month following the month being reported upon.

IV

All meter readings, charts, pipe line tickets and other relative data incidental to the production of CENTRAL TANK BATTERY FACILITIES shall be retained within the State of Michigan for not less than one year and shall be available for inspection and audit by the Supervisor of Wells.

ICHIGAN DEP. MENT OF NATURAL RESOURCES
EOLOGICAL SU Y DIVISION
AS AND OIL SE ION

FORM A

CENTRAL PRODUCTION FACILITIES METER READINGS

Month of _____ Facility Name _____ Account Number _____

LEASE NAME	(Column 1) Meter Read. Beg. of Month *Liquid Bbls.*	(Column 2) Meter Read. End of Month *Liquid Bbls.*	(Column 3) Adjustments Date + or - *Bbls.*	(Column 4) Meter Prover Factor	(Column 5) Water %	(Column 6) Oil Prod. *Bbls.*	(Column 7) Water Prod. *Bbls.*
	Gas Mcf	*Gas Mcf*	*Mcf*		*Gas Prod. Mcf*	Remarks:	

R-7125

Being a duly authorized representative of _____ I hereby certify that to the best of my information and belief the foregoing report is true and correct.

_____

Title:

This report shall be filed with the Supervisor of Wells by the 15th day of each month following the month being reported upon.

1. The meter reading for each lease on the 1st day of the month and the 1st day of the following month shall be recorded in the space provided (Column 1 & 2).

2. If a meter is replaced during the month the reading of both are to be recorded, plus a note of explanation.

3. If adjustments are necessary (+ or -) these should be recorded in the space provided (column 3) along with the date of occurrence and an explanation of the adjustment, i.e. malfunction of meter.

4. The difference in the meter reading and adjustments multiplied by each meter prover factor (column 4) should give a corrected production figure (oil and water).

5. If the produced fluid is water cut the percentage of cut is to be entered in column 5. In column 6 & 7 the resulting oil and water production shall be recorded. Corrected gas figures shall be entered in the proper column. These figures should also be recorded in Section I of Form B.

NOTE: This report shall be mailed to: *Michigan Department of Natural Resources, Geological Survey Division, Stevens T. Mason Building, Lansing, Michigan 48926.*

REMARKS:

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
GAS AND OIL SECTION

FORM B

CENTRALIZED PRODUCTION FACILITIES MONTHLY REPORT

Month of_____ Facility Name_____ Account Number_____

	LEASE & WELL NAME	Oil, Bbls.	Gas, Mcf	Water Bbls.	Remarks:			
Section I Individual Metered Well Prod.								
	Total							
Section II Unit Totals	Stock on Hand 1st of Month -							
	Stock on Hand End of Month +							
	Pipe Line Runs							
	Actual Production				Average Daily Water Bbls.	Prod. Method & Hrs.	Surface Pressures C.H.	Surface Pressures Tub.
	Adjustment Factor							
Section III Adjusted Individual Well Production								
	Total							

R-7126

Being a duly authorized representative of _____
I hereby certify that to the best of my information and belief the foregoing report is true and correct.

_____

Title:

This report shall be filed with the Supervisor of Wells by the 15th day of each month following the month being reported upon.

Section I The results reported on Form A from the individual meter reading (oil, gas and water) shall be recorded in the spaces provided.

Section II In the space under the oil column the stock on hand at both the beginning and ending of the month (7:00 A.M., 1st day of each month) shall be recorded. Pipe line runs shall be the total amount of oil sold during the month being reported on. Actual oil produced would be the amount of oil sold with the differences in the stock tank oil taken into consideration. The gas and water meter recording for the whole facility shall be entered in the space provided.

Adjustment Factor Is derived by dividing the actual production (Section II) by the totals in Section I.

Section III Will be the results of the individual lease's production as indicated in Section I multiplied by the adjustment factor. Each lease should have adjusted figures. The composite of these figures must be the same as actual production found in Section II. Hence, Section III will represent the actual production from each lease. For the purpose of PRORATION each well, on a multiple well lease, shall have its monthly oil production recorded.

In the spaces provided each well's daily average water production, producing method and well head pressures are to be recorded.

NOTE: This report shall be mailed to: *Michigan Department of Natural Resources, Geological Survey Division, Stevens T. Mason Building, Lansing, Michigan 48926.*

REMARKS:

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

Cause No. 8-9-80: Petition by Supervisor of Wells to amend Special Order 1-73 and the Cal-Lee Salina-Niagaran Formation Pools Area Spacing Order No. 37-3-73

OPINION AND ORDER OF THE SUPERVISOR OF WELLS

On September 25, 1980, a public hearing was held before the Supervisor of Wells and the Advisory Board pursuant to 1939 P A 61, as amended and the rules promulgated thereunder. The purpose of the hearing was to consider the petition of the Supervisor of Wells to amend Special Order No. 1-73 and Cal-Lee Salina-Niagaran Formation Pools Area Order No. 37-3-73.

FINDINGS OF FACT

1. Special Order No. 1-73, as amended, effective June 23, 1975, established 80-acre spacing for wells drilled into or below the Salina-Niagaran Formation underlying an area which includes Sections 1, 2, the N½ of Section 3, Sections 12 and 13, T.1S., R.5W., Lee Township, Calhoun County, except areas subject to spacing and proration orders issued prior to June 23, 1975.

2. Based on the evidence presented, it now appears that 40-acre spacing is appropriate for those areas within such sections which are spaced pursuant to Special Order No. 1-73, as amended.

CONCLUSIONS OF LAW

Rule 203 of the rules promulgated pursuant to 1939, P A 61, as amended, provides that any interested person may request a hearing to consider the need or desirability of adopting a special spacing order to apply to a designated area, pool, or geological formation.

ORDER

Wherefore, based on the evidence presented and in accordance with the recommendation of the Advisory Board, it is the opinion of the Supervisor that Special Order No. 1-73 and Order No. 37-3-73 should be amended.

Now, therefore, it is ordered that:

1. Special Order No. 1-73, as amended, effective June 23, 1975, is hereby amended by deleting therefrom those areas within Sections 1, 2, the N½ of Section 3, Sections 12 and 13, T.1S., R.5W., Lee Township, Calhoun County.

2. Cal-Lee Salina-Niagaran Formation Pools Area Order No. 37-3-73, as amended, effective March 30, 1973, is hereby amended by adding thereto the Salina-Niagaran Formation underlying the area deleted from Special Order No. 1-73, by paragraph 1 of this order.

3. All the developed drilling and/or production units within the area deleted from Special Order No. 1-73 by paragraph 1 of this order shall remain intact.

4. The drilling of additional wells shall be allowed in each such developed drilling and/or production unit that is larger than 40 acres provided that each well is located on a separate quarter-quarter section and is no closer than 660 feet from an offset well.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
ASSISTANT SUPERVISOR OF WELLS

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

Cause No. 12-6-75: Petition of Mobil Oil Corporation to amend Special Order No. 1-73, "Special Spacing and Proration Order for Wells Drilled into or Below The Salina-Niagaran Formation Within Specified Area of The State" issued effective April 1, 1973, to extend the purview of the order to cover additional area particularly T.1S., R.5, 6, and 7W, and T.2S., R.5, 6, and 7W, being Lee, Convis, Pennfield, Marengo, Marshall, and Emmett Townships, Calhoun County.

OPINION AND ORDER OF THE SUPERVISOR OF WELLS

On June 18, 1975 a public hearing was held pursuant to Act 61, P.A. 1939, as amended, and the rules promulgated thereunder by the Supervisor of Wells and the Advisory Board. The purpose of the hearing was to consider the amendment of Special Order 1-73 to include certain lands in Calhoun County, Michigan.

FINDINGS OF FACT

1. That petitioner, Mobil Oil Corporation, has requested the extension of Special Order 1-73 to include 6 townships in Calhoun County being; Pennfield, Convis, Lee, Emmett, Marshall and Marengo.

2. That petitioner is the lessee of approximately 41% of the acreage within the six townships and is engaged in an active exploration and development program within the area.

3. The proposed area for extension of Special Order 1-73 immediately adjoins the southern boundaries of Barry and Eaton County, both of which counties are subject to Special Order 1-73.

4. The six townships are underlain in whole or partly by the same geological zones of interest as those included in Special Order 1-73.

5. There are several existing spacing orders for portions of the six townships which should be excluded from any extension of Special Order 1-73 to protect equity, correlative rights and provide for the uniform development of those areas.

6. That development of the six townships of 80 acre units will decrease the number of wells necessary to develop the area. Which will reduce surface damage and lessen the environmental impact to the area.

7. That petitioners experience with Salina-Niagaran Formation development in the area has shown that one well will effectively drain 80 acres for oil.

CONCLUSIONS OF LAW

1. Act 61, P.A. 1939, as amended, Section 6 (0) authorizes the Supervisor to make orders for development, extraction or production of hydrocarbons.

2. Section 6 of Act 61 mandates the Supervisor to prevent waste, to that end to regulate the spacing and production of wells.

3. Section 13 of Act 61 declares the drilling of unnecessary wells is waste.

DETERMINATION AND ORDER

Wherefore based upon the evidence submitted and in concurrence with the recommendation of the Advisory Board it is the opinion of the Supervisor that Special Order 1-73 should be amended to include the six townships requested.

Now therefore it is ordered:

1. That Special Order 1-73 be and is hereby amended to include the following six townships all in Calhoun County.

Pennfield	T 1S - R 7W
Convis	T 1S - R 6W
Lee	T 1S - R 5W
Emmett	T 2S - R 7W
Marshall	T 2S - R 6W
Marengo	T 2S - R 5W

2. That this order does not supersede or amend spacing and proration orders issued prior to June 23, 1975.

3. Exceptions to this order may be granted in accordance with the Act 61, P.A. 1939 and the rules promulgated thereunder.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
ASSISTANT SUPERVISOR OF WELLS

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

SPECIAL SPACING AND PRORATION ORDER FOR WELLS DRILLED INTO OR BELOW THE SALINA-NIAGARAN FORMATION WITHIN SPECIFIED AREAS OF THE STATE

At a public hearing held in Lansing, Michigan, on January 25, 1973, after due notice as provided in Act No. 61 of the Public Acts of 1939, as amended, and Act No. 326 of the Public Acts of 1937, as amended, and in Rules of Procedure in Public Hearings promulgated thereunder, evidence and testimony was presented to the Supervisor of Wells and the Advisory Board on the need and desirability of adopting a Special Order pertaining to the exploration, development, and production of wells drilled for oil and/or gas into or below the Salina-Niagaran Formation in counties north of Townline 20 North and the western, southwestern, and southern Michigan counties of Mason, Lake, Oceana, Newaygo, Muskegon, Ottawa, Kent, Allegan, Barry, Eaton, Ingham, and Livingston.

Pursuant to the recommendations of the Advisory Board following full consideration of the evidence and testimony submitted, the Supervisor of Wells finds that it is necessary to establish special drilling units, spacing of wells, and a basic prorated allowable per well to provide for orderly development of the Salina-Niagaran reef-type reservoirs, prevent waste, protect correlative rights, and eliminate the drilling of unnecessary wells.

ORDER

Effective April 1, 1973, the requirements for the location, spacing, and production of wells drilled for oil and/or gas into or below the Salina-Niagaran Formation in the area specified in Paragraph 1 above, except for wells to be drilled in gas storage reservoirs, liquid petroleum gas storage reservoirs, unitized areas, and other specifically designated areas where special spacing orders, rules, or determinations are in effect, are as follows:

(A) DRILLING UNIT

The drilling unit shall be eighty (80) acres, more or less, formed by combining two governmental surveyed quarter-quarter sections of land with one common boundary of approximately 1,320 feet with allowances being made for the differences in the size and shape of sections as indicated by official governmental survey plats. A declaration of the unit must be indicated on the application for a drilling permit.

(B) DRILLING UNIT EXCEPTION

The Supervisor may issue a permit to drill an oil or gas well on a tract less than an eighty (80) acre drilling unit which is not a part of a pooled or communitized drilling unit providing the application for permit is accompanied by a certified statement that a reasonable effort has been made to obtain the lease or leases or to obtain a communitization agreement to form the full eighty (80) acre drilling unit and that such effort has failed.

(B) DRILLING UNIT EXCEPTION - continued

Should a well be completed on such partial drilling unit, a full drilling unit shall be formed by voluntary or compulsory pooling. This pooled unit shall conform with the provisions of (A) above or shall conform to a drilling unit to be adopted following public hearing.

(C) SPACING OF WELLS

Permits may be granted for the drilling of exploratory and development wells for oil or gas without a proration penalty provided the location is not less than four hundred and sixty (460) feet from an adjoining drilling unit as prescribed in (A) above. Permits may also be granted at locations less than four hundred and sixty (460) feet but not less than three hundred and thirty (330) feet from an adjoining drilling unit subject to a fifty per cent (50%) proration penalty. Refer to exhibit attached.

(D) BASIC ALLOWABLE

Subsequent to the 30-day test program and the filing of final test data as provided in Special Order 2-71, "Testing and Reporting Procedure for Oil Wells" all oil wells, as provided for in this order, will be allowed to produce a standard or basic prorated allowable as follows:

1) Wells located north of Townline 13 North: Not to exceed 300 barrels of oil and/or 450,000 cubic feet of gas per day.

2) Wells located south of Townline 13 North: Not to exceed 200 barrels of oil and/or 200,000 cubic feet of gas per day.

Until such time a study has been completed on the feasibility of adopting a depth bracket allowable, the present established basic allowable, as set forth above, will remain in effect.

(E) ADOPTION OF SPECIAL SPACING AND PRORATION ORDERS

The development of an oil or gas field following the completion of a discovery well may warrant the adoption of a drilling unit, well spacing pattern, and proration other than that specified. Any interested person may request, or the Supervisor may schedule, a hearing to consider the need or desirability of adopting a special spacing and proration order to apply to a designated area, field, or pool.

(F) COMMUNITIZATION TO FORM DRILLING UNITS

NOTE 2

All royalty and working interests within a drilling unit shall be communitized and each royalty owner therein shall participate in the royalty from the well drilled thereon in the relation that the acreage of such owner bears to the total acreage of the unit.

THIS SECTION IS VOID

(G) STATUTORY POOLING

NOTE 2

THIS SECTION IS VOID

In the event there are divided or undivided interests within any unit subject to this order, and the parties are unable to agree on a voluntary plan for the development of the unit, their rights and equities shall be determined by the Supervisor of Wells following a public hearing held in accordance with the provisions of the statutes specified herein.

(H) EXCEPTIONS

Exceptions to this order may be granted by the Supervisor of Wells in accordance with the provisions of the statutes specified herein.

This order does not supersede or amend Spacing and Proration Orders issued prior to April 1, 1973, except where specified.

Signed and ordered published this first day of March, 1973.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
SUPERVISOR OF WELLS

NOTE 1 Paragraph 1 of Special Order No. 1-73 stipulates "counties North of Townline 20 North" which includes the Northern Peninsula. The exhibit attached to Special Order No. 1-73 referenced in (c) SPACING OF WELLS of the Section entitled Order is in error by omission of the Northern Peninsula from map.

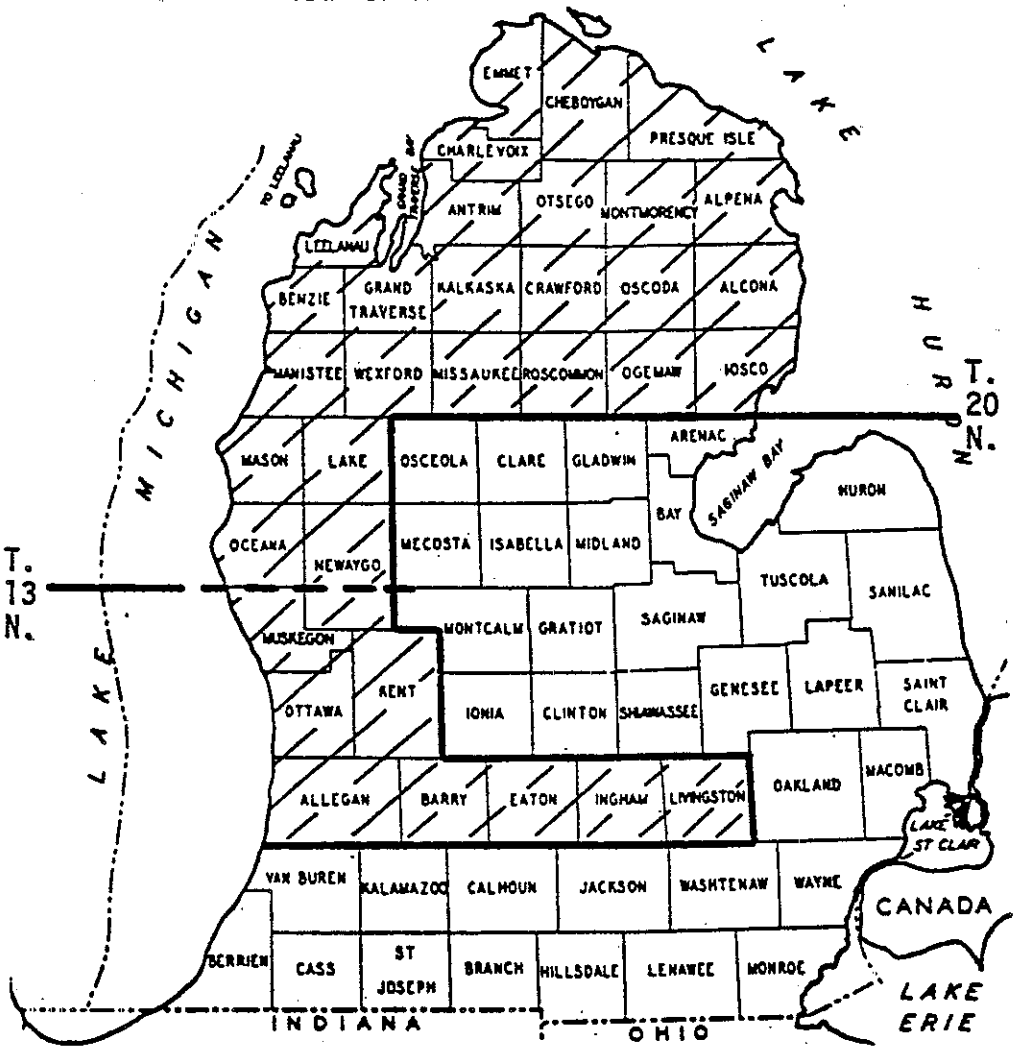
NOTE 2 Sections (F) and (G) of this Order have been determined to be void as a result of a ruling by the Michigan Supreme Court: 420 Mich 128, 1984

CAUSE NO. 23-1-73

SPECIAL ORDER NO. 1-73

Effective Date: April 1, 1973

MAP OF AREA

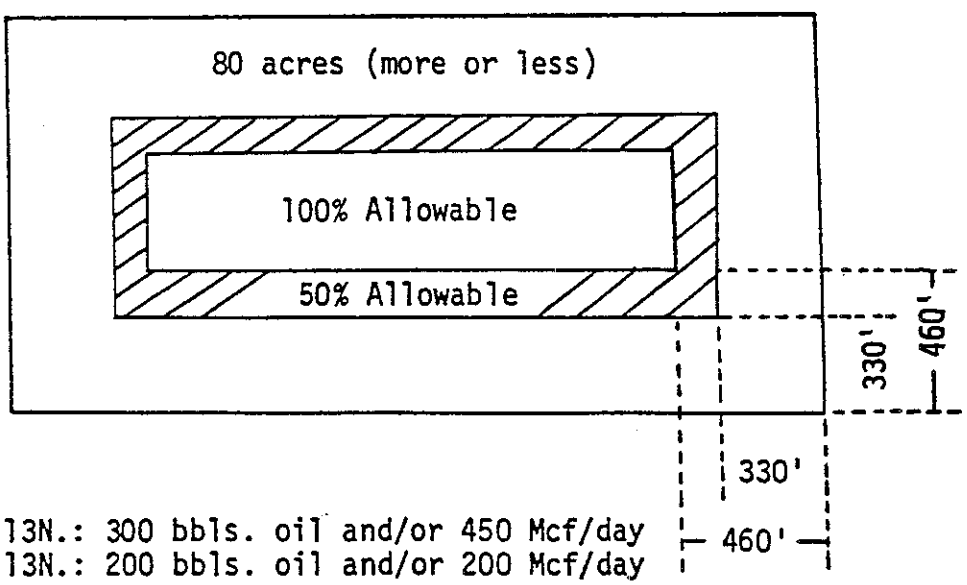


DRILLING UNIT

80 acres, more or less, by combining two (2) governmental surveyed quarter-quarter sections of land with a common boundary of approximately 1320 feet.

WELL SPACING

Not less than 460 feet from the unit line receives full allowable. From 460 feet to not less than a minimum distance of 330 feet from the unit line receives 50% allowable.



BASIC FULL ALLOWABLE

1) North of Townline 13N.: 300 bbls. oil and/or 450 Mcf/day
2) South of Townline 13N.: 200 bbls. oil and/or 200 Mcf/day

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

ORDER OF THE SUPERVISOR OF WELLS

IN THE MATTER OF:

THE PETITION OF TERRA ENERGY LTD. FOR AN ORDER ESTABLISHING ALLOWABLES FOR THE WATSON #11-29 WELL IN THE E½ OF SE¼ SECTION 29, BEAR LAKE TOWNSHIP MANISTEE COUNTY)	ORDER NO. 7-4-89

OPINION AND ORDER

This matter comes before the Supervisor of Wells and the Oil and Gas Advisory Board (Advisory Board) for decision, following a long and protracted process. The Petition in this cause was filed in February 1989 followed by a prehearing conference, various motions and eight days of hearing, held over a period from June 1989 to late October 1989. Following the hearing, posthearing briefs and replies were filed by the parties. The hearing was conducted before the Supervisor and Advisory Board. Not all Advisory Board members were present on all dates; therefore, they have all been provided with a complete transcript and all exhibits of the proceedings. The hearings were conducted pursuant to 1939 PA 61, as amended; and the promulgated rules. The purpose of the hearing was to consider the Petition of Terra Energy Ltd. (Terra), for an exception to SPECIAL ORDER NO. 1-73 and a Proration Order.

FINDINGS OF FACT

1. The Petitioner, Terra Energy Ltd., is the operator of the Watson #11-29 well (P.N. 41726) in the E½ of the SE¼, Section 29, Bear Lake Township, Manistee County. The Watson #11-29 well is a Salina-Niagaran oil well, completed as a development well, in the Bear Lake 33 Field. The bottom hole location of the well, at least the lowest perforations, is located 275 feet from the east line and 315 feet from the south line of the 80-acre drilling unit. Special Order No. 1-73 (1-73, Order 1-73) is the generally applicable spacing order; although it does not specificially provide for well locations closer than 330 feet from a unit line, or an allowable production rate for such wells, it does provide for special spacing and proration different than that specified (Section E) and for exceptions (Section H).

2. The Bear Lake 33 Field was discovered by Shell Western Exploration and Production Inc. (SWEPI) in 1975, by the drilling of the Sedelmaier-O'Hagan #1-33. The other three SWEPI wells were drilled later in 1975 or early 1976. Reef Petroleum drilled the Reef-Watson #1-29 well in 1978. This well was completed in the A-1 Carbonate and produced less than one thousand barrels of oil before it was plugged and abandoned. In 1988, Terra directionally drilled the Watson #11-29 well, with the stated objective of the Clinton, at a 330' location. The well was

directionally drilled so as to venture out some 75 feet beyond the 330' line towards the unit boundary on its way to the Clinton, and curve back into the objective formation. This excursion, beyond the 330'line, was to examine the Niagaran as a secondary objective. The well was dry in the Clinton and perforated and tested in the Niagaran. The well had not been permitted to the Niagaran and was not in a legal location for the Niagaran. The Petitioner subsequently obtained a rework permit, for the already performed Niagaran perforation. The Supervisor is not particularly impressed by the manner in which Terra selected their prospect and does not condone the practice of concealing the intent of an off-pattern-secondary-target. The fact remains that both Act 61 and Special Order No. 1-73 require an exception be obtained for an off-pattern location. Those who drill off-pattern wells, without benefit of an exception, do so at their own risk.

3. Terra and SWEPI provided extensive testimony concerning their geological, geophysical and engineering interpretations of the structure and reservoir. Both parties estimated the original oil in place of the reservoir to be approximately 10,000,000 barrels and the original gas in place to be approximately 12,000,000,000 cubic feet. Both placed the remaining primary reserves at approximately 400,000 barrels of oil. The differences in the estimates of total oil and gas in place and recoverable oil and gas in place, between Terra and SWEPI, are well within those expected of competent oil and gas producers. The parties differ widely on the amount of original oil and gas in place, and the amount of both recoverable and remaining reserves, under the Watson tract. If both parties can be so close in agreement concerning the entire reservoir, why is it that, as to the Watson tract, there is such a wide divergence of opinion? There is no easier place to calculate total reserves than a field that is virtually depleted. According to SWEPI, in approximately four years, we will know exactly how much producible oil and gas was present in this reservoir because it will be entirely depleted. The advanced stage of production provides clear and accurate data as to the whole reservoir. This case graphically demonstrates the limitations on the knowledge of Salina-Niagaran reefs and the speculative nature of predicting reserves for edge areas of those reefs. There are several tools used in the determination of potential reserves. Seismic gives an idea of the shape and configuration of the reef. Geologic data obtained from drilled wells will validate or amend the seismic conclusions. General assumptions about reef geometry and regional geologic knowledge, gained by drilling Niagaran oil and gas tests, are also used to form opinions. Terra chose to use reef geometry, well control and their experience to configure the reservoir. SWEPI chose to use seismic data and well control as their primary tools. The experience with Salina-Niagaran reef rock has clearly shown that it is heterogeneous in porosity and permeability. Often the reef edge wells are the most prolific producers in the reservoir. This production could be the result of several things, such as gravity drainage to edges, channeling, or well-developed porosity and permeability zones at reef edges. The productivity of reef edge wells could be attributed to well porosity and permeability or the presence of a large amount of oil in place. Thus, an attempt determine the recoverable oil along the edges of reefs is speculative. The same is also true of any attempt to calculate incremental oil the Watson #11-29 well might recover. The undisputed fact is that the Watson #11-29 well encountered production in commercial quantities at the well bore location. Further, it appears to be a reasonably strong producer with low gas to oil ratio, in spite of the advanced stage of depletion of the reservoir. There are significant recoverable oil reserves under the Watson tract, as well as some incremental oil to be recovered.

4. The Reef-Watson #1-29 well was drilled at a 330'-330' surface location in the unit corner closest to the existing, producing wells. The well produced oil, primarily from the A-1 Carbonate section of the reef, but was plugged and abandoned after producing about 1,000 barrels. The well was permitted as a straight hole. A subsequent gyro survey showed that the drill bit had walked 80 plus feet, primarily north-northwest away from the 330'-330' corner. Thus, the bottom hole location was 80 feet from the intended target. The data from this well and the offset producing well, lead Terra to believe there were hydrocarbons underlying the Watson tract, between the 330' and unit lines. SWEPI has taken the position that a well must be drilled dry at a 330'-330' location before an exception can be granted, and that such a location would be productive on the Watson Lease; therefore, the Watson #11-29 well must be plugged and redrilled to a 330'-330' location. It is the position of the Supervisor that a well drilled from a 330'-330' surface location as a straight hole is considered to have a 330'-330' bottom hole location. The Supervisor made this ruling as part of the preliminary motions in which Terra sought to have gyro surveys made to determine if the SWEPI bottom hole locations were proper in relation to their surface locations. There is no evidence in the Record to indicate that the Reef-Watson #1-29 well was drilled as anything other than straight-hole. For that matter, had the well walked in a southeasterly direction, for the same distance, it would be further encroaching than is the Watson #11-29 well. For a 6,000 foot hole to walk 80 feet is not quite 1½ percent deviation. Thus, it is the Supervisor's opinion that the Reef-Watson #1-29 well is a straight hole, is at a 330'-330' location and is a non-commercial dry hole. The fact that SWEPI had the Watson lease for a number of years and chose not to drill cannot go unnoticed. The viability of a proposed location is assessed before the well is drilled.

5. The orders of the Supervisor are to provide that each owner in the pool shall have an opportunity to produce his just and equitable share as far as it can be practicably determined. The Supervisor is also obligated to assure that those who seek to develop their property are not deprived of the opportunity to recover the hydrocarbons underlying their land. As previously found, the precise amounts of relative hydrocarbons present under the various units in this field are not ascertainable with reasonable certainty. SWEPI asserts that the "law of capture" absolves them from any past production that might have migrated from the Watson tract, and thus, Terra, upon drilling a well is limited to whatever reserves are remaining today. A decade and one-half of uncompensated drainage cannot be ignored, as though it did not happen. The facts demonstrate if oil and gas moved from the Watson tract, it moved to the SWEPI tracts. The oil, if it were not produced by the SWEPI wells, has moved to the SWEPI tracts. Thus, it could be suggested that potential production by the Watson #11-29 well from the SWEPI tract would be no more than returning oil to the Watson tract, that previously had migrated toward the SWEPI wells.

6. Special Order No. 1-73 recognizes the difficulty in predicting reserves in Salina-Niagaran reservoirs, the heterogeneous nature of the reservoirs, and the non-uniform shapes and sizes of the reservoirs. Thus, Special Order No. 1-73 allocates production on the basis of distance from unit boundaries. Several witnesses testified they believed that Special Order No. 1-73 had served the development of the Niagaran through several thousand wells in an acceptable manner. In those instances where the Supervisor has granted an exception, the underlying policy of 1-73 has been continued; that is, the exception cases have allocated production, again, on the basis of distance to the unit line. The basic

engineering principle of radial drainage is recognized, in that the closer a well comes to a unit line, the greater the probability of drainage from adjoining tracts. Thus, the Supervisor has used a logarithmic-based scale to establish appropriate production levels. This method recognizes the increased potential for drainage from offsetting tracts as the distance decreases between wells and unit lines. For example, a well between 41 feet and 99 feet from a unit line would be entitled to only five percent of a full allowable.

7. Terra has requested that they be granted an allowable of 400 barrels of oil per day. The presumed entitlement to this allowable is based upon the efficient gas oil ratio of the Watson #11-29 well as compared to other wells in the reservoir, the past production, and the incremental oil the Petitioner believes will be obtained. Early in the development of the Niagaran trend, the Supervisor issued several orders allowing experimental, stepped-up allowables for Niagaran wells. The proration levels in Special Order No. 1-73 are reflective of that experience. The production of wells at high rates, even at initial reservoir pressures, did not prove to be an efficient method of production. Most wells were unable to sustain high rates of production and it is believed that some may have damaged the reservoir. The Supervisor has serious doubts whether the Watson #11-29 well could sustain a 400 barrel per day production level for any period of time, without coning gas. A not improbable result would be damage to the reservoir and a decrease in the ultimate recovery that might otherwise be expected from the Watson #11-29 well. A major reason for the granting of the exception to the location requirements is to allow the Petitioner to protect their correlative rights and to recover their fair share of the reservoir products. It is a fact that the Terra well is the most efficient well in the reservoir. This is to be expected at the advanced stage of depletion present in this reservoir. There is no evidence that prior production and production-to-date has been done in anything other than an efficient manner. The only way to have recovered more hydrocarbons, would have been to unitize the field--a possibility that SWEPI explored at one time and, apparently, abandoned. Unitization would have been the best of all possible worlds, in that the Watsons would have been compensated for the hydrocarbons underlaying their property and, presumably, there would have been a substantial increase in the ultimate recovery of oil. To grant the Petitioner a 400 barrel per day allowable would be wasteful. The Supervisor believes distance-based proration is fair and equitable for reefs, and has worked well in the past. It would be inconsistent to now ignore relative reservoir positioning of wells and allocate only on a doubtful, presumed productive capability of the Watson #11-29 well, or on speculative reserve allocations. The concept of an equal opportunity to capture a fair share of reservoir products and energy is maintained by distance-based proration. Not one witness disagreed with the fact the Watson well would be entitled to 150 barrels of oil at a 330'-330' location, nor with 300 barrels at a 460'-460' location.

CONCLUSIONS OF LAW

1. This case has become one that is dependant upon the Supervisor's interpretation of Section 13 of Act 61. That section, among other things, discusses exceptions for well locations. Additionally, R299.1201 et. seq. generally addresses spacing and special spacing orders. Special Order No. 1-73 is a special spacing order promulgated pursuant of both Section 13 and Rule 201. Thus, all of these criteria come into consideration when a location exception is before the Supervisor and Advisory Board.

A fundamental tenet for Oil and Gas Law is the law of capture and Act 61 recognizes that tenet; however, capture is not absolute. The prevention of waste and protection of correlative rights modify the right of capture. Owners are to be allowed to recover their just and equitable share of oil and gas in the pool. Section 13 states in part,

> "The owner of any tract that is smaller than the drilling unit established for the field, shall not be deprived of the right to drill on and produce from such tract if same can be done without waste,..."

Section 13 also discusses exceptions to uniform spacing, which may be allowed for several reasons, including where a well located at a regular location would be unproductive. This Opinion has previously found as a matter of fact that a well at a regular location would be unproductive. I further conclude that an exception is necessary to protect correlative rights and allow the Petitioner to recover their fair share of the reservoir. That is, the Watson #11-29 well is being drilled into a producing reservoir with a competing well on an adjoining unit. The facts show a likelihood of substantial uncompensated drainage from the Watson tract. Therefore, to disallow Petitioner an opportunity to produce would be the functional equivalent of confiscation of their reserves.

2. The parties to this case have made a number of assumptions about what this case represents. SWEPI obviously views development between the 330' and unit lines as either a tremendous threat or unwelcome drilling obligation. Terra is the opportunist seeking to develop those small tracts orphaned by current development patterns. This dichotomy is obvious to the Supervisor, and is not likely to be settled by this Order. This controversy provides the opportunity to interpret and apply Act 61 in a new circumstance. Off-pattern drilling is not a new or uncommon circumstance. Certainly, the significant flexibility of Special Order No. 1-73 largely obviated the need for exceptions. Much of oil and gas law and regulation has grown out of fairly uniform predictable reservoirs. The Salina-Niagaran development has been the antithesis of such development. It now has reached a new stage of maturity. We are now greeted with circumstances not recognized in the early Special Order No. 1-73 development. It is only recently that we have seen sub-80-acre units.

I conclude that Act 61 and Special Order No. 1-73 (Section E and H) permit wells located closer than 330 feet to a unit line under the following circumstances.

1) That a well at a regular 330' location was a non-commercial dry hole.
2) That an offset well is or is likely draining the subject parcel.
3) That a sub-330'-well be subjected to distance based logarithmic reductions in allowable production rates; see Schedule A attached and incorporated by reference.
4) That there is geologic/geophysical evidence which indicates that a structure/reservoir underlies an area between the 330 feet line and unit lines.

3. The Supervisor is obligated to assure that all who own minerals are allowed to recover their fair share if it can be done without waste or uncompensated drainage. The Watson #11-29 well is not wasteful, and will not cause uncompensated

drainage. To the extent practicable, as discussed in the Findings of Fact, a proration schedule has been imposed that bears a reasonable relationship to reservoir conditions.

DETERMINATION AND ORDER

Based on the foregoing and in accordance with the recommendations of the Advisory Board, the Petition of Terra Energy Ltd. is granted in part.

Now therefore, It is Ordered:

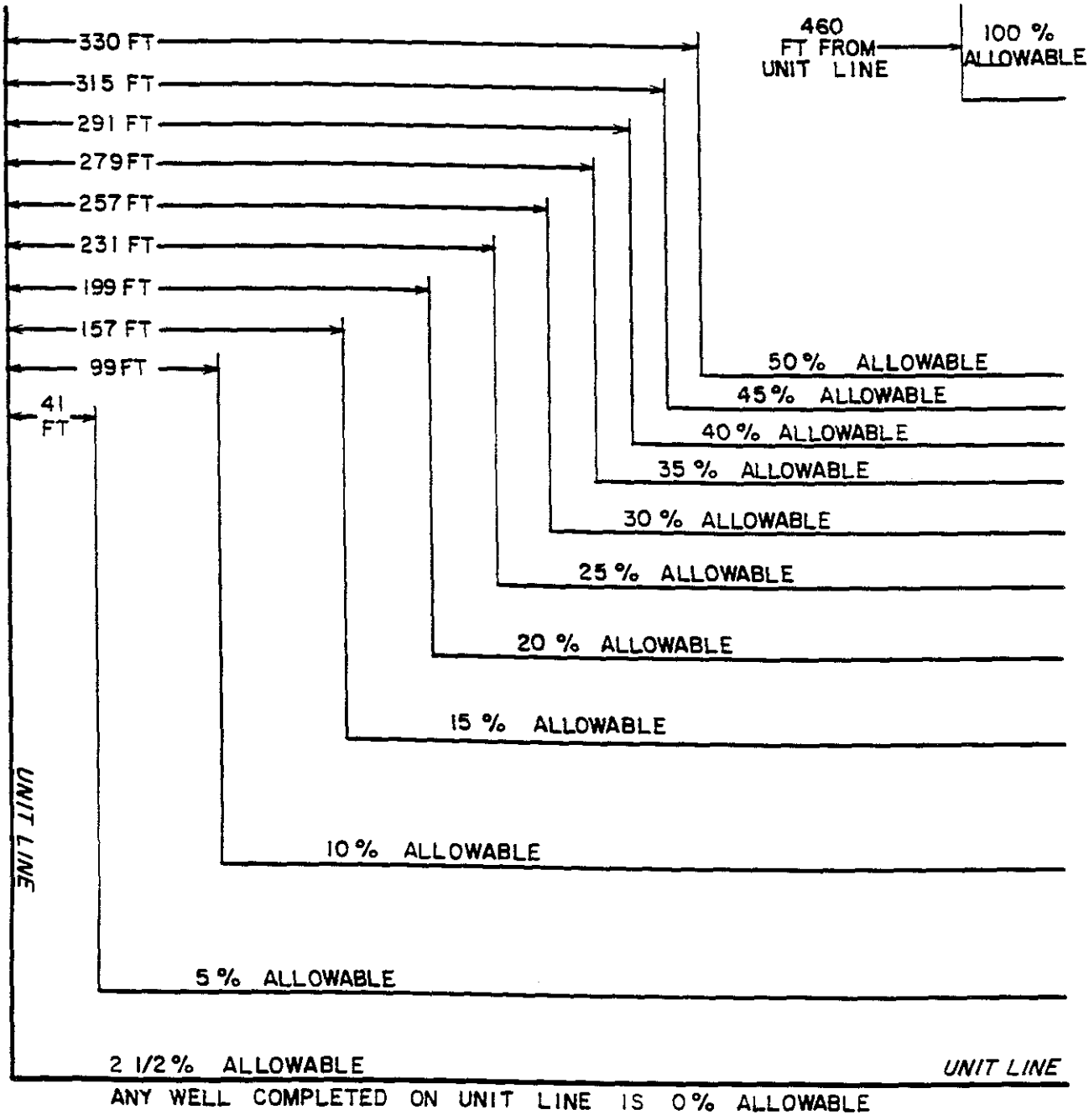
1. A location exception is granted as an exception to Special Order No. 1-73 for the Watson #11-29 well's perforations located at 275 feet from the east line and 315 feet from the south line of the drilling unit.

2. An allowable of 90 barrels of oil per day and/or 135 MCF of gas per day is hereby established for the Watson #11-29 well; this allowable is retroactive to May 25, 1989. The well shall be either shut in, or produced at a reduced rate, as directed by the Supervisor, until such time that cumulative daily overproduction has been accounted for. The Order granting a preliminary allowable dated: May 25, 1989 is rescinded.

Dated: January 24, 1990

R. Thomas Segall

R. THOMAS SEGALL
ASSISTANT SUPERVISOR OF WELLS



PRORATION PENALTY FOR PETROLEUM WELLS COMPLETED BETWEEN THE UNIT LINE AND THE 330 FOOT LINE.

SCHEDULE A
ORDER NO. 7-4-89

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

SPECIAL ORDER NO. 2-73, AMENDED

CASING AND SEALING REQUIREMENTS FOR WELLS DRILLED BELOW THE BASE OF THE DETROIT RIVER GROUP WITH ROTARY TOOLS

Pursuant to a public hearing held in Lansing, Michigan, on February 21, 1974, and review of the evidence and testimony presented and in consideration of the recommendation of the Oil Advisory Board, the Supervisor of Wells has determined the following procedure and minimum casing and sealing requirements are necessary to insure the health, welfare, and safety of the public. These requirements are hereby issued in conjunction with and in addition to the provisions of Rule 301, 302, and 306 of the General Rules promulgated June 21, 1971, under the authority of Act No. 61, Public Acts, 1939, as amended.

1) Casing shall be run from the surface to a depth no less than 100 feet into the bedrock and in all instances shall be run at least 100 feet below all fresh water aquifers; shall be cemented to the surface by the pump and plug method; shall be equipped with blowout preventer equipment in accordance with the provisions of the General Rules; and pressure tested in accordance with good oil field practice.

2) An intermediate string of casing of sufficient weight and quality to withstand the maximum anticipated pressure is to be run from the surface to a point below all porous or lost circulation zones between the Amherstburg Formation of the Detroit River Group and a point within the top fifty (50) feet of the Salina A_2 Carbonate or equivalent. The minimum size hole for any given size casing is to be one and three-quarters inches (1 3/4") larger in diameter than the outside diameter of the casing run. The casing is to be equipped with centralizers and scratchers in accord with good oil field practice and be cemented with a minimum of 150 sacks of cement of the proper class and such additives as may be necessary to provide a positive seal in the annulus for a minimum distance of 500 feet above the casing shoe. Additional cement shall be used if unusual drilling or well bore conditions are encountered or upon the direction of the Supervisor or his agent. A temperature survey shall be run in order to determine the top of the cement if the cement is not circulated to the surface. Verification of the survey, signed by the service company representative, designating the depth at which he found the top of the cement, shall be left at the rig and be available for inspection by the Supervisor's agent. A copy of the temperature survey and copy of the cementing service ticket shall be filed promptly at the office of the Supervisor.

3) Blowout prevention equipment shall be installed to provide positive SINGLE shut-off protection when the drill pipe is out of the hole; to provide positive DOUBLE shut-off protection when drill pipe is in the hole; to provide connections separate of those of the casinghead for choke and kill line assemblies; and to provide protection against casing wear.

4) All outlets, fittings, and connections on the casing, blowout preventers, and auxiliary well head equipment which may be subject to well head pressure shall be of such material construction designed to withstand the maximum anticipated pressure at the well head. All lines from outlets on or below the blowout preventers shall be securely anchored. All outlets below the blowout preventers shall be the flange type.

(B) DRILLING UNIT EXCEPTION - continued

Should a well be completed on such partial drilling unit, a full drilling unit shall be formed by voluntary or compulsory pooling. This pooled unit shall conform with the provisions of (A) above or shall conform to a drilling unit to be adopted following public hearing.

(C) SPACING OF WELLS

Permits may be granted for the drilling of exploratory and development wells for oil or gas without a proration penalty provided the location is not less than four hundred and sixty (460) feet from an adjoining drilling unit as prescribed in (A) above. Permits may also be granted at locations less than four hundred and sixty (460) feet but not less than three hundred and thirty (330) feet from an adjoining drilling unit subject to a fifty per cent (50%) proration penalty. Refer to exhibit attached.

(D) BASIC ALLOWABLE

Subsequent to the 30-day test program and the filing of final test data as provided in Special Order 2-71, "Testing and Reporting Procedure for Oil Wells" all oil wells, as provided for in this order, will be allowed to produce a standard or basic prorated allowable as follows:

1) Wells located north of Townline 13 North: Not to exceed 300 barrels of oil and/or 450,000 cubic feet of gas per day.

2) Wells located south of Townline 13 North: Not to exceed 200 barrels of oil and/or 200,000 cubic feet of gas per day.

Until such time a study has been completed on the feasibility of adopting a depth bracket allowable, the present established basic allowable, as set forth above, will remain in effect.

(E) ADOPTION OF SPECIAL SPACING AND PRORATION ORDERS

The development of an oil or gas field following the completion of a discovery well may warrant the adoption of a drilling unit, well spacing pattern, and proration other than that specified. Any interested person may request, or the Supervisor may schedule, a hearing to consider the need or desirability of adopting a special spacing and proration order to apply to a designated area, field, or pool.

(F) COMMUNITIZATION TO FORM DRILLING UNITS

NOTE 2

All royalty and working interests within a drilling unit shall be communitized and each royalty owner therein shall participate in the royalty from the well drilled thereon in the relation that the acreage of such owner bears to the total acreage of the unit.

THIS SECTION IS VOID

5) Before drilling the plug, the blowout preventers, surface connections and fittings, auxiliary well head equipment, and the intermediate casing is to be satisfactorily pressure tested for a period of at least 20 minutes at a stabilized pressure of not less than 1,500 psig. A representative of the Supervisor shall be notified a minimum of 12 hours prior to commencement of the test.

6) Prior to drilling potential producing zones the blowout preventers, surface connections and fittings, auxiliary well head equipment, and intermediate casing are to be satisfactorily pressure tested for a period of at least 20 minutes at a pressure commensurate to the maximum rated working pressure. A representative of the Supervisor shall be notified a minimum of 12 hours prior to commencement of the test.

7) Mechanical tests shall be made by each crew on every tour to insure that the blowout preventers are in working order and will close properly.

8) A record of each pressure test and each mechanical test of the casings, blowout preventers, surface connections and fittings, and auxiliary well head equipment shall be entered in the log book and kept available for inspection by the Supervisor of Wells or his authorized representative.

9) Any failure of the casings, blowout preventers, surface connections and fittings, or auxiliary well head equipment during the required pressure or mechanical tests shall be corrected or repaired and retested. The nature of the failure, its repair, and retesting shall be recorded in the log book before drilling is resumed.

10) The development of any hazardous condition during drilling operations such as lost circulation, threatened blowouts, casing or cement failure or failure of any secondary control equipment must be reported promptly to the Supervisor of Wells.

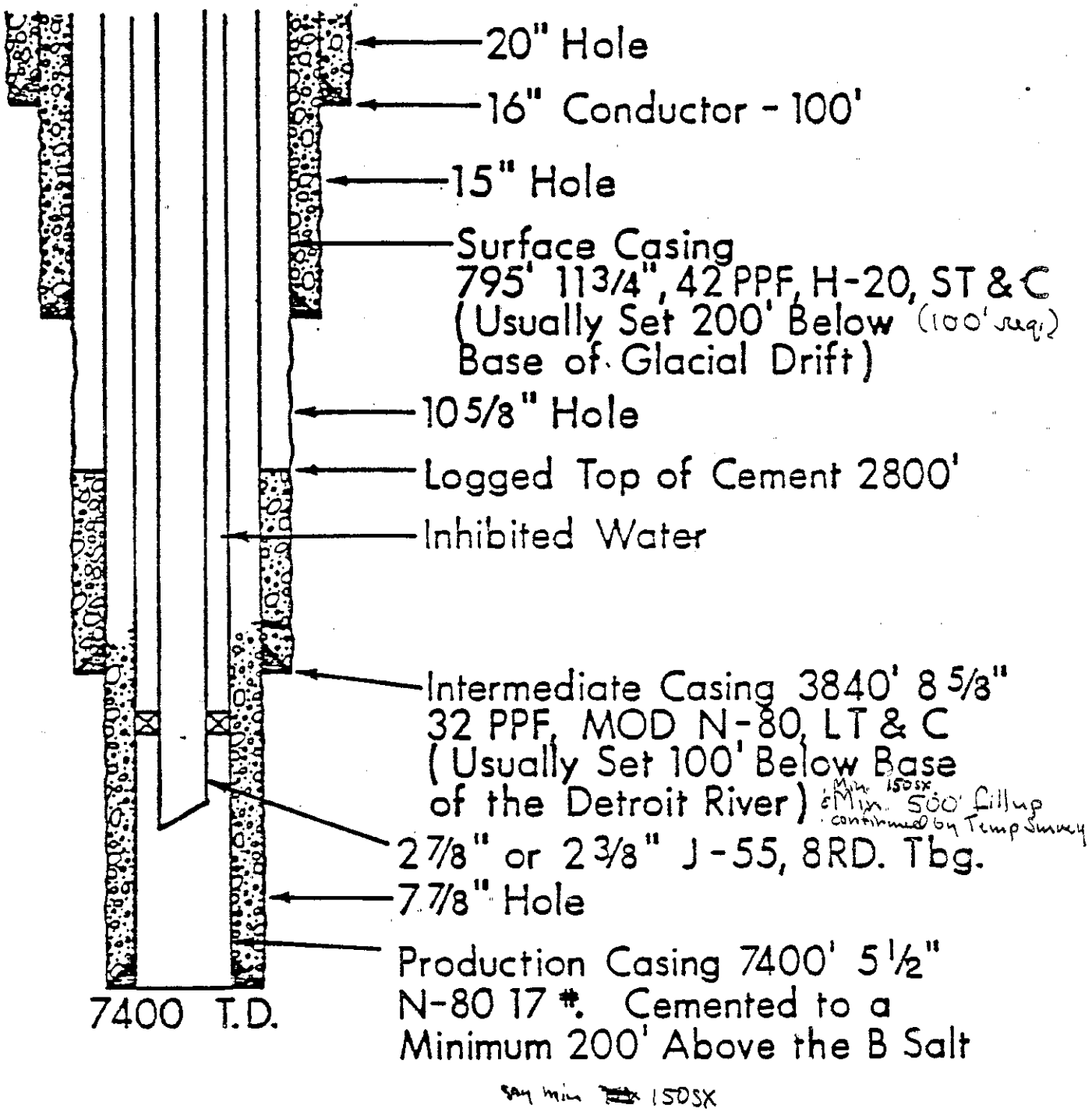
The requirements and procedures set forth are applicable to all wells drilled below the base of the Detroit River Group with rotary tools except where special rules are adopted pursuant to public hearings scheduled for such purpose; or in instances where subsequent to receipt of written supportive data and upon review and evaluation and where deemed appropriate exceptions may be granted by the Supervisor or his authorized representative; or in instances where the Supervisor finds them inadequate or inappropriate and adopts such requirements as he may deem appropriate and necessary; or in the event unusual geological conditions or mechanical problems are encountered during drilling operations.

This order amends and supersedes Special Order No. 2-73 dated May 21, 1973, and Casing and Sealing Directives issued December 21, 1967, and January 30, 1970, pertaining to the Albion-Scipio Trenton-Black River Formation Trend Field in Calhoun, Jackson, and Hillsdale Counties and Specified Areas of Calhoun County and directive effective June 1, 1968, pertaining to St. Clair and Macomb Counties.

Signed and ordered published this 15th day of April, 1974.

A. GENE GAZLAY
SUPERVISOR OF WELLS

TYPICAL MICHIGAN NIAGARAN REEF WELL BORE



Superceded by S.O. 2-73, Amended, dated 4-15-74

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

SPECIAL ORDER NO. 2-73

CASING AND SEALING REQUIREMENTS
FOR ALL WELLS DRILLED BELOW THE DETROIT RIVER FORMATION

Consistent and in conjunction with the provisions of Rules 301, 302, and 306 in the General Rules promulgated effective June 21, 1971, under the authority of Act No. 61, Public Acts of 1939, as amended, and Rule 6 of the General Rules promulgated effective January 1, 1957, under the authority of Act No. 326, Public Acts of 1937, as amended, the following procedures and minimum casing and sealing requirements are hereby issued and in effect:

1) An intermediate string of casing designed to withstand the maximum anticipated pressure is to be run from the surface to a point below the base of the Detroit River Formation and below any other porous formations prior to drilling the Salina A_2 Carbonate or equivalent and be cemented with no less than 150 sacks of cement and to no less than a minimum height of 500 feet above the casing shoe. A temperature survey shall be run to determine the top of the cement and shall be immediately available to the Supervisor of Wells or his representative and filed as part of the well records.

2) Blowout prevention equipment shall be installed to provide positive SINGLE shut-off protection when the tools and drill pipe are out of the hole; to provide positive DOUBLE shut-off protection when the tools and drill pipe are in the hole; to provide connections separate of those of the casinghead for choke and kill line assemblies; and to provide protection against casing wear.

3) All outlets, fittings, and connections on the casing, blowout preventers, and auxiliary well head equipment which may be subjected to well head pressure shall be of such material and construction designed to withstand the maximum anticipated pressure at the well head. All lines from outlets on or below the blowout preventers shall be securely anchored. All connections below the blowout preventers shall be the flange type.

4) Prior to drilling out cement immediately above the shoe the blowout preventers, surface connections and fittings, auxiliary well head equipment and the intermediate casing is to be satisfactorily pressure tested for a period of at least 20 minutes at a pressure not less than 1500 psig. The office of the Supervisor shall be notified a minimum of 12 hours prior to commencement of the test.

SPECIAL ORDER NO. 2-73 (continued)

5) Mechanical tests shall be made by each crew on every tour to insure that the blowout preventers are in working order and will close properly.

6) A record of each pressure test and each mechanical test of the casings, blowout preventers, surface connections and fittings, and auxiliary well head equipment shall be entered in the log book and kept available for inspection by the Supervisor of Wells or his authorized representative.

7) Any failure of the casings, blowout preventers, surface connections and fittings, or auxiliary well head equipment during the required pressure or mechanical tests shall be corrected or repaired and the nature of the failure and repairs duly recorded in the log book before drilling is resumed.

8) The development of any hazardous condition during drilling operations such as the failure of the well bore to retain drilling fluids, casing or cement failure or failure of any control equipment must be reported promptly to the Supervisor of Wells.

The procedures and requirements set forth above are applicable to all wells drilled below the base of the Detroit River Formation.

Signed and ordered published this 21st day of May, 1973

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
SUPERVISOR OF WELLS

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

EMERGENCY ORDER NO. 2-73

CASING AND SEALING REQUIREMENTS
FOR ALL WELLS DRILLED BELOW THE DETROIT RIVER FORMATION

The following requirements are issued hereby in accordance with the provisions of Section 16, Act No. 61 of the Public Acts of the State of Michigan, 1939, as amended, and Rule No. 306 of the General Rules promulgated thereunder, and Act No. 326 of the Public Acts of the State of Michigan, 1937, as amended, to become effective on April 27, 1973.

1) All wells drilled for oil and gas to a depth below the Detroit River Formation, throughout the State of Michigan, for which drilling permits have been issued and drilling operations have not commenced and all future permitted wells shall be required to run an intermediate string of casing from the surface to below the base of the Detroit River Formation prior to drilling the Salina A_2 Carbonate Formation and to cement the casing to the surface.

2) A pressure test shall be made on the intermediate string of casing, blowout preventers, surface connections and fittings, and auxiliary well head equipment before drilling out the cement. This test shall be made at a minimum pressure of 1,500 pounds per square inch for a period of at least 30 minutes. The office of the Supervisor shall be notified at least 12 hours prior to commencement of the test. A record of this test shall be entered and certified in the log book.

Signed and ordered published this twenty-third day of April, 1973.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
SUPERVISOR OF WELLS

NATURAL RESOURCES COMMISSION
THOMAS J. ANDERSON
MARLENE J. FLUHARTY
KERRY KAMMER
STEWART MYERS
VID D. OLSON
RAYMOND POUPORE

STATE OF MICHIGAN

JAMES J. BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
BOX 30028
LANSING, MI 48909

GORDON E. GUYER Director

DEC — 5 1995

June 15, 1987

TO OIL AND GAS DRILLERS AND OPERATORS

The Department of Natural Resources and the Supervisor of Wells, having a constant commitment to protect the water resources of the State, have determined that modification of current drilling practices under S.O. #2-73, amended, are necessary in certain areas.

In parts of the State, shown on the accompanying map, attempts to drill through the Middle Devonian and Upper Silurian rock usually result in loss of drilling fluid. In addition, attempts to cement surface casing usually result in loss of cement and no returns to surface. The uncemented annulus remains as an avenue for invasion by pollutants of fresh water aquifers in both the glacial drift and the formations being discussed.

Rule 306 of Act 61, PA 1939, amended, requires that aquifer systems be protected from pollutants borne by fluids moving either up or down the hole. Because of the local geology the hole for the surface casing must be drilled to a depth below the base of the Detroit River Group to provide this protection. Special Order No. 2-73, Amended, CASING AND SEALING REQUIREMENTS FOR WELLS DRILLED BELOW THE BASE OF THE DETROIT RIVER GROUP WITH ROTARY TOOLS; therefore, governs the depth and method of setting casing.

Requesting an Exception to S.O. #2-73, Amended

An exception to Special Order #2-73, amended, will be required for the setting of surface casing in areas of the State having formations which contain collapse features or what is commonly described as karst topography. Special Order #2-73, amended, with Information Circular IC-7200-2 (Revised 5-87) Requesting An Exception To Special Order No. 2-73, Amended is enclosed. Information Circular IC-7200-2 parts F(1) through F(6) under RESTRICTIONS AND CONDITIONS APPLYING TO EXCEPTIONS in addition to Sections A through B(1) under INSTRUCTIONS FOR REQUESTING AN EXCEPTION address this problem. Please refer to them when preparing an Application to Drill a Well in these particular areas of the State.

R. Thomas Segall
Assistant Supervisor of Wells

GEOLOGICAL SURVEY DIVISION, DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 30028, LANSING, MI 48909

REQUESTING AN EXCEPTION TO SPECIAL ORDER NO. 2-73, AMENDED

Restrictions, conditions and instructions for requesting an exception to Special Order No. 2-73, amended, "CASING AND SEALING REQUIREMENTS FOR WELLS DRILLED BELOW THE BASE OF THE DETROIT RIVER GROUP WITH ROTARY TOOLS." (Submit requests as part of the Application for Permit to Drill.)

RESTRICTIONS AND CONDITIONS APPLYING TO EXCEPTIONS

A Though an exception to Special Order No. 2-73 may be granted, all other pertinent requirements of the Special Order remain in effect. The supervisor's representatives must be notified immediately if circulation loss or high pressure is encountered. Remedial measures must be undertaken immediately if it is determined that hazardous or potentially hazardous conditions exist. These measures may require running intermediate casing.

B An exception to reduce or eliminate intermediate casing will rule out permission at a later date to deepen the well to deeper potentially productive formations unless another intermediate casing is run.

C Exceptions that reduce or eliminate intermediate casing may not be granted if the drilling program includes cutting core in the Salina-Niagaran or deeper formations. (See instruction for requesting an exception)

D In Northern Michigan an exception for setting a shorter intermediate casing string may be allowed in certain limited areas. The intermediate casing string may be set below the Detroit River Salt rather than below the Amherstberg formation where conditions allow.

E In Southern Michigan, an exception allowing the setting of extended surface casing instead of running intermediate casing may be granted. Should such an exception be granted, the minimum amount of surface casing required shall be 30% (.30) of the intended depth of the well. It shall be cemented with a volume of cement sufficient to circulate uncontaminated slurry to the surface. Conductor casing may be required to protect the fresh water bearing strata and/or enable the hole to be drilled without undue risk.

F (1) In some areas of northern and southeastern Michigan karst and collapsed or fractured strata may result in "losing returns" into deep aquifers containing fresh water. These geologic conditions are associated with the subcrop and outcrop of the Middle Devonian and upper Silurian strata (see map).

(2) The geologic setting that has resulted in these deep fresh water aquifers also dictates the need for setting surface casing into extraordinarily deep formations. In this case the surface casing also may serve the purpose of intermediate casing and obviate the need for additional intermediate casing. Restrictions on coring and deepening will not ordinarily be imposed when casing is set into formations in accord with paragraph 2), Special Order No. 2-73, amended.

(3) Special Order No. 2-73 requires surface casing both to be run at least 100 feet below fresh water aquifers and to be cemented to the surface. When cement does not return to the surface because of "losing returns", an exception to the requirement must be requested specifying the measures proposed to deal with the situation. All avenues for entry of pollutants into fresh water from surface sources must be closed.

(4) No fluid shall be injected into the annulus between the surface casing and conductor casing.

(5) Only fresh water fluid and biologically inert fluid loss or circulation control materials shall be used for drilling and setting the conductor and surface casing. Operations shall conform to the practices set forth in "Notice and Requirements for Sources of Water and Water Wells Used in Conjunction With Oil and Gas or Mineral Well Drilling and Operations", December 1, 1984.

OVER

(6) The plan that follows is not sponsored by but is acceptable to the Supervisor of Wells. An applicant may propose an alternative. Placing bull plugs in the wellhead outlets is not sufficient.

(a) Set conductor pipe well into bedrock, where possible, below upper fresh water aquifers. Cement to surface. Setting conductor pipe in this manner will prevent flow down the hole or casing annulus into deeper lost circulation zones which may have significantly lower hydraulic heads. The conductor pipe shall be of such a diameter that there is room for a grout pipe to be inserted between the conductor and surface casing.

(b) When "losing returns" of drilling fluid, set extended surface casing to a depth below the lowermost porous or lost circulation zone containing fresh water. Select, where possible, a casing point at a depth and in a formation capable of containing cement to seal the annulus for a distance of 500 feet or more above the casing shoe. Do not penetrate rock salt. Cement with a volume of cement equal to the calculated annular volume to circulate to surface plus 100% excess. In addition to other casing hardware run a cementing basket on this casing below the third collar from the top at least 50 feet below ground. Cement the annulus through a grout pipe from the cementing basket to the surface if cement from the primary cement job fails to circulate. At least 50 feet of cement must remain in the annulus above the cementing basket.

(c) Should problems arise in implementing this and other practices, additional or alternate plans may be required by the Supervisor of Wells or his authorized representative.

INSTRUCTIONS FOR REQUESTING AN EXCEPTION

Respond, as needed, in detail to the concerns listed below. Attach and submit as supplemental sheet(s) per instructions found with the Application for Permit to Drill.

(A) Describe any drilling problems encountered in the adjacent wells or that are known to the area. Provide all pertinent data and a detailed description including: a location map showing the adjacent well(s); geological information; and information about pressure, casing and cementing.

(B) Outline a contingency plan should an exception be granted and one or more of the following conditions be encountered:

(1) Circulation loss zone(s) incapable of supporting a cement column to the surface on surface casing or to the prescribed height on intermediate casing.

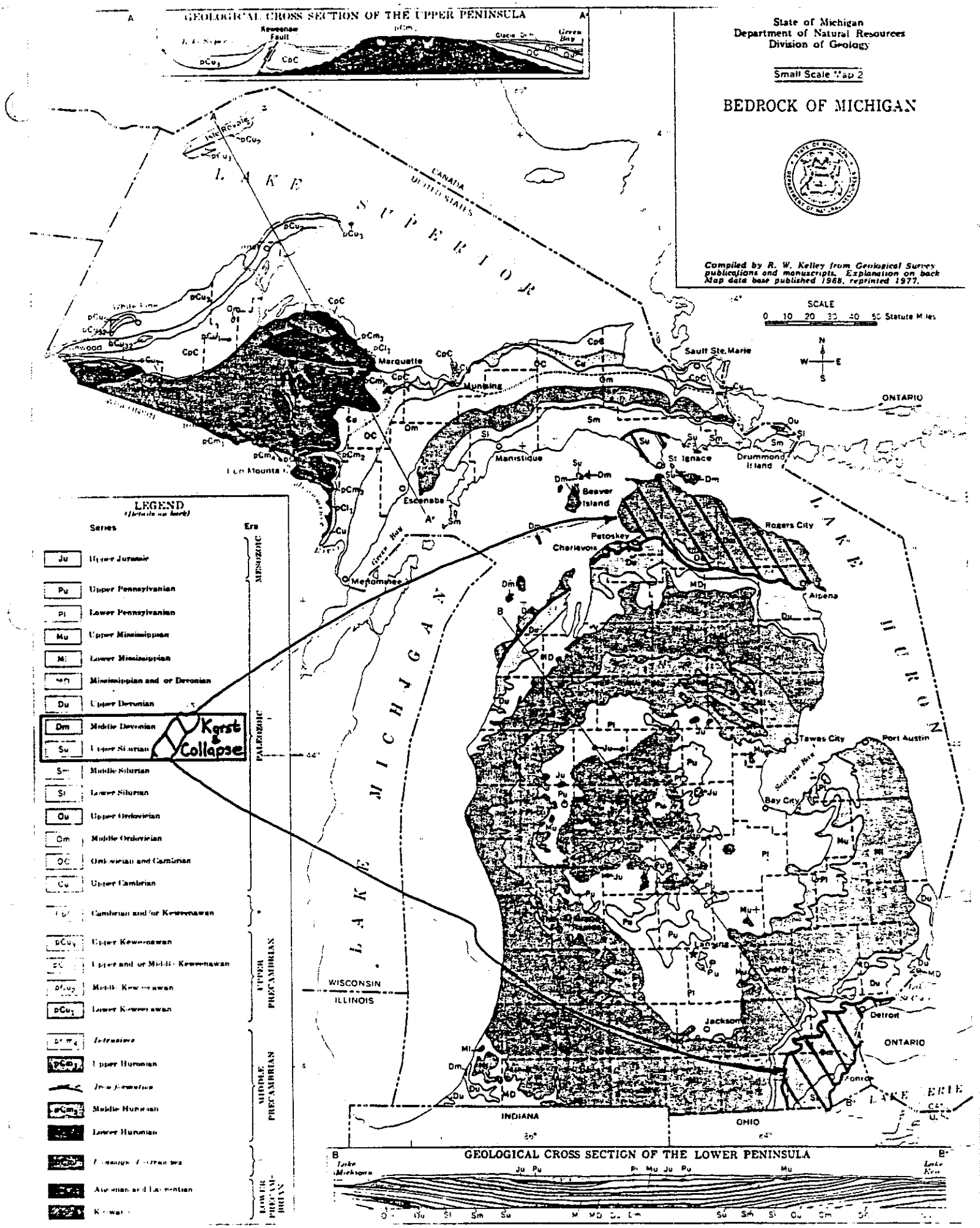
(2) Circulation loss zone(s) incapable of supporting the column of drilling fluid without the addition of lost circulation material and/or which would break down if subjected to formation pressure should it be necessary to close the blowout preventers.

(3) Failure to obtain a pressure test which meets specifications as set forth in Special Order No. 2-73 or as prescribed by the Supervisor's representative.

(4) Gas pressure zones above the producing horizon capable of causing a kick sufficient to unload or cause a partial unloading of the drilling fluid from the well bore.

(5) Potential lost circulation and BLOWOUT conditions subsequent to encountering the producing horizon and/or before production casing is set and cemented.

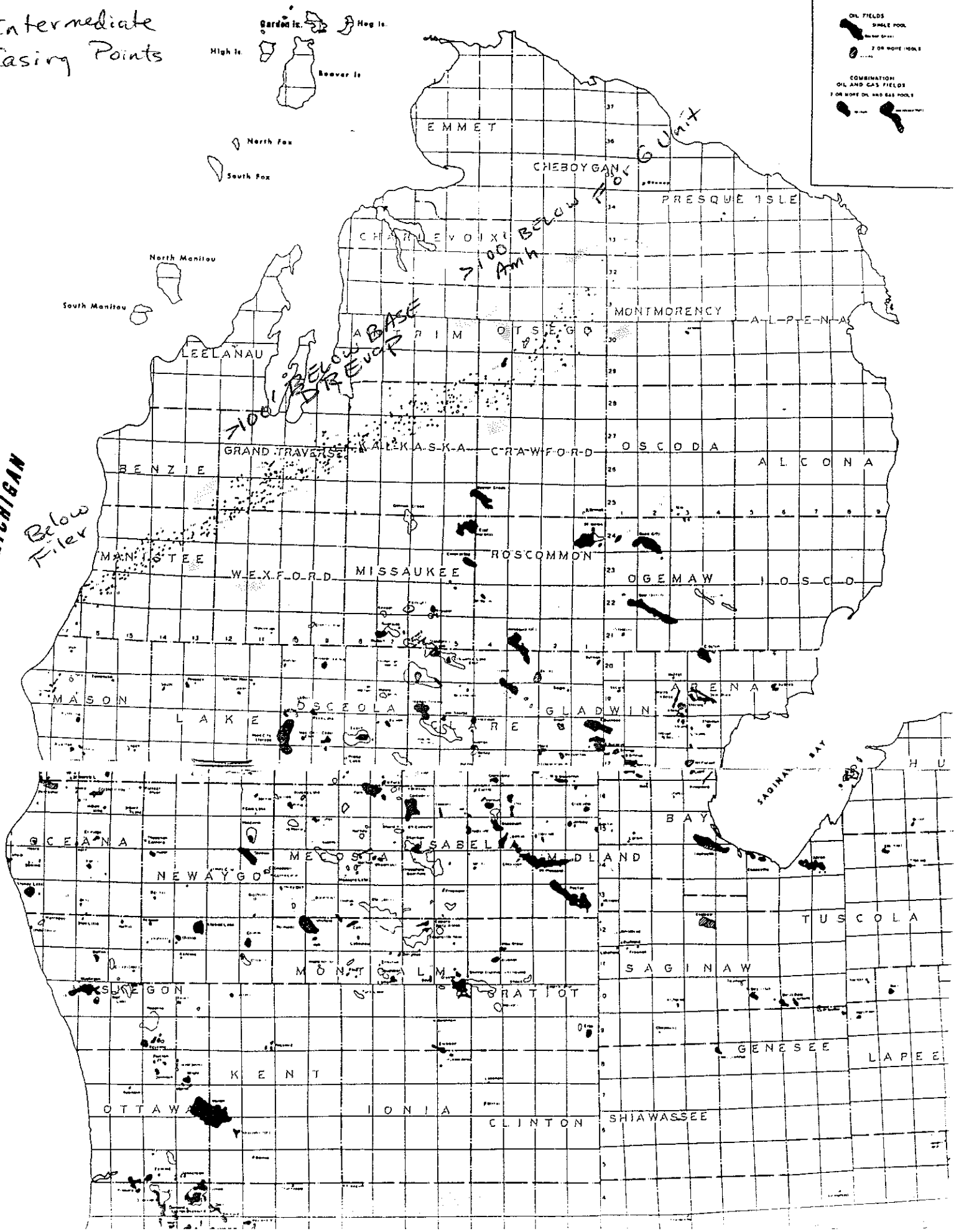
CONTACT THE GEOLOGICAL SURVEY DIVISION OR DISTRICT GEOLOGIST FOR SPECIFIC CASING, SEALING AND DRILLING DETAILS.


State of Michigan
Department of Natural Resources
Division of Geology
Small Scale Map 2
BEDROCK OF MICHIGAN
Compiled by R. W. Kelley from Geological Survey publications and manuscripts. Explanation on back
Map data base published 1968, reprinted 1977.
GEOLOGICAL CROSS SECTION OF THE UPPER PENINSULA
Keweenaw Fault
SCALE
0 10 20 30 40 50 Statute Miles
N
W
E
S
LAKE SUPERIOR
CANADA
UNITED STATES
Marquette
Munising
Sault Ste. Marie
ONTARIO
Manistique
St. Ignace
Drummond Island
Escanaba
Beaver Island
Rogers City
Petoskey
Charlevoix
Menominee
Alpena
LAKE HURON
LAKE MICHIGAN
Tawas City
Port Austin
Bay City
Lansing
Jackson
Detroit
Monroe
LAKE ERIE
WISCONSIN
ILLINOIS
INDIANA
OHIO
LEGEND
(Details on back)
Series
Era
Ju Upper Jurassic
Pu Upper Pennsylvanian
Pl Lower Pennsylvanian
Mu Upper Mississippian
Ml Lower Mississippian
MD Mississippian and or Devonian
Du Upper Devonian
Dm Middle Devonian
Su Upper Silurian
Sm Middle Silurian
Sl Lower Silurian
Ou Upper Ordovician
Om Middle Ordovician
OC Ordovician and Cambrian
Cu Upper Cambrian
Cambrian and/or Keweenawan
pCu3 Upper Keweenawan
pCu2 Upper and or Middle Keweenawan
pCu1 Lower Keweenawan
Intrusive
Upper Huronian
Middle Huronian
Lower Huronian
Archean and Laurentian
Kewatin
MESOZOIC
PALEOZOIC
UPPER PRECAMBRIAN
MIDDLE PRECAMBRIAN
LOWER PRECAMBRIAN
Karst & Collapse
GEOLOGICAL CROSS SECTION OF THE LOWER PENINSULA
Lake Michigan
Lake Erie

MICHIGAN OIL AND GAS FIELDS, 1982

DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

Intermediate Casing Points



SPECIAL ORDER NO. 1-78
Effective: March 15, 1978

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

Cause No. 4-2-78: Adopting a Special Order authorizing the Supervisor of Wells to determine and establish well allowables which will provide for the expeditious depletion of a reservoir, pool, or field after it has been shown that oil and/or gas allowables as set forth in Special Order No. 1-73 and other specified proration orders are no longer appropriate, effective, or necessary to prevent waste.

OPINION AND ORDER OF THE SUPERVISOR OF WELLS

On February 23, 1978, a hearing was held before the Supervisor of Wells and Advisory Board. The purpose of the hearing was to consider the adoption of a special order to provide for expeditious depletion of reservoirs, fields, or pools subject to a proration order. The hearing was conducted pursuant to Act No. 61, P.A. 1939, as amended and the promulgated rules.

FINDINGS OF FACT

1. The staff of the Geological Survey Division is the petitioner in this cause.

2. The staff has proposed an expeditious method of reviewing the allowables for wells located in fields that are in the depletion or blow down stage of production.

3. A special order is necessary to eliminate the need for individual proration hearings on each field and to provide a method of administrative review of requests for changes in allowables.

CONCLUSIONS OF LAW

Pursuant to Section 6 of Act No. 61, P.A. 1939, as amended the Supervisor is empowered to: Sec. 6 (a) ". . ., issue orders and instructions necessary to enforce such rules and to do whatever may be necessary with respect to the subject matter herein to carry out the purposes of this act. . ." (j) "To fix the spacing of wells and to regulate the production therefrom. (k) To require the operation of wells with efficient gas-oil ratios."

ORDER

Wherefore based upon the evidence presented and in accordance with the recommendation of the Advisory Board, it is the opinion of the Supervisor that a Special Order is necessary.

Now, therefore, it is ordered that the following procedure is adopted for requests for exceptions to oil and/or gas allowables as set forth in Special Order 1-73 and other specified proration orders when proration ceases to prevent waste.

The procedure is as follows:

(1) A petition for an exception to the established well allowable shall be filed with the Supervisor of Wells and shall include the following:

a. Name and address of the petitioner.

b. Description, location, section, township, and county relating to the matter to be heard.

c. Names and address of owners, operators, lessees, lessors, and other interested parties which would be affected by the adoption or denial of the action proposed.

d. Maps, plats, logs, pertinent engineering data, production data, and exhibits necessary to show that the reservoir, field, or pool is in the depletion stage and that the current restricted production rates are no longer effective.

e. A recommendation as to alternate producing allowables.

(2) A meeting will be scheduled by the Supervisor of Wells to consider the petition. The petitioner is to furnish a copy of the notice of meeting to all owners, operators, lessees, lessors, and all owners of record of the oil and gas mineral interests underlying the lands directly affected by the proposed action.

(3) If the proposed action is contested by a party of interest, a hearing may be required. A determination of whether the hearing is to be administrative or before the Oil Advisory Board will be made by the Supervisor of Wells.

(4) Following a review and evaluation of the data presented either administratively, or by public hearing, the Supervisor of Wells will issue an order of determination.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
ASSISTANT SUPERVISOR OF WELLS

CAUSE NO. 1-1-81 SPECIAL ORDER NO. 2-81

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
SUPERVISOR OF WELLS

SPECIAL SPACING AND PRORATION ORDER FOR WELLS DRILLED INTO THE SALINA-NIAGARAN FORMATION WITHIN OAKLAND COUNTY

At a public hearing held in Lansing, Michigan, on January 21, 1981, after due notice and pursuant to Act No. 61 of the Public Acts of 1939, as amended, and the promulgated rules, evidence and testimony was presented to the Supervisor of Wells and the Advisory Board on the need and desirability of adopting a Special Order pertaining to the exploration, development, and production of wells drilled for oil and/or gas into the Salina-Niagaran Formation in Oakland County.

Pursuant to the recommendations of the Advisory Board following full consideration of the evidence and testimony submitted, the Supervisor of Wells finds that it is necessary to establish a special spacing and proration order to provide for the orderly development of the Salina-Niagaran reef-type reservoirs, prevent waste, protect correlative rights, and eliminate the drilling of unnecessary wells.

ORDER

Effective February 6, 1981, the requirements for the location, spacing, and production of wells drilled for oil and/or gas into the Salina-Niagaran Formation in Oakland County, except for wells where special spacing orders, rules, or determinations are in effect, are as follows:

(A) DRILLING UNIT

The drilling unit shall be forty (40) acres, more or less consisting of a governmental surveyed quarter-quarter section of land.

(B) SPACING OF WELLS

Permits may be granted for the drilling of exploratory and development wells for oil or gas without a proration penalty provided the location is not less than four hundred and sixty (460) feet from an adjoining drilling unit as prescribed in (A) above. Permits may also be granted at locations less than four hundred and sixty (460) feet, but not less than three hundred and thirty (330) feet, from an adjoining drilling unit subject to a fifty per cent (50%) proration penalty. Refer to exhibit attached.

(C) BASIC ALLOWABLE

Subsequent to the 30-day test program and the filing of final test data as provided in Special Order 2-71, "Testing and Reporting Procedure for Oil Wells" all oil wells, as provided for in this order, will be allowed to produce a standard or basic prorated allowable not to exceed 200 barrels of oil and/or 200,000 cubic feet of gas per day.

Signed and ordered published this sixth day of February, 1981.

Arthur E. Slaughter

ARTHUR E. SLAUGHTER
ASSISTANT SUPERVISOR OF WELLS

Dated: February 6, 1981

Exhibit I

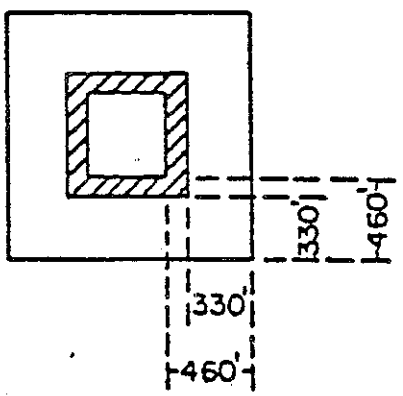
Map of Area

WELL SPACING

Not less than 460 feet from the unit line receives full allowable. From 460 feet to not less than a minimum distance of 330 feet from the unit line receives 50% allowable.

BASIC FULL ALLOWABLE

200 bbls. oil and/or
200 Mcf/day



This document paid for with State funds

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

ORDER OF THE SUPERVISOR OF WELLS

IN THE MATTER OF

CAUSE NO. 2-4-86, A HEARING SCHEDULED AT THE INITIATIVE OF THE SUPERVISOR TO CONSIDER SPACING FOR WELLS DRILLED FOR GAS BELOW THE TOP OF THE GLENWOOD MEMBER OF THE BLACK RIVER GROUP IN SPECIFIED AREAS OF THE STATE	SPECIAL ORDER NO. 1-86 Effective: August 8, 1986

OPINION AND ORDER OF THE SUPERVISOR OF WELLS

On April 29, 30 and May 20, 1986, a technical evidentiary hearing was held before the Supervisor of Wells and Advisory Board. A prehearing conference was held on April 14, 1986. Additionally, public comment hearings to address policy issues were held on April 2 and 3, 1986. The hearings were conducted pursuant to 1939 PA 61, as amended, and the promulgated rules.

The purpose of the hearings was to receive statements concerning policy and technical evidence concerning spacing and location requirements for wells drilled for gas below the Glenwood Member of the Black River Group in 51 counties in Michigan.

FINDINGS OF FACT

1. Currently there is no uniform approach for the development of deep gas reserves discovered below the Glenwood Member of the Black River Group (Glenwood). Depending on the geographical location, wells may be drilled on 40-or 80-acre units. Several special orders have been issued addressing the spacing for specific reservoirs. However, most of the area believed potentially productive below the Glenwood has not been specifically spaced except as required by the Supervisor of Wells' Order No. 1-73 and the General Rules. Recent discovery wells and continued active drilling programs indicate we are at the threshold of significant further development for deep gas. The situation parallels that of the Salina-Niagaran development in the early 1970's. That development was different than the oil and gas development which had preceded it. In 1973, Special Order 1-73 was issued, recognizing the difference in the needs for orderly efficient development. That order lent stability and predictability to the future course of development and prevented waste.

The development of deep gas reserves in an orderly and sound manner presents a similar challenge to chart a course for future action. It is because this development presents both an opportunity and challenge to set a predictable and sound course for future development of this important natural resource that the hearing was called. It is the opinion of the Supervisor that existing spacing orders do not adequately address the needs of future development. The prevention of waste is the cornerstone of the Supervisor's power. The presence of wasteful activity compels the Supervisor to act.

2. The notice of hearing proposed the following counties for consideration of a special spacing order: Alcona, Alpena, Antrim, Arenac, Barry, Bay, Benzie, Charlevoix, Clare, Clinton, Crawford, Eaton, Genesee, Gladwin, Grand Traverse, Gratiot, Huron, Ingham, Ionia, Iosco, Isabella, Kalkaska, Kent, Lake, Lapeer, Leelanau, Livingston, Macomb, Manistee, Mason, Mecosta, Midland, Missaukee, Montcalm, Montmorency, Muskegon, Newaygo, Oakland, Oceana, Ogemaw, Osceola, Oscoda, Otsego, Ottawa, Roscommon, Saginaw, Sanilac, Shiawassee, St. Clair, Tuscola, and Wexford. These counties are underlain by potentially productive zones below the Glenwood at depths greater than 7,000 feet. Other areas of the state are also underlain by similar potentially productive horizons. Those areas were excluded from consideration for two reasons. First, the shallower depth could be productive of oil which may require different regulatory treatment. Second, the surface use implications and economic considerations of shallower drilling are less marked. Therefore, this hearing did not address other areas of the state that may be productive below the Glenwood.

3. According to the testimony, approximately 40 wells have been drilled below the Glenwood. Of those wells, 11 have been productive. The early development was marked by limited success. Recent experience has been considerably more successful. The techniques for the location of production have improved substantially as a result of the knowledge gained through past drilling. Today we see the exploration and development of deep gas reserves as an area of substantial interest and activity. The increased technical knowledge and activity make it now appropriate to examine the future direction for orderly development. Knowledge of the reservoirs is not perfect; many questions will only be answered by future development and production. A century of oil and gas development has shown that decisions for subsequent development must be made early in that development to assure that it is orderly and not wasteful. If we are to await a substantial and unassailable body of data, a situation unlikely to occur, we would have the benefit of hindsight and a corresponding inability to correct the mistakes of the past.

4. The development of deep gas reserves requires a large commitment of capital. The estimates of well costs offered at the hearing range from in excess of $1 million to over $3 million. Additional costs for completion, surface equipment and processing will also be incurred. If problems are encountered during drilling, the cost can escalate substantially. The Ruwe Gulf 1-19 and Ballentine 1-35 Wells both encountered problems downhole that necessitated abandoning the

original well bore and directionally drilling a replacement well. Mechanical or drilling problems are always a risk; however, in deep gas wells, they are exceptionally costly.

To determine spacing, a well must economically and efficiently drain the unit. Several witnesses testified as to the economic parameters of deep gas drilling. It is clear that drilling on 40-or 80-acre units is not economic. The capital expenditure and anticipated reserves of gas make such units unfeasible. To date, units of larger size have been formed voluntarily or by a Supervisor's spacing order. None of the expert witnesses believed that wells would be economic on a unit size less than 320 acres, nor did they suggest that wells would be uneconomic on 640-acre units. In fact, the economic considerations were most favorable at 640 acres. The difference of opinion related to 320-acre units; that is, units of 320 acres were characterized as uneconomic, marginal or economic, depending on the witness. In part, the difference must be attributed to the differing financial approaches of each operator. Inherent in such projections are capital and drilling costs, anticipated reserves, rate of return and anticipated sales price for gas. The substantial evidence indicates that wells are economic on 640-acre units and may be economic on 320-acre units.

5. The maximum area to be efficiently and economically drained by one well is also a consideration. There was a considerable amount of testimony concerning the expected drainage area for a deep gas well. Extensive production and test data does not exist. Most wells have had limited production to date. The wells have shown a productive capability in the range of several million cubic feet of gas per day. Generally, gas is flared during tests. To successfully perform reservoir limit tests on these wells, very large volumes of gas would have to be produced with the attendant waste of the gas. Prudence dictates that such testing is not appropriate.

The primary objective of deep gas is the Prairie du Chien Group. There has been production from the Glenwood and production is anticipated below the Prairie du Chien.

The Prairie du Chien Group is approximately 1,000 feet in thickness. To date, descriptive terminology for the zones within the Prairie du Chien is not yet settled. Various zones have been called the Zone of Unconformity, the Foster and the Bruggers. In spite of the differences in terminology, there are a number of observations that can be made about the Prairie du Chien.

Exhibit Nos. 15-26 provide petrophysical data for six productive fields. I find these data are generally representative of productive Prairie du Chien fields. In the western portions of the basin the Prairie du Chien is shallower, with thicker producing zones and better rock porosity and permeability, than in the eastern portions of the basin. The average well has 38 feet of net pay, a porosity of 11.4% and 38% water saturation. For purposes of determining productive net pay, a 5% porosity cutoff and 60% water saturation were used. A 5% porosity cutoff is conservative; that is, wells may be productive at a lesser

porosity. The 60% water saturation appears to be high; however, it is believed that most of the water encountered on logs is in a secondary porosity and is not movable. The productive zones show good permeability in relation to porosity development.

To determine the maximum area to be effectively drained by one well, the general producing characteristics must be examined. Enough data exist to form the basis for predicting the likely drainage area for wells. Those wells that are producing have demonstrated strong stable production. It is clear that some of the wells are capable of draining very large areas. The permeability is generally very good for gas reservoirs. The drive mechanism appears to be a depletion drive.

Available production in the initial testing stage and production histories will yield a radius of investigation which is an indication of drainage area. To determine the true influence of a well, it is necessary to run a reservoir limit test or interference test between wells in the same reservoir. The witnesses were of the opinion that the radius of investigation was probably less than the actual drainage area. Additionally, it is not uncommon to see a skin effect in the early testing. Further treatment and production has, in most cases, reduced the skin effect and increased the productive capability of wells.

After considering all the geologic, petrophysical and engineering data, it is my conclusion that one well can economically and efficiently drain 640 acres. It is also clear that some of the wells are capable of draining much larger areas. At this point in time, with the available data, it is most appropriate to be conservative. If future production data should indicate a greater well density, infill drilling can be authorized.

6. After finding that 640-acre units are appropriate, the next question to be addressed is: How are the units to be formed? At the hearing, various methods were suggested. Principally, it was proposed that ¼ ¼ sections, ½ sections, or full sections be used to create the units. Full sections offer appeal in that they are easily described, certain, and would leave no open spaces or corridors between wells; sections also are inflexible. It is the inflexibility of sections that is unacceptable to the Supervisor. An operator should be able to select a drilling unit that reasonably conforms to the target structure. There are limitations on the predictability of reservoir size and limits before actual drilling. It is my opinion that units formed of ¼ sections, placed together in a square, is the most reasonable approach. Flexibility to align units with prospects is presented, while ½ sections work to limit windows and lessen gerrymandering of units to conform with ownership. I find as a matter of fact,therefore, that drilling units should be approximately 640 acres, and formed of four contiguous ¼ sections of land in a square.

Further, I find as a matter of fact that to assure orderly development of reservoirs and to avoid corridors and create uniformly spaced units, a spacing pattern should be established by commencement of a well. Once diligent drilling has begun for a well (not setting

conductor pipe) like spacing should be applicable to the eight contiguous 640-acre units, forming a spaced area of nine (9) square miles in the shape of a square. If the well does not result in a discovery, the spacing requirement for the 8 contiguous units should no longer be applicable.

7. The parties offered various proposals for the location of wells. The location of wells is important for two reasons. First, location requirements restrict or limit the places where a well may be placed. Restrictions on well location can cause operational problems in that much of the drilling is in old fields with existing surface features that must be avoided. Therefore, many operators argued for maximum flexibility. The second aspect of well location is the relative well location for drainage purposes. Wells should be located so as to encourage uniform drainage and minimize interference between wells. A spacing pattern that allows wells too close together could result in the crowding of wells and waste.

The available data suggest that beyond 1,000 feet between wells, the potential interference between wells begins to lessen considerably. Witnesses suggested distances from 1,280 to 2,640 between wells as appropriate. The selection of a setback must balance the competing factors, avoidance of surface features, and uniform drainage. To provide reasonable setbacks and flexibility, I find that all wells should be located at least 990 feet from a drilling unit boundary. This provides a minimum of 1,980 feet between wells which will provide orderly development.

8. An important consideration in any spacing decision is the equity and correlative rights of all mineral owners. To assure perfect equity a well would be drilled on each individual's property. The infancy of the oil industry was marked by just such development. Such development spurred the need for regulation. As technical knowledge grew the spacing concept gained acceptance. Spacing is not perfect, nor is any other method of regulation; however, spacing has, as its basis, reasonably predictable scientific fact. There is now enough evidence to set a course of future conduct. A similar question of how equity and correlative rights might be addressed was raised in Cause No. 7-6-85. I believe the rationale is applicable here.

> "Many mineral owners that are concerned that large units will substantially dilute their interest in production have proposed 160-acre and 320-acre spacing. The different proposals also relate to how units are to be configured. Spacing is prospective in nature and is to provide for the orderly future development and if it is not done prospectively only chaos can result. Spacing has to be the result of the best evidence available at a given point of time. If tremendous financial resources are to be committed, there must be a plan for development.

> To assure perfect equity each tract of diverse ownership would have to be drilled. An approach must be pursued which is reasonable for all concerned. All interests large and small must be considered. In a sense a road map is being prepared to guide the future course of development. To draw that map the available scientific tools must be utilized. These scientific tools tell us the conservative approach is to space on 640-acre units. This is the maximum area to be effectively and efficiently drained by one well. The argument has been advanced that within the proposed spaced area there are included lands which appear to be unproductive. All spacing plans suffer from a similar infirmity. Experience has shown that some areas believed productive will not be and other areas believed nonproductive will produce. That is the nature of oil and gas exploration. The drill bit is the final arbiter of such disagreements. Prospective spacing gives everyone that same opportunity to develop lands. As between those drilling units that prove productive the Public Service Commission is mandated to assure that each unit receive an equitable portion of gas reserves attributed to that unit. Correlative rights will will be protected with 640-acre spacing." Order No. 7-6-85, August 30, 1985.

Two other concerns affect correlative rights. One concern is that there is a right to an exception to all spacing orders. This order will set a general course of conduct and applicability. There is no question that some of the future development will be better served by another method. At that time, following a hearing dealing with site specific facts, an appropriate spacing pattern and unit configuration can be established. It has been argued that spacing should be done on a case-by-case basis following a discovery well. I believe that approach is the opposite of what ought to be done. A general method appropriate to the producing formation should be established and exceptions granted from the norm. This lends certainty and reasonable predictability which are necessary to assure the commitment of resources necessary for development.

The other area affecting equity and correlative rights is proration. Gas proration is within the jurisdiction of the Michigan Public Service Commission. Their proration attempts to assure equity between units, crediting each with its appropriate reserves.

The availability of exceptions and the method of proration provide safeguards to potential inequities that could possibly result from uniform spacing.

9. Several participants in the hearing have asked that an order be issued which would apply to existing or permitted wells. I believe such spacing would be inappropriate. The purpose of the hearing was to set a standard for future development, not to affect existing wells.

CONCLUSIONS OF LAW

1. 1939 PA 61, as amended, states in part in Section 13 as follows:

> "A drilling unit, as contemplated herein, means the maximum area which may be efficiently and economically drained by 1 well..."

2. The spacing requirements for wells drilled below the Glenwood within the proposed spaced area are set by the General Rules R 299.1201 and Special Order No. 1-73 depending on the geographic location. These spacing requirements are for 40-and 80-acre units respectively. Based on the foregoing Findings of Fact I conclude that development of gas reservoirs below the Glenwood on 40-or 80-acre units is wasteful and would require the drilling of unnecessary wells.

1939 PA 61, as amended, states in part in Section 13 as follows:

> "The drilling of unnecessary wells is hereby declared waste as such wells create fire and other hazards conducive to waste, and unnecessarily increase the production cost of oil and gas to the operator, and thus also unnecessarily increase the cost of the products to the ultimate consumer."

3. I conclude, as a matter of law, that drilling units of 640 acres are the maximum size to efficiently and economically drain reservoirs below the Glenwood.

DETERMINATION AND ORDER

Wherefore, based on the evidence and after consulting with and considering the recommendations of the Advisory Board, the Supervisor finds that a special spacing Order is necessary and desirable.

Now, therefore, It is Ordered:

1. A special spacing order is established, as an exception to Rule 201 (R 299.1201) and Special Order No. 1-73, where applicable, for all wells drilled for gas below the top of the Glenwood Member of the Black River Group in the following described counties: Alcona, Alpena, Antrim, Arenac, Barry, Bay, Benzie, Charlevoix, Clare, Clinton, Crawford, Eaton, Genesee, Gladwin, Grand Traverse, Gratiot, Huron, Ingham, Ionia, Iosco, Isabella, Kalkaska, Kent, Lake, Lapeer, Leelanau, Livingston, Macomb, Manistee, Mason, Mecosta, Midland, Missaukee, Montcalm, Montmorency, Muskegon, Newaygo, Oakland, Oceana, Ogemaw, Osceola, Oscoda, Otsego, Ottawa, Roscommon, Saginaw, Sanilac, Shiawassee, St. Clair, Tuscola, and Wexford. This order shall not apply to the wells that are in existence or permitted, nor to lands subject to a special spacing order applicable to the same formations at the effective date.

2. A drilling unit shall consist of four ¼ sections of land joined together to form a square. Once diligent drilling has begun for a well (not setting conductor pipe), like spacing shall be applicable to the eight contiguous 640-acre units, forming a spaced area of nine (9) square miles in the shape of a square. If the well does not result in a discovery, the spacing requirement for the 8 contiguous units shall no longer be applicable.

3. All wells shall be located not closer than 990 feet from any unit boundary.

4. The Supervisor may issue a permit to drill for gas on a drilling unit described in this order which is not totally pooled, nor communitized on condition that the application for permit is accompanied by a certified statement detailing efforts that have been made to obtain the lease or leases or to obtain a communitization agreement to form the full drilling unit and that such effort has failed. Should a well be completed on such drilling unit, a pooled drilling unit shall be formed by voluntary or compulsory pooling. This pooled unit shall conform to this order or shall conform to a drilling unit adopted following public hearing.

5. Exceptions to the spacing and location requirements of this order may be granted after notice and hearing.

6. The Supervisor after receiving technical data that one well may not economically and efficiently drain a drilling unit and consulting with the Advisory Board may allow a second well on a unit. All mineral interest and equity within the unit will remain the same should a second well be drilled on a unit.

Dated: August 8, 1986

R. Thomas Segall

R. THOMAS SEGALL
ASSISTANT SUPERVISOR OF WELLS

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

May 22, 1987

TO: Regional Geologists--Region II & III

FROM: James S. Lorenz, Supervisor, Permits & Technical Evaluation Section, Geological Survey Division

SUBJECT: S.O. 1-86

Please note provision No. 2 of the Determination and Order of the attached copy of S.O. 1-86. This provision is very significant and because of it, it is very important that the Permitting Unit is aware of the starting of "diligent drilling". When you are aware that a well subject to the order starts to diligently drill you should contact the appropriate permit coordinator and inform him/her of the date and time of start up. They can then properly record and evaluate the close in permitted but not yet spudded wells and/or any new close in drilling applications as they pertain to S.O. 1-86 provision No. 2.

Thank you and if you have any questions, please contact me or Sam.

JSL:lb

Attachment

cc: R. Thomas Segall, Chief, GSD
Jack L. VanAlstine, Assistant Chief, GSD
Samuel L. Alguire, Supervisor, Permits & Bonding, GSD
Rex A. Tefertiller, Permit Coordinator, GSD
David H. Bechler, Permit Coordinator, GSD

NATURAL RESOURCES COMMISSION
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STATE OF MICHIGAN

JAMES J BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
BOX 30028
LANSING, MI 48909

GORDON E GUYER Director

May 27, 1987

TO: Oil and Gas Permittee

FROM: R. Thomas Segall, Assistant Supervisor of Wells

SUBJECT: Well Spacing and Drilling Units for Competitive Drilling Permits Under Section 2, Special Order No. 1-86.

The exploratory Prairie Du Chien well where diligent drilling has commenced first (not the first issued permit) will set the spacing for the adjoining eight 640-acre drilling units. This as per Section 2, Special Order 1-86.

Be aware that this permit will be invalid and held in abeyance if the drilling unit for this well is in conflict with the spacing pattern set by another well where diligent drilling has commenced first, regardless of the date of issuance of this permit.

If a permit is held in abeyance (as noted above) an extension of time, not to exceed the time period during which it was held in abeyance, may be granted to commence drilling of the well later, if approved, or the transferring of the permit to another location.

R. Thomas Segall

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

July 16, 1987

TO: Permit Coordinators, Permits & Bonding Unit, Geological Survey Division

FROM: Samuel L. Alguire, Supervisor Permits & Bonding Unit, Geological Survey Division

SUBJECT: Drilling Units Below the Top of the Glenwood in Counties Where Special Order #1-73 and Special Order #1-86 Apply

Special Order No. 1-86 is a special spacing order established as an exception to Rule 201 (R299.1201) and Special Order No. 1-73, where applicable, for all wells drilled for gas below the top of the Glenwood Member of the Black River Group in the counties described. It requires 640 acre drilling units for gas production only from the affected formations below the top of the Glenwood.

Special Order No. 1-73 is a special spacing and proration order for wells drilled into or below the Salina Niagaran Formation in areas where the order is applicable. It applies to wells drilled for oil and/or gas and controls their location, spacing and production. Consequently, it is still lawful to request and receive a permit under Special Order No. 1-73 to explore for oil and associated gas below the top of the Glenwood member of the Black River Formation.

Special Order No. 1-86 established an exception to Special Order No. 1-73 where it applies regarding gas (gas not associated with oil). The exception, among other things, requires 640 acre drilling units for gas.

Since this situation may appear to conflict with Special Order No. 1-73 we will condition the permit as follows when approving an 80 acre drilling unit below the top of the Glenwood:

> Permit Condition - When drilling below the base of the top of the Glenwood Member of the Black River Formation Special Order No. 1-73 (80-acre drilling Units) no longer applies when drilling for gas. Special Order No. 1-86 (640-acre drilling unit) applies when drilling for gas below the top of the Glenwood Member.

Special vigilance must be maintained in permit application review to identifv this situation and condition the permit accordingly.

S. L. Alguire

SA:gb

cc: Regional and District Offices
James Lorenz, Supervisor, Permits & Technical Evaluations, Geological Survey Division
Innaiah Pothacamury, Assistant Supervisor, Permits & Bonding Unit, Geological Survey Division

I-13e

☐ REWORK ☐ OPERATE

...ED UNDER PROVISIONS OF
...1939, as amended ☐ Act 315, P.A. 1969, as amended
...C.L. 319.1 to 319.27) (M.C.L. 319.211 to 319.236)

Violation of and/or non-compliance with the provisions of the acts and conditions of permit may result in penalties. This permit includes as requirements all the operations and methods proposed by the applicant, unless rejected or altered by the DNR, and along with the attached stipulations are incorporated in its entirety by reference.

ISSUED: 40515 6-23-87

CANCEL AND TRANSFER ISSUED

DEEPENING PERMIT

PERMIT EXPIRES: 6-23-88

TYPE OF WELL: Oil & Gas

FORMATION: Prairie Du Chien

DEPTH: 5650'

KIND OF TOOLS: Rotary

ISSUED TO:

Trenton Exploration Company, Inc. (TREXCO)
P.O. Box 51055
Livonia, MI 48151

WELL NAME: Semrau WELL NO.: #33-14

LOCATION AND FOOTAGES:

NE¼ NW¼ SE¼, Sec. 14, T3N, R7W, Castleton Twp., Barry Co.
460 Ft. from North and 860 Ft. from West Line of quarter section.
860 Ft. from South and 460 Ft. from East Line of drilling unit.

CASING AND SEALING REQUIREMENTS

CASING O.D. SIZE	WT./FT.	GRADE	CONDITION	DEPTH	CEMENT SACKS	W.O.C. (HRS.)
11 3/4"	42#	H-40	New	225'	275	12
8 5/8"	24#	K-55	New	1700'	400	12
5 1/2"	14#	J-55	New	5650'	150	24

1. BOP's will be tested:
   A. After setting surface.
   B. Prior to drilling Trenton Formation (full string test). 12-hour minimum notice on above.
   C. Body check daily after drilling Salina "C".
2. Topsoil shall be stockpiled to N of site as diking material.
3. S, E, & SE must be diked & must have sedimentation pond in SE quarter.
4. Rig shall be placed at W of location facing N.
5. Dissolving tank must be on location & hooked up prior ro drilling salts.
6. District Geologist shall be notified prior to pit excavation, liner installation and pit encapsulation.
7. When drilling below the base of the Black River (top of the Glenwood Unit), Special Order 1-73 (80 acre unit) no longer applies when drilling for gas. Order 1-86 (640-acre unit) applies when drilling for gas below the top of the Glenwood Unit in Barry County.

JIM FYI

OFFICE TO BE NOTIFIED BEFORE DRILLING/DEEPENING STARTS
Plainwell Field Office 616-685-6851

BY David H. Bohlen PERMIT COORDINATOR
David H. Bohlen 517-334-6974

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