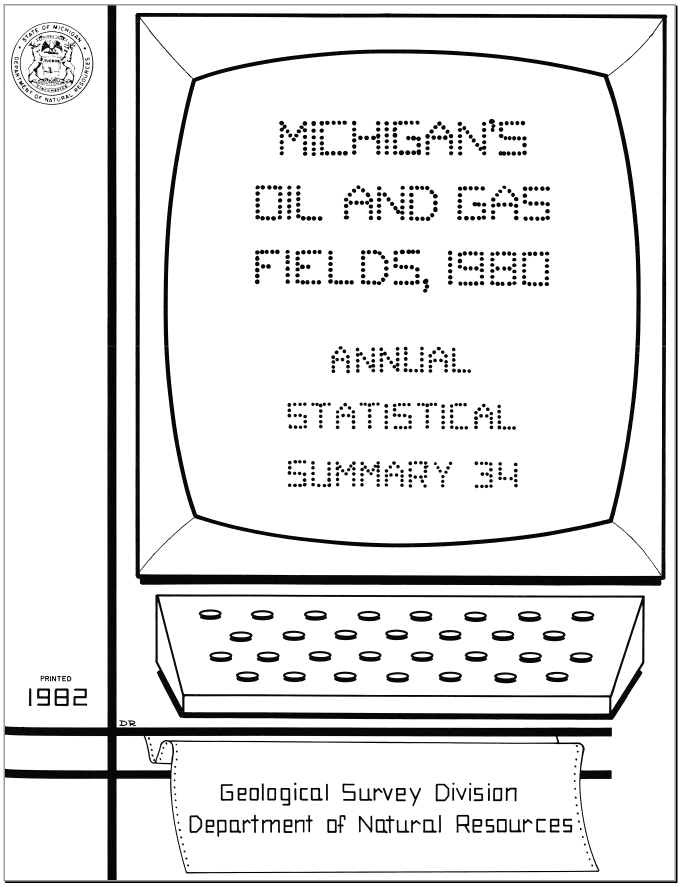

MICHIGAN'S OIL AND GAS FIELDS, 1980
ANNUAL STATISTICAL SUMMARY 34

CONTENTS

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The collection and compilation of oil and gas field data into a yearly report is a cooperative effort of the Geological Survey Division's Oil and Gas Section staff personnel who are under the general supervision of James S. Lorenz, Geologist-in-Charge. Additional data were contributed by field office personnel under the supervision of Regional Geologists in DNR Regions II and III. Unit supervisors who provided specific information are:

Samuel L. Alguire, Supervisor, Regulatory Control Unit Contribution: All data in columns under the headings "Number of Oil and Gas Wells" and "Brine Production" on Tables 2 and 3.

Raymond H. Ellison, Supervisor, Production-Proration Unit. Contribution: All Michigan oil and gas production data, oil and gas valuation figures, import and export figures, LPG and condensate figures, secondary recovery projects (Table 4).

D. Michael Bricker, Acting Supervisor, Subsurface and Petroleum Geology Unit. Contribution: All general drilling statistics and well completion data, discovery well and deep test data, cumulative records, and all other summary information not specifically provided by other Unit supervisors or by other agencies. Annual Statistical Summary compilation and manuscript preparation by staff members of the Subsurface and Petroleum Geology Unit.

The compilers also acknowledge the assistance of the Interstate Supply personnel, Office of Utilities Operation, Gas Division, Department of Commerce, in providing figures on natural gas imports via interstate pipelines, and the Lands Division, Department of Natural Resources, in providing figures for state revenue derived from various oil and gas transactions.

Michigan oil and gas production figures maintained by the Production-Proration Unit are compiled by the Unit from records obtained from the Michigan Department of Treasury and from records filed by producers and purchasers. All

hydrocarbon production figures cited herein are subject to correction as warranted.

Inquiries concerning information contained in this publication should be directed to the appropriate Unit supervisor as noted earlier.

Compilers: D. Michael Bricker
Ronald C. Elowski
C. Robert Reszka
Randall L. Milstein

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Lansing, Michigan
June, 1982

MICHIGAN'S OIL AND GAS FIELDS, 1980

INTRODUCTION

To help foster the development of Michigan's hydrocarbon resources, statistical data have been maintained and published for many years. This issue of the oil and gas field statistical summary brings together information on various facets of Michigan's oil and gas industry activities.

The information contained in this oil and gas summary has been treated as uniformly as possible from year to year so that the data reflect accurately the actual figures and other information that should be credited to this year. The data found herein are mainly derived from records maintained by the Oil and Gas Section, Geological Survey Division, Department of Natural Resources.

This publication is essentially divided into three parts. The first summarizes significant statistics on oil and gas field activities and includes numerous other related records kept by the Oil and Gas Section. Part 2 contains specific information on Michigan's oil and gas fields, gas storage fields, and other related subjects. Part 3 contains cumulative records important to the oil and gas industry.

Certain well completion data are furnished to the American Petroleum Institute (API) and the American Association of Petroleum Geologists (AAPG) on a regular basis. Reports citing preliminary oil and gas statistics and production figures are also prepared for the Interstate Oil Compact Commission (IOCC). API publishes the data in monthly and quarterly reports. Year-end printouts of the data are made available to authors of the AAPG yearly Development Papers and to others. Year-end figures published by API are in general agreement with figures for similar categories published in this summary. Oil and gas production data are supplied by request to the United States Bureau of Mines for publication in their minerals yearbook.

Statistical data on Michigan oil and gas activities, derived from outside sources, are also published by the Oil and Gas News, Mt. Pleasant, Michigan; Petroleum Information, Incorporated, Denver, Colorado; American Petroleum Institute, Washington, D.C.; American Association of Petroleum Geologists, Tulsa, Oklahoma; Interstate Oil Compact Commission, Oklahoma City, Oklahoma; World Oil, Houston, Texas; and Oil and Gas Journal, Tulsa, Oklahoma.

It should be noted that certain figures for the number of exploratory, development, and service wells drilled and completed, the number of new fields and pools discovered, oil and gas production figures, and other data published in this summary may differ from figures reported by regional or national trade publications or by industry reporting services. The differences in the various statistics are generally minor and are due to methods of gathering and reporting well data, determining cutoff dates for reporting yearly statistics, and the necessity for making projections and estimates for certain types of reports.

Other factors which may result in statistical differences are internal decisions of the Oil and Gas Section regarding final year-end status of completed wells and decisions resulting from public hearings on oil and gas matters. For example, a well originally classified as a development well, and reported as such to one of the above organizations, may later be reclassified as the discovery well for a new pool or field, or a gas well might later be declared an oil well completion on the basis of new evidence. Frequently the changes in well status cannot be readily passed on to these outside organizations so that their records can be updated prior to publications of their final statistics.

PART I
1980 STATISTICAL DATA

* * * OIL AND GAS PERMITS * * *

Michigan's oil and gas permit system began in 1927 with the issuance of permit number 1. Since then, permit numbers have been issued in numerically consecutive order. Permits issued under Act 61, P.A. of 1939, as amended are terminated one year after date of issue if actual drilling operations have not begun.

INITIAL CLASSIFICATION	1978	1979	1980
Exploratory wells	311	282	356
Development wells	298	283	456
Gas storage facility wells	74	62	25
LPG storage facility wells	0	5	0
Brine disposal wells	3	5	5
Water injection wells	4	12	5
Total	690	649	856

Deepening permits were issued for 37 wells during 1980 as compared with 29 the previous year. Deepening permits issued in 1980 began with number 1971 and ended with number 2007.

Directionally drilled holes. Environmental and economic considerations have necessitated the drilling of a large number of directional holes since 1972, particularly to help locate Niagaran reefs. During 1980 there were 187 permits issued to drill directional holes. Many of these holes involve using the upper part of a previously drilled hole which, after being initially completed as a dry hole, was plugged back and directionally drilled to a more favorable subsurface location. Only one producing well is allowed per well bore, regardless of the number of holes directionally drilled from the same well bore.

Each new directional hole, even if drilled from the same surface location and using the upper part of a previously drilled well, is treated as a separate test and is assigned its own unique permit number.

Rework applications, transfers of ownership, etc. In addition to issuance of permits for various types of wells covered under Act No. 61, P.A. of 1939, as amended, 308 applications were received and approved for rework operations on existing wells. Letters of termination were sent out for 33 previously issued permits. Transfers of ownership were processed for 247 wells. Corrections of location, well name, or other detail involving specific permits were made for 79 wells, and cancel and transfer of permit were made for 28 others. The surface location as well as the projected bottom-hole location is published for each permitted directionally drilled hole. After the well is drilled and the directional survey is filed, the correct bottom-hole location is determined from the survey record and then published as a correction for the initial projected bottom-hole location. Corrections of this type were published for 191 wells.

Oil and gas hearings. Oil and Gas Section activities included scheduling and preparation for hearings on oil and gas matters and the issuance of orders resulting from these hearings. These activities are summarized as follows:

Advisory Board Hearings held	4
Administrative Hearings held	22
Meetings as provided for in Special Order 1-78	2
Total Orders issued	35
Total Causes heard	35

Includes:
- 5 amendments to Spacing orders
- 2 spacing and proration orders
- 8 exceptions to Spacing Orders
- 3 compulsory Pooling Orders
- 1 cause dismissed
- 1 cause to establish Special Order 1-81
- 1 unitization order
- 6 secondary recovery by waterflood & pressure maintenance by gas inj.
- 3 amendment to spacing & proration order
- 5 abrogation of spacing orders
- 1 supplemental hearing
- 1 amendment to spacing order denied
- 3 conversion to gas storage field & exception under spacing order
- 1 hearing to continue
- 2 denials to change well allowables as provided for in Special Order 1-78

* * * WELL COMPLETIONS * * *

EXPLORATORY AND DEVELOPMENT WELL COMPLETIONS

	Exploratory Wells			Development Wells			
Year	Oil	Gas	Dry	Oil	Gas	Dry	Totals
1976	30	36	234	90	21	99	510
1977	35	36	230	101	34	111	547
1978	29	25	214	117	32	111	528
1979	42	28	187	131	30	103	521
1980	41	21	257	167	30	159	675

SERVICE WELL COMPLETIONS

Year	GS	INJ	LPG	BDW	Totals
1976	25	13	0	12	50
1977	43	2	1	4	50
1978	60	11	0	3	74
1979	51	13	0	4	68
1980	41	9	2	5	57

Major and independent company well completions. Requests are frequently made for statistics on major oil company drilling activities in Michigan. The figures cited for the major companies do not include wells drilled by independents under farmout agreements with a major company or wells drilled by independents but partially supported by dry hole money or some other significant assistance from a major oil company. Independent oil companies, who have drilled most of Michigan's wells, are too numerous to cite individually. All figures cited for majors and independents were derived from inspection of operator names appearing on completion records. On the following chart, in cases where two or more companies were joint operators in a drilling venture, the well completion was attributed to the company whose name appears first (generally the major interest holder) on the official records.

WELL COMPLETIONS BY MAJORS AND INDEPENDENTS IN 1980

MAJOR COMPANY	EXPLORATORY OIL	EXPLORATORY GAS	EXPLORATORY DRY	DEVELOPMENT OIL	DEVELOPMENT GAS	DEVELOPMENT DRY	SERVICE WELLS	TOTALS
AMOCO	5	3	15	6	0	9	1	39
GETTY	0	0	3	1	0	1	0	5
MARATHON	0	0	0	6	0	0	8	14
SHELL	2	2	42	14	8	44	4	116
UNION	0	0	0	3	0	0	0	3
OTHER	1	1	0	42	0	3	0	47
SUBTOTAL	8	6	60	72	8	57	13	224
INDEPEND.	33	15	197	95	22	102	44	508
TOTALS	41	21	257	167	30	159	57	732

TOTAL:
EXPLORATORY WELLS 319
DEVELOPMENT WELLS 356
SERVICE WELLS 57

EXPLORATORY WELLS DRILLED BY MAJORS 31%
EXPLORATORY WELLS DRILLED BY INDEPENDENTS 69%

EXPLORATORY DISCOVERIES MADE BY MAJORS 23%
EXPLORATORY DISCOVERIES MADE BY INDEPENDENTS 77%

DEVELOPMENT WELLS DRILLED BY MAJORS 38%
DEVELOPMENT WELLS DRILLED BY INDEPENDENTS 62%

PRODUCING DEVELOPMENT WELLS DRILLED BY MAJORS 41%
PRODUCING DEVELOPMENT WELLS DRILLED BY INDEPENDENTS 59%

DISCOVERY SUCCESS RATIO (TOTAL EXPLORATORY WELLS DIVIDED BY NUMBER OF DISCOVERY WELLS)
MAJORS 1:4/INDEPENDENTS 1:4

Well casing used in 1980 well completions. Periodically, inquiries are made concerning the amount of casing (pipe) used in Michigan wells during a given year. Almost all oil and gas tests drilled in this state utilize rotary drilling techniques and require the setting of surface pipe and an intermediate casing string. A conductor pipe is set on many holes, and all wells completed as producers require a string of production casing. For convenience, casing tallies have been related to a range of casing sizes as shown in the chart on the following page.

[Drilled Footage]

1980 DRILLED FOOTAGE BY COUNTY

County	Exploratory Wells	Development Wells	Service Wells
Alcona			
Allegan	5,570		
Alpena			
Antrim	6,815	8,743	
Arenac	4,344	9,036	
Barry			
Bay	25,181	12,752	
Benzie			
Berrien	637		
Branch			
Calhoun	80,905	58,258	
Cass	2,472	6,745	440
Charlevoix			
Cheboygan	13,388	5,719	
Clare	20,353	46,692	14,321
Clinton			
Crawford	7,102	44,708	20,202
Eaton	51,609	15,451	
Gd. Traverse	285,715	243,210	2,137
Genesee			
Gladwin		69,688	
Gratiot			
Hillsdale	12,648	28,477	
Huron			
Ingham	74,661	24,368	
Ionia			
Iosco			
Isabella	8,890	31,439	
Jackson		39,701	
Kalamazoo		2,830	
Kalkaska	129,862	134,211	103,505
Kent			
Lake			
Lapeer	9,878	34,926	
Lenawee	4,921	3,790	
Livingston	19,993		
Macomb	20,257	16,610	
Manistee	164,926	165,768	1,700
Mason		6,972	
Mecosta	16,068	1,312	8,490
Midland	3,707	10,698	
Missaukee	11,916	120,070	
Monroe	3,101		
Montcalm	3,275	3,315	13,292
Montmorency	33,451		
Muskegon	1,743		
Newaygo	3,100	13,799	
Oakland	30,124	25,495	
Oceana	16,042	4,299	
Ogemaw	4,135	33,616	16,560
Osceola	14,770		
Oscoda			
Otsego	124,277	118,886	27,992
Ottawa	2,835		
Presque Isle	105,305		
Roscommon	3,737	71,412	
Saginaw	6,038	12,848	
Sanilac	8,512		
Shiawassee			
St. Clair	10,785	3,135	
St. Joseph			
Tuscola	11,194	15,314	
Van Buren	3,625	5,921	1,135
Washtenaw		3,681	
Wayne			2,327
Wexford	8,126	14,143	
State Total	1,375,993	1,468,038	212,101

	Conductor Pipe	Surface Pipe	Intermediate Pipe	Production Pipe
Casing Size Range Used	13"-20" Dia.	10"-13" Dia.	6"-10" Dia.	4"-6" Dia.
Normal Size Used	16"	11-3/4"	8-5/8"	5-1/2"
Average Weight	75#/ft.	53#/ft.	37#/ft.	19#/ft.
No. feet used (1)	43,992	312,733	1,303,075	1,427,898

(1) Total footage: 3,087,698

* * * 1980 OIL AND GAS PRODUCTION * * *

Oil and gas production figures are derived from records submitted to the Production-Proration Unit, Oil and Gas Section, Geological Survey Division, Department of Natural Resources and from tax records from the Michigan Department of Treasury. Treasury Department records are primarily concerned with gross production figures needed to calculate revenues. These data are supported by reports required from producing companies and purchasers by the Geological Survey Division.

Delays in reporting and changes in methods of reporting used by producing companies and purchasers result in a continuous correction and refinement of production figures. Consequently all monthly, yearly, or other production figures are subject to correction as warranted.

In an attempt to obtain national uniformity of data as recommended by the Interstate Oil Compact Commission, all annual and cumulative gas production figures for Michigan were converted to a standard base pressure for volumetric measurement of 14.73 pounds per square inch in 1978. This conversion and subsequent adjustment of gas production figures resulted in slight changes in cumulative production volumes in those fields which had been measured at varying pressure bases in prior years.

A no-flare order, enacted as a conservation measure, prohibits the flaring of oil-well gas and requires Salina-Niagaran oil wells in specified counties to be shut-in until a market connection is achieved for the sale of the gas or an exception to the order is granted. Consequently, Special Order No. 3-71, amended, in effect since late 1971, tends to temporarily curtail production from Salina-Niagaran oil wells until gas gathering pipelines are laid and connections made.

Another order, Special Order No. 1-73, deals with spacing and proration of Salina-Niagaran wells in specific counties. This order established basic 80-acre drilling units (either stand-up or lay-down units) for Salina-Niagaran oil and/or gas wells and state-wide proration for Salina-Niagaran oil reservoirs in the specified counties or parts of counties covered by the order. These prudent and justifiable conservation measures effectively prevent waste of millions of cubic feet of valuable and much needed gas that might have been flared in part years, and these measures should ultimately result in more efficient drainage of reef reservoirs and a greater recovery of the liquid hydrocarbons.

[Oil and Gas Production by County]

OIL AND GAS PRODUCTION BY COUNTY IN 1980

County	Barrels Oil	MCF Gas
Allegan	126,971	26,713
Antrim	155,014	400,901
Arenac	138,991	0
Barry	8,773	0
Bay	171,719	0
Benzie	81,755	116,347
Calhoun	901,589	1,723,049
Cass	23,995	0
Cheboygan	1,562	0
Clare	436,400	634,521
Crawford	1,487,672	3,459,214
Eaton	412,001	4,616,746
Genesee	14,321	0
Gladwin	322,792	0
Grand Traverse	4,149,467	38,675,710
Gratiot	8,285	815
Hillsdale	1,242,533	5,944,814
Huron	790	0
Ingham	977,132	2,803,473
Isabella	104,190	7,977
Jackson	9,967	0
Kalamazoo	2,081	0
Kalkaska	3,953,441	29,802,104
Kent	99,298	0
Lake	82,796	0
Lapeer	244,470	25,398
Lenawee	572	0
Livingston	3,290	459,008
Macomb	26,589	5,876,369
Manistee	7,981,345	40,635,624
Mason	194,063	1,983,233
Mecosta	20,793	6,399
Midland	180,607	0
Missaukee	967,014	1,109,034
Monroe	2,790	0
Montcalm	77,723	0
Muskegon	6,494	0
Newaygo	15,558	15,118
Oakland	128,376	1,433,622
Oceana	23,896	0
Ogemaw	588,995	129,699
Osceola	158,501	6,122
Oscoda	788	0
Otsego	6,456,860	13,465,038
Ottawa	9,629	132,157
Presque Isle	2,751	0
Roscommon	418,141	264,826
Saginaw	51,386	0
Shiawassee	12,216	0
St. Clair	521,261	1,600,310
Tuscola	58,821	0
Van Buren	15,800	0
Washtenaw	0	30,549
Wayne	9,481	0
Wexford	716,763	2,953,034
Totals	33,808,463	158,337,922

* * * NATURAL GAS LIQUIDS * * *

The amount of liquids produced from gas-condensate reservoirs are included in the yearly oil production totals shown in tabulations in this publication. Wells officially determined to be gas wells are assigned to the Public Service Commission for well connection permits and determination and jurisdiction of gas production rates. There is no restriction on the amount of liquids produced along with the gas. Gas plants operated by Shell Oil Company and Amoco Production Company in Kalkaska County strip natural gas liquids from the gas. The liquids are then sold to another company through the Shell pipeline that terminates at Marysville, Michigan.

An attempt has been made to maintain records of condensate production from the northern reef reservoirs discovered since 1969. Production-Proration Unit records show the following figures for condensate liquids:

[Condensate Production]

CONDENSATE PRODUCTION

Year	Barrels
1969	0
1970	18,946
1971	98,668
1972	125,768
1973	335,041
1974	1,187,498
1975	1,863,338
1976	1,896,870
1977	1,991,330
1978	2,295,263
1979	1,801,928
1980	1,582,638
Total	13,197,288

Gas plant operations are summarized in Table 6. It should be noted that the LPG recovery figures for the Amoco and Shell plants in Kalkaska County include stabilized condensate as well as LPGs.

* * * OIL AND GAS VALUATION * * *

	Average Wellhead Price*		Gross Value*	
Year	Oil per Bbls.	Gas per MCF	Oil	Gas
1969	$ 3.07	$ .26	$ 37,494,318	$ 9,296,332
1970	3.10	.27	36,246,376	10,476,482
1971	3.27	.26	38,858,706	6,775,629
1972	3.20	.31	41,556,432	10,314,222
1973	4.07	.40	59,412,710	17,494,727
1974	8.55	.51	154,746,373	35,181,955
1975	10.74	.63	262,351,653	65,103,875
1976	10.84	.88	329,636,770	120,252,528
1977	10.95	1.10	360,994,743	145,969,976
1978	12.34	1.11	427,881,248	166,920,524
1979	14.94	1.75	524,257,112	279,121,269
1980	21.55	2.36	728,607,821	372,855,197

*Source: Production-Proration Unit records

* * * OIL AND GAS IMPORTS AND EXPORTS * * *

Michigan refineries import some U.S. domestic and foreign crude oil each year. Overseas foreign sources include Libya and Nigeria. Canadian crude oil brought via pipeline from western Canada oil fields constitutes another important source of imports. Imports by month were reported by refineries as follows:

1980 CRUDE OIL IMPORTS (Bbls.)

	Domestic & Foreign	Canadian	Total
January	2,686,979	357,107	3,044,086
February	1,468,631	448,267	1,916,898
March	3,369,386	357,292	3,716,678
April	1,407,913	197,264	1,605,177
May	1,419,986	198,043	1,618,029
June	1,010,888	197,248	1,208,136
July	751,716	243,120	994,836
August	867,456	194,547	1,062,003
September	837,615	259,041	1,096,656
October	906,732	128,687	1,035,419
November	1,061,168	64,041	1,125,209
December	934,102	126,503	1,060,605
Totals	16,712,572	2,771,160	19,483,732

Most Michigan produced crude oil goes to Michigan refineries but some is exported. Records provided to the Production-Proration Unit by companies reporting exports of Michigan crude are as follows:

1980 CRUDE OIL EXPORTS (Bbls.)

January	462,651
February	688,337
March	664,876
April	652,789
May	791,674
June	1,059,400
July	1,140,744
August	1,083,179
September	1,342,899
October	887,738
November	1,108,543
December	1,046,604
Total	10,929,434

1980 PIPELINE GAS IMPORTS (Mcf)*

January	67,883,213
February	67,647,697
March	75,683,904
April	77,326,985
May	39,203,775
June	41,217,726
July	44,302,406
August	48,014,585
September	44,805,902
October	59,825,686
November	61,979,794
December	81,336,360
Total	709,228,033

*Compiled by Interstate Supply Section, Michigan Public Service Commission

* * * NEW FIELD AND POOL DISCOVERIES * * *

All the new discoveries are tentatively classified as Class E pools having possible oil and gas recoveries as defined by the Committee of Statistics of Drilling, American Association of Petroleum Geologists. These classes, shown below, are used to give some estimate or measure of reserves found by a discovery well.

Class A - Over 50 million barrels oil or 300 BCF gas
Class B - 25-50 million barrels oil or 150-300 BCF gas
Class C - 10-25 million barrels oil or 60-150 BCF gas
Class D - 1-10 million barrels oil or 6-60 BCF gas
Class E - 1 million barrels or less oil, or less than 6 BCF gas
Class F - Abandoned as non-profitable

Michigan wells are initially classified as near as possible according to guidelines established by AAPG and API (AAPG Bulletin, Vol. 58/8, August 1974, pp. 1501-1503). Classifications such as exploratory, development, and the various types of service wells, are made after inspection of appropriate oil and gas maps and noting the location of the test in reference to established fields, dry holes, etc. Gas storage facility wells, water injection wells and other types of service wells are generally designated as such by the operator. The Lahee classification system for designating exploratory or development wells is particularly adaptable to structural traps but does not adapt to all situations involving small reefs such as are found in Michigan. Because of the apparent small areal extent of most reefs as shown by seismic anomalies and the close proximity of one reef to another, especially in the northern and southern reef belts, it has become increasingly difficult to classify with certainty all new well locations as exploratory or development.

Reservoir performance may show that a well previously classified as a development well should actually be considered as being in a separate reservoir or pool. Likewise, a so-called discovery well may actually turn out to be a development well to a nearby reef reservoir. Changes in classification may be the result of action by the regulating agency after enough data has been accumulated on the well or wells, or may result from new data presented at public hearings and the decision of the Supervisor of Wells after thorough consideration of the new data.

[Analysis of Discovery Wells by Geologic System]

ANALYSIS OF DISCOVERY WELLS BY GEOLOGIC SYSTEM

SYSTEM	FORMATION OR PAY	NO. OF DISCOVERIES 1978	1979	1980
PENNSYLVANIAN		-	-	-
MISSISSIPPIAN	"MICHIGAN STRAY SS."	1	-	1
	"BEREA SS."	1	2	2
DEVONIAN	ANTRIM SHALE	-	1	2
	"TRAVERSE LIME"	1	2	5
	DUNDEE	2	4	1
	DETROIT RIVER			
	"SOUR ZONE"	-	2	2
	RICHFIELD	-	1	3
SILURIAN	SALINA-NIAGARAN	49	56	46
ORDOVICIAN	TRENTON-BLACK RIVER	-	2	-
	PRAIRIE DU CHIEN	-	-	-

[Drilling Objectives]

DRILLING OBJECTIVES IN MICHIGAN

SYSTEM	FORMATION OR PAY	PRECENTAGE 1978	1979	1980
PENNSYLVANIAN		-	-	-
MISSISSIPPIAN	"MICHIGAN STRAY SS."	8.9	4.8	2.9
	"BEREA SS."	0.2	0.8	2.6
DEVONIAN	ANTRIM SHALE	-	1.0	1.4
	"TRAVERSE LIME"	2.4	3.4	4.5
	DUNDEE	6.7	7.1	7.7
	DETROIT RIVER			
	"SOUR ZONE" & RICHFIELD	7.7	11.0	12.7
SILURIAN	SALINA-NIAGARAN	69.6	69.1	64.1
ORDOVICIAN	TRENTON-BLACK RIVER	3.4	2.6	3.6
	PRAIRIE DU CHIEN	1.1	0.2	0.1
PRECAMBRIAN		-	-	.4

[Discovery Well List]

1980 DISCOVERY WELLS

County Location	Field Name	Operator and Lease	Permit Number	Depth to Pay	Total Depth	Initial Production Oil Wells	Initial Production Gas Wells	Producing Formation	AAPG Pool Class
Arenac 30-19N-4E	Sterling, Sec. 30	Charles J. Noskowitz Babcock #1	33868	4276	4344	264 BOPD		Richfield	E
Bay 8-14N-3E	Williams	K. P. Wood, Jr. Arthur #1	33341	4276	4344	25 BOPD		Berea	E
Calhoun 21-1S-6W	Convis 21-1S-6W	Robert Klabzuba Fairchild-Hugget #1-21	33584	2882	3450	168 BOPD Trace Gas		Niagaran	E
Calhoun 29-1S-6W	Convis 29-1S-6W	Robert Klabzuba Albright-Boehmer-Ware #2-29	33692	2906	3438	144 BOPD Trace Gas		Niagaran	E
Calhoun 10-1S-5W	Lee 10-1S-5W, Pool B	MGU Development Co. Koyl et al #3-10	33803	3247	3366		1000 MCF	Niagaran	E
Calhoun 16-1S-5W	Lee 16-1S-5W	MGU Development Co. Heisler #1-16	33439	3174	3360		900 MCF	Niagaran	E
Calhoun 21-1S-5W	Lee 21-1S-5W	Collins Bros. Oil Co. Weaver #1-21	33939	3010	3241	50 BOPD +14 BWPD		Niagaran	E
Calhoun 23-1S-5W	Lee 23-1S-5W, Pool A	J. O. Mutch Gaede et al #2-23	33660	3070	3253	200 BOPD +20 MCF		A-1 Carb.	E
Cass 28-7S-14W	Calvin, Sec. 28	Vernon East Burns #1	34007	763	770	70 BOPD		Traverse	E
Clare 18-18N-5W	Freeman-Lincoln Dundee Pool	Dart Oil & Gas Corp. Frackelton #1-18	33526	3975	5320	120 BOPD +Gas		Dundee	E
Clare 20-18N-5W	Freeman-Lincoln Richfield Pool	Dart Oil & Gas Corp. Frackelton #1-20	32858	5173	5340	80 BOPD +269MCF +11 BWD		Richfield	E
Eaton 16-2N-3W	Eaton Rapids 16-2N-3W	Amoco Prod. Co. Kunkel Unit #1-16	33841	4006	4332	220 BOPD +830 MCF		Niagaran	E
Eaton 17-2N-3W	Eaton Rapids 17-2N-3W, Pool B	Amoco Prod. Co. Getter #4-17	33400	4072	4385	200 BOPD +200 MCF		Niagaran	E
Eaton 28-2N-3W	Eaton Rapids 28-2N-3W, Pool A	Sullivan & Co. Miller Dairy Farms #1-28	33530	3914	4006	125 BOPD +200 MCF		Niagaran	E
Eaton 6-1N-3W	Hamlin 6-1N-3W	Patrick Petrol. Corp. Holbrook et al #1-6	34019	3696	3850	888 BOPD +680 MCF		Niagaran	E
Eaton 6-1N-3W	Hamlin 6-1N-3W, Pool A	Patrick Petrol. Corp. Popranec #1-6A	34075	3731	3841	226 BOPD +60 MCF		Niagaran	E
Eaton 8-1N-3W	Hamlin 8-1N-3W, Pool B	Patrick Petrol. Corp. Wilson-Hargrave et al #1-8	34020	3672	3835	576 BOPD +150 MCF		Niagaran	E
Grand Traverse 16-26N-11W	Blair 16-26N-11W	North. Mich. Explor Co. Menzel-Frlauff #1-16	33679	5443	5810	127 BOPD +184 BWPD		Niagaran	E
Grand Traverse 10-26N-10W	East Bay 10-26N-10W	Traverse Corp. Gembis-MacDonald #1-10	33474	6174	6328	267 BOPD +332 MCF +10 BWD		Niagaran	E
Grand Traverse 12-26N-10W	East Bay 12-26N-10W	Amoco Prod. Co. Foster Unit #1-12	33503	6191	6352	314 BOPD +220 MCF +87 BWD		Niagaran	E
Grand Traverse 33-25N-12W	Grant 33-25N-12W	Reef Petrol. Corp. Schwoerm #1-33	33555	5864	6220	296 BC +2650 MCF		Niagaran	E
Grand Traverse 1-25N-11W	Mayfield 1-25N-11W, Pool B	Traverse Corp. Nickerson et al #1-1	33350	6314	6500		206 BC +4 MMCF	Niagaran	E
Grand Traverse 7-25N-11W	Mayfield 7-25N-11W	Eason Oil Co. Yanska #1-7A	33759	5676	6166	36 BOPD +70 MCF +133 BWD		Niagaran	E
Grand Traverse 28-25N-11W	Mayfield 28-25N-11W, Pool A	Shell Oil Co. Hoerich-Hill Est. #5-28A	33603	6499	6733		178 BC +3341 MCF +28 BWD	Niagaran	E
Grand Traverse 7-25N-10W	Paradise 7-25N-10W	Mack Oil Co. Fewless #1-7A	33936	6061	6683		42 BC +1515 MCF	Niagaran	E
Grand Traverse 26-26N-10W	Paradise 26-26N-10W, Pool A	Mack Oil Co. Baldwin-Steadman #1-26B	33696	6571	6827		24 BC +1003 MCF	Niagaran	E
Grand Traverse 29-26N-9W	Union 29-26N-9W	Amoco Prod. Co. State Union "S" #2-29	33961	6808	7075		45 BC +135 MCF	Niagaran	E
Grand Traverse 35-27N-9W	Whitewater 35-27N-9W, Pool A	Amoco Prod. Co. St. Whitewater Unit "L" #4-35	33823	6412	6743	308 BOPD +1160 MCF		Niagaran	E
Ingham 15-2N-2E	White Oak 15-2N-2E	Kulka & Schmiot, Inc. Kemler et al Unit #1-15	33481	4357	4480	120 BOPW +50 MCF		Niagaran	E
Ingham 30-2N-2E	White Oak 30-2N-2E	Reef Petrol. Co. Walker #1-29B	33982	4174	4276	360 BOPD		Niagaran	E
Isabella 35-16N-4W	Vernon, Det. River Sour Zone Pool	H. E. Tope, Inc. McGuire #2	33262	4470	4840	10 BOPD		Det. River Sour Zone	E

1980 DISCOVERY WELLS - Continued

County Location	Field Name	Operator and Lease	Permit Number	Depth to Pay	Total Depth	Initial Production: Oil Wells	Initial Production: Gas Wells	AAPG Producing Formation	Pool Class
Kalkaska 5-26N-8W	Boardman 5-26N-8W	Shell Oil Co. State-Boardman #3-8A	33512	6755	6841		150 BC +1846 MCF	Niagaran	E
Kalkaska 2-27N-6W	Excelsior 2-27N-6W	Shell Oil Co. D'Hondt #3-2B	33319	7247	7373	14 BOPW +55 BWD		Niagaran	E
Kalkaska 14-27N-7W	Kalkaska 14-27N-7W	Amoco Prod. Co. Meier Unit #1-14	33648	6785	7135		321 BC +2695 MCF +60 BWD	Niagaran	E
Lapeer 20-10N-10E	Rich Berea Pool	Sun Oil Co. Curell-Ferrill Unit #1	33158	1420	3334		30 BWD +112 MCF	Berea	E
Manistee 16-23N-15W	Bear Lake 16-23N-15W	Energy Acquisition Corp. Bowling #1-16	33138	4316	4790	18 BOPD +50 MCF		Niagaran	E
Manistee 16-24N-13W	Cleon 16-24N-13W	North. Mich. Explor. Co. Rebman et al #3-16A	33450	5343	5558		111 BC 3303 MCF +1 BWD	Niagaran	E
Manistee 19-24N-13W	Cleon 19-24N-13W, Pool B	Miller Bros. State-Cleon #4-19	33242	5268	5460	240 BOPD +Gas		Niagaran	E
Manistee 23-24N-13W	Cleon 23-24N-13W	Shell Oil Co. Drobena et al #2-23A	33711	5740	5883	426 BOPD +316 MCF		Niagaran	E
Manistee 28-24N-13W	Cleon 28-24N-13W	Muskegon Dev. Co. Knight-Emerson #2-28	33778	5545	5670	288 BOPD		Niagaran	E
Manistee 32-24N-13W	Cleon 32-24N-13W, Pool B	Traverse Corp. Spaulding #1-32	33621	5422	5740	180 BOPD +225 MCF		Niagaran	E
Manistee 2-22N-16W	Manistee 2-22N-16W, Pool A	Miller Bros. Hadaway et al #5-2	33780	4344	4500	120 BOPD +60 MCF +28 BWD		Niagaran	E
Manistee 36-22N-17W	Manistee 36-22N-17W, Pool A	Traverse Corp. Mar-Lawn Hgts. Subdivis. #3-36	33488	3911	4100	342 BOPD +230 MCF		Niagaran	E
Manistee 10-23N-14W	Maple Grove 10-23N-14W, Pool B	Miller Bros. State-Maple Grove #1-10	33289	5140	5350	108 BOPD +796 MCF		Niagaran	E
Missaukee 35-22N-6W	Prosper Traverse Pool	Dart Oil & Gas Co. Coffield Estate #1-35	33760	3176	5280	41 BOPD		Traverse	E
Newaygo 33-16N-11W	Barton, Sec. 33	Robert Raffaele, Inc. Cousineau #1-33	33884	1206	3100		250 MCF	Marshall	E
Oakland 8-1N-7E	Lyon 8-1N-7E	Reef Petroleum Corp. Felber #1-8	33713	3686	3851	277 BOPD +177 MCF		Niagaran	E
Oakland 17-1N-7E	Lyon 17-1N-7E	Reef Petroleum Corp. Chicorel #1-17	34002	3631	3777	480 BOPD		Niagaran	E
Oakland 25-3N-10E	Pontiac 25-3N-10E	Mich. Oil Co. Meadowbrook Pk. Dev. Co.#1-25A	33031	3501	3568	25 BOPD +Trace Wtr.		Niagaran	E
Oceana 15-14N-18W	Benona 15-14N-18W	Amoco Prod. Co. Isley Unit #1-22	33154	3906	5035	295 BOPW +1431 MCF Sour		Niagaran	E
Oceana 11-13N-18W	Claybanks 11-13N-18W	Amoco Prod. Co. Miller-Fox #1-11	33500	3658	3737		51 BC +3.875 MMCF	Niagaran	E
Osceola 27-18N-8W	Evart - Richfield Pool	Dart Oil & Gas Co. McCormick #1-27	33813	4881	4975		200 MCF	Richfield	E
Otsego 8-30N-1W	Charlton, Sec. 8	Reef Petroleum Corp. Andrilla Corp. #1-A-8	33394	1315	1488		30 MCF +45 BWD	Antrim	E
Otsego 16-30N-1W	Charlton, Sec. 16	Antrim Resources Kalman #1-A16	33371	1389	1523		70 MCF +75 BWD	Antrim	E
Otsego 16-30N-1W	Charlton 16-30N-1W	Reef Petroleum Corp. Cauchon et al #2-16A	33769	5894	6189		500 MCF	Niagaran	E
Otsego 13-29N-2W	Chester - Traverse Pool	Murell L. Welch State-Chester #17	33750	1767	1768		1.2 MMCF	Traverse	E
Presque Isle 17-34N-5E	Belknap 17-34N-5E	Mi. Oil Co. & North. Mi. Expl. Tosch-Wolson #1-17	33255	3003	3387	500 BOPD 2.5 BWD Sour		Niagaran	E
Roscommon 17-22N-4W	Wellsville - Traverse Pool	Dart Oil & Gas Corp. Porter-Hogan Trust #3-17	33544	3000	3737	92 BOPD +Gas		Traverse	E
Saginaw 24-9N-3E	Chesaning, Sec. 24	Stocker & Sitler Vrable-St.-Chesaning Unit #1	33310	2223	2961	Pump 4-5 BOPD		Traverse	E
St. Clair 27-6N-16E	Kimball	American Nat. Gas Prod. Co. Fogarty #1-27	33267	2887	3020		2100 MCF	Niagaran	E
Tuscola 29-11N-8E	Vassar	Sun Oil Co. Marecki #1	33159	3190	3554	1 BOPD +58 BWD		Det. River Sour Zone	E

[Permits, Well Completions, Drilled Footage, Table 1]

TABLE 1. DRILLING PERMITS, WELL COMPLETIONS, DRILLED FOOTAGE BY COUNTY, 1980

Classification of New Hole Completions
Does not include reworked wells or old wells drilled deeper

COUNTY	OIL/GAS PERMITS ISSUED	OIL & GAS TESTS Completed Explor.	OIL & GAS TESTS Completed Devel.	RESULTS Oil Wells	RESULTS Gas Wells	RESULTS Dry Holes	SERVICE WELLS Completed G.S.	SERVICE WELLS Completed B.D.W.	TOTAL WELLS DRILLED	TOTAL DRILLED FOOTAGE Explor.	TOTAL DRILLED FOOTAGE Devel.	TOTAL DRILLED FOOTAGE Fac.	Average Well Depth
Allegan	6	2	0	0	0	2	0	0	2	5,570	0	0	2,785
Antrim	4	1	2	1	0	2	0	0	3	6,815	8,743	0	5,186
Arenac	8	1	2	2	0	1	0	0	3	4,344	9,036	0	4,460
Bay	16	7	4	4	0	7	0	0	11	25,181	12,752	0	3,448
Benzie	1	0	0	0	0	0	0	0	0	0	0	0	0
Berrien	0	1	0	0	0	1	0	0	1	637	0	0	637
Calhoun	64	24	19	7	7	29	0	0	43	80,905	58,258	0	3,236
Cass	18	3	9	7	0	5	0	0	12	2,472	6,745	440*	805
Cheboygan	4	3	2	1	0	4	0	0	5	13,388	5,719	0	3,821
Clare	14	4	9	11	0	2	4	2	19	20,353	46,692	14,321	4,282
Crawford	10	1	8	4	0	5	0	3 (1)	12	7,102	44,708	20,202	6,001
Eaton	17	13	4	7	0	10	0	0	17	51,609	15,451	0	3,945
Genesee	2	0	0	0	0	0	0	0	0	0	0	0	0
Gladwin	30	0	24	24	0	0	0	0	24	0	69,688	0	2,904
Gd. Traverse	107	52	49	12	14	75	0	1	102	285,715	243,210	2,137	5,206
Gratiot	3	0	0	0	0	0	0	0	0	0	0	0	0
Hillsdale	17	3	7	6	0	4	0	0	10	12,648	28,477	0	4,113
Huron	3	0	0	0	0	0	0	0	0	0	0	0	0
Ingham	30	18	7	2	0	23	0	0	25	74,661	24,368	0	3,961
Iosco	1	0	0	0	0	0	0	0	0	0	0	0	0
Isabella	14	2	8	4	0	6	0	0	10	8,890	31,439	0	4,033
Jackson	5	0	7	3	0	4	0	0	7	0	39,701	0	5,672
Kalamazoo	2	0	1	0	0	1	0	0	1	0	2,830	0	2,830
Kalkaska	53	21	22	7	5	31	16	0	59	129,862	134,211	103,505	6,230
Lapeer	33	3	11	8	1	5	0	0	14	9,878	34,926	0	3,200
Lenawee	4	3	1	0	0	4	0	0	4	4,921	3,790	0	2,178
Livingston	6	6	0	0	0	6	0	0	6	19,993	0	0	3,332
Macomb	11	5	5	0	3	7	0	0	10	20,257	16,610	0	3,687
Manistee	79	36	37	19	5	49	0	1	74	164,926	165,768	1,700	4,492
Mason	5	0	2	1	0	1	0	0	2	0	6,972	0	3,486
Mecosta	9	4	1	0	0	5	6	0	11	16,068	1,312	8,490	2,352
Midland	2	1	3	2	0	2	0	0	4	3,707	10,698	0	3,601
Missaukee	32	3	26	24	0	5	0	0	29	11,916	120,070	0	4,551
Monroe	0	1	0	0	0	1	0	0	1	3,101	0	0	3,101
Montcalm	14	1	1	0	0	2	10	0	12	3,275	3,315	13,292	1,657
Montmorency	6	7	0	0	0	7	0	0	7	33,451	0	0	4,779
Muskegon	5	1	0	0	0	1	0	0	1	1,743	0	0	1,743
Newaygo	8	1	4	3	1	1	0	0	5	3,100	13,799	0	3,380
Oakland	14	8	6	5	1	8	0	0	14	30,124	25,495	0	3,973
Oceana	4	3	1	1	1	2	0	0	4	16,042	4,299	0	5,085
Ogemaw	18	1	10	10	0	1	0	6 (1)	17	4,135	33,616	16,560	3,195
Osceola	3	3	0	1	0	2	0	0	3	14,770	0	0	4,923
Oscoda	1	0	0	0	0	0	0	0	0	0	0	0	0
Otsego	67	27	29	4	12	40	5	0	61	124,277	118,886	27,992	4,445
Ottawa	2	1	0	0	0	1	0	0	1	2,835	0	0	2,835
Presque Isle	31	34	0	1	0	33	0	0	34	105,305	0	0	3,097
Roscommon	24	1	16	17	0	0	0	0	17	3,737	71,412	0	4,421
Saginaw	8	2	5	4	0	3	0	0	7	6,038	12,848	0	2,698
Sanilac	1	1	0	0	0	1	0	0	1	8,512	0	0	8,512
St. Clair	12	4	1	0	1	4	0	0	5	10,785	3,135	0	2,784
Tuscola	6	2	4	2	0	4	0	0	6	11,194	15,314	0	4,418
Van Buren	12	2	5	3	0	4	0	1	8	3,625	5,921	1,135	1,335
Washtenaw	3	0	1	0	0	1	0	0	1	0	3,681	0	3,681
Wayne	0	0	0	0	0	0	2	0	2	0	0	2,327	1,164
Wexford	7	2	3	1	0	4	0	0	5	8,126	14,143	0	4,454
Total	856	319	356	208	51	416	43	14	732	1,375,993	1,468,038	212,101	

*Includes some facility footage credited to old wells drilled deeper
(1)Water injection wells involved in secondary recovery operations.

* * * STATE OIL AND GAS REVENUE * * *

Total State revenue credited to 1980 is as follows:

Hydrocarbon royalties	
Oil & Condensate	$16,448,702.73
Gas, Casinghead gas, LPG	8,055,148.15
Shut-in royalty	877.32
Subtotal	$24,504,728.20
Rentals	1,015,876.99
Bonus	-2,982.64
Application-Assignment fees . . .	1,679.00
Subtotal	1,014,573.35
Total Revenue	$25,519,301.55

* * * WELL RECORDS AND OIL AND GAS MAPS * * *

OIL AND GAS WELL RECORDS. Descriptive geological logs and driller's logs are available for over 34,000 tests, including exploratory, development, facility and other types of wells. Individual well records may be purchased at a nominal cost from the Geological Survey Division. Electric or radiation logs of any type are not available for distribution or sale.

OIL AND GAS FIELD MAPS. Blueprint copies of oil and gas field maps are available for every county in the Southern Peninsula. The maps show locations of oil and gas tests but do not show geological data or structural contour lines. County map scales are 1" = 1 mile. Blueprint field maps are available for many oil and gas fields. These maps show well locations, well permit numbers, operators and lease names. They do not show geological data or structural contour lines. Field map scales are mainly 4" = 1 mile. All manuscript maps or tracings from which blueprint copies are made are posted on a regular basis. An oil and gas field maps list may be obtained from the Geological Survey Division upon request.

PART 2

EXPLANATION

Part 2 brings together general information on Michigan's oil and gas fields, gas storage reservoirs, LPG storage facilities, gas plant operations, refinery facilities and other items.

TABLES 2 and 3 list Michigan's oil and gas fields and gas storage reservoirs. The symbol on the left margin of the table indicates the official classification of fields and pools at the end of the year. Classifications may be changed as warranted. Official field names are listed alphabetically in the first column and the producing pool, or pools, are shown under the heading Producing Formation or Pool. Most fields consist of one pool with oil or gas production coming from a single reservoir within a formation. Some fields have two or more separate pools, each producing from a different formation or stratigraphic interval and at a different depth. Most multi-pool fields are associated with a common structural feature. Salina-Niagaran reef oil or gas accumulations are mostly single-pool fields. Some, however, have several separate reef reservoirs designated as Pool A, Pool B and so on. Most have been so designated by administrative action following public hearings. Also, a few of the listed fields actually consist of two or more hydrocarbon accumulations which for administrative purposes have been consolidated under one field name.

Location of fields. The geographic location of fields and pools can be found by township and range on the center-spread oil and gas field map. Due to space limitations, all field names are not shown on the map.

The Pay Zone part of the table generally refers to data for the discovery well for the field or pool. The indicated pay thickness relates to the amount of pay opened or perforated in the discovery well and does not necessarily indicate total net or gross pay for the reservoir.

The Deepest Formation or Pool Tested column indicates the stratigraphically oldest formation penetrated and the deepest total depth reached beneath the field area. Data in these columns are updated periodically.

The Number of Wells column indicates the number of successful field wells drilled in the field to the end of the specified year, the number completed as producing wells during the specified year, the number abandoned during the year and the number of active wells at the end of the specified year.

The Drilled Acres column indicates the total number of acres assigned to the field or pool according to individual well drilling units assigned to each producing well completed in the field or pool. Except as provided by special orders covering drilling units, rules promulgated under Act No. 61, P.A. of 1939, as amended, call for a minumum 40-acre unit consisting of a governmental quarter-quarter section of land. Special Order No. 1-73 calls for basic 80-acre drilling units for Salina-Niagaran or deeper tests in specified areas of the state. These 80-acre units are formed by two governmental quarter-quarter sections of land having a common boundary of approximately 1320 feet. In past years drilling units have been 10, 20 or 40 acres for oil wells. A field may have had a 10 or 20-acre drilling unit for one pool and a 40-acre unit for a deeper formation pool. During the development of a field or pool the drilling unit size may change. Subsequent wells are assigned acreage values in accordance with the new unit size. Gas well units, especially for Michigan Stray Sandstone reservoirs, have generally been 160-acre units. Other sizes currently in use for gas wells are 40, 80, 320 and 640-acre units, or a unit size based on seismic and reservoir data. Reef reservoirs, especially in the northern reef trend, have been assigned 80, 160, 640, or a unit based on seismic data. Changes in drilling units, off-pattern wells, etc., complicate the maintenance of accurate figures during the lifetime of a given field or pool.

Recovery Per Acre Drilled figures for oil pools are derived by dividing the cumulative production figure by the drilled acres figure.

Gas Fields, Gas-Condensate Fields. Some fields are listed as "shut-in" and show no production figures. In the case of Niagaran reef fields classified as gas-condensate reservoirs, virtually all those listed as shut-in at the end of the year were waiting pipeline construction or gas-handling facilities. Others, mainly small dry-gas reservoirs in shallower formations, are listed as shut-in because of slow field development, small reserves or lack of marketing facilities. Other fields, not considered to have commercial-size gas accumulations, produce small quantities of unmetered gas which is used for domestic purposes and in some cases, lease fuel.

GAS STORAGE RESERVOIRS. Most gas storage reservoirs were originally classified as gas fields or pools. Upon depletion or near depletion of native gas they were converted to storage reservoirs.

LPG STORAGE. Surface and underground storage facilities for liquified petroleum gas.

OIL WELL GAS. This is casinghead gas produced incidental to the production of oil from pools or fields generally classified as oil accumulations.

NATURAL GAS LIQUIDS (CONDENSATE). Natural gas liquids are those portions of reservoir gas which are liquified at the surface in lease separators, field facilities, or gas processing plants. These liquids include but are not limited to: ethane, propane, butanes, pentanes, natural gasoline and condensate. On Tables 2 and 3 of this report, condensates from Michigan gas-condensate fields are shown under the oil production column.

WELL SAMPLE SETS. Well cuttings for over 9,000 wells are available for inspection at the Geological Survey Division, Michigan Department of Natural Resources, Lansing. Samples are contained in glass vials arranged in open trays. In addition, several thousand shallow geological test samples are also available for inspection. The Division does not maintain a core collection. Other sample and core repositories, not connected with the Division, are located at:

Subsurface Laboratory, Department of Geology,
The University of Michigan, Ann Arbor, Michigan.

Department of Geology, Wayne State University,
Detroit, Michigan.

Department of Geology, Western Michigan University,
Kalamazoo, Michigan.

Department of Geology, Michigan State University,
East Lansing, Michigan.

Department of Geology, Central Michigan University,
Mt. Pleasant, Michigan.

PART 3
CUMULATIVE RECORDS

EXPLANATION

PART 3 contains cumulative statistics principally of oil and gas production, well completions, and oil field brine production and disposal from 1925 through the most recent year-end compilations.

OIL AND GAS PRODUCTION TABLES. Oil and gas production figures for individual years prior to 1960 can be found in issues of "Summary of Operations, Oil and Gas Fields" for 1962 and prior years, and in "Michigan's Oil and Gas Fields" 1963 to present. The tables show the year of the first recorded production from a particular formation, and the yearly and cumulative production totals from 1925 through the most recent year-end compilations. Cumulative oil and gas production by county is shown on a separate table. Refer to Part 1 for county production figures for the past year, and prior issues for previous years.

CUMULATIVE WELL COMPLETIONS. These tables show the cumulative number of yearly completions in a county. Well density figures include field development wells, exploratory wells, and service wells of all types.

DRILLING PERMITS, WELL COMPLETIONS, FIELDS DISCOVERED. These tables show the number of drilling permits issued by year from 1927 through the most recent year-end compilations. Initial classification of well completions by year, the number of new fields or pools discovered, and the number of producible oil or gas wells on a yearly basis are all shown on the same table.

BRINE PRODUCTION AND DISPOSAL. Oil field brine production records other than for individual fields were discontinued in 1968. These tables listed the reported amount of produced brine and the method of disposal from 1937 up to 1967. Most of field brine is still returned to subsurface formations. Small quantities are used for dust control or ice and snow removal on county roads in local areas.

SERVICE WELLS. Service wells as listed in this publication are those wells which were drilled to serve some purpose other than the initial production of oil or gas. Oil or gas wells are sometimes converted to salt water disposal, observation, or facility wells in gas storage or pressure maintenance projects. There are several types of service wells:

LPG Wells. These are wells drilled for underground storage of liquified petroleum gas. In Michigan, these storage reservoirs are in man-made cavities in salt beds. The cavities have been made by dissolving the salt with water and then pumping out the brine.

Gas Storage Wells. These are wells drilled in gas storage reservoirs. They are frequently referred to as facility wells, and are generally used to inject gas into or extract gas from the reservoir. Certain facility wells may sometime in the history of the field be used as salt water disposal wells or observation wells.

Observation Wells. Most observation wells are related to gas storage projects. They are used to observe underground movement of gas, brines and other fluids, or to observe pressures.

Brine Disposal Wells. These wells are used in the disposal of oil and gas field brines back into some suitable subsurface formation.

Injection and Pressure Maintenance Wells. These are wells used in secondary recovery, or pressure maintenance projects. They may be new wells drilled specifically for injection or pressure maintenance, or they may be converted oil or gas wells; their status can change from time to time.

Oil or gas wells are sometimes converted to salt water disposal, observation, facility wells in gas storage reservoirs, or water injection wells used in secondary recovery or pressure maintenance projects. The types of service wells listed under "Classification of Well Completions" do not include oil or gas wells converted to service wells.

CROSS-REFERENCE LIST - FIELDS BY COUNTY

ALLEGAN
ALLEGAN; CASCO; CHESHIRE; CROOKED LAKE; DIAMOND SPRINGS; DIAMOND SPRINGS; DORR; DUNNINGVILLE; HAWKHEAD; HEATH; MILLIARDS; HOPKINS; LEE; MARTIN; MONTEREY; NEW RICHMOND; OTSEGO; OVERISEL; PULLMAN; RABBIT RIVER; SALEM; TROWBRIDGE; WAYLAND

ALPENA
ALPENA

ANTRIM
MANCELONA

ARENAC
ADAMS; AU GRES; CLAYTON; DEEP RIVER; LINCOLN; MOFFATT; STANDISH; STERLING

BARRY
FREEPORT; HOPE; JOHNSTOWN; THORNAPPLE

BAY
BEAVER; CRUMP; ESSEXVILLE; GIBSON; KAWKAWLIN; LUCHT; MT. FOREST; PINCONNING; WILLIAMS

BENZIE
COLFAX; NILES; PIPESTONE

CALHOUN
ALBION; CAL-LEE; CLARENCE; CONVIS; LEE; PENNFIELD; TEKONSHA

CASS
ADAMSVILLE; CALVIN; CALVIN-JUNO LAKE; JEFFERSON; NORTH PORTER

CLARE
CLARE CITY; CRANBERRY LAKE; CRANBERRY LAKE, EAST; FREEMAN; FREEMAN-LINCOLN; FREEMAN-REDDING; GARFIELD; GREENWOOD; HAMILTON; HARRISON; HATTON; LAKE GEORGE; MCKAY; REDDING; SKEELS; SURREY; WINTERFIELD

CHEBOYGAN
FOREST

CLINTON
DALLAS; LEBANON

GRAWFORD
BEAVER CREEK UNIT; FREDERIC; MAPLE FOREST; SOUTH BRANCH

EATON
BROOKFIELD; EATON RAPIDS; HAMLIN; OLIVET

GRAND TRAVERSE
BLAIR; EAST BAY; GRANT; MAYFIELD; PARADISE; UNION; WHITEWATER

GENESEE
OTISVILLE; OTTER LAKE

GLADWIN
BARD; BEAVERTON; BEAVERTON, SOUTH; 8EAVERTON, WEST; BENTLEY; BILLINGS; BILLINGS, SOUTH; BUCKEYE, NORTH; BUCKEYE, SOUTH; BUTMAN; GROUT; HAY; SAGE; SECORD; SKEELS

GRATIOT
ELBA; ITHACA; NEWARK; NORTH STAR; PINE RIVER; PINE RIVER; SUMNER

HILLSDALE
ADAMS; ALBION-PULASKI-SCIPIO TREND

HURON
DWIGHT; GRANT

INGHAM
AURELIUS; INGHAM; LESLIE; ONONDAGA; STOCKBRIDGE; VEVAY; WHITE OAK

ISABELLA
BRINTON; BROOMFIELD; CHIPPEWA; COLDWATER; CURRIE; FREMONT; GILMORE

JACKSON
CONCORD; HANOVER; HENRIETTA; SPRINGFORT

KALAMAZOO
ALAMO; COMSTOCK; COOPER

KALKASKA
BLUE LAKE; BOARDMAN; COLD SPRINGS; EXCELSIOR; KALKASKA; RAPID RIVER; SOUTH BOARDMAN UNIT

LAKE
CHASE

LENAWEE
BLISSFIELD; DEMINGS LAKE

LIVINGSTONE
GREEN OAK; FOWLERVILLE

HILLSDALE
LIME LAKE; READING

IONIA
HUBBARDSTON

ISABELLA
ISABELLA; LEATON; LINCOLN; ROLLAND; ROSEBUSH; SHERMAN; UNION; VERNON; WISE

KENT
ROCKFORD; TYRONE;. WALKER; WYOMING PARK

LAKE
LUTHER; LUTHER, NORTH; PEACOCK; SAUBLE

LAPEER
MARATHON; RICH

LENAWEE
NEWBURG; MACON CREEK; MEDINA; RIDGEWAY; NORTH MORENCI; WOODSTOCK

LIVINGSTON
IOSCO

MACOMB
BRUCE; CHESTERFIELD; COON CREEK; LENOX; MT. CLEMENS; RICHMOND; WASHINGTON

MANISTEE
BEAR LAKE; BROWN; CLEON; FILER; MAPLE GROVE; MARILLA; ONEKAMA; PLEASANTON; SPRINGDALE

MASON
EDEN; FOUNTAIN; GRANT; HAMLIN; LOGAN; OXBOW; RIVERTON; SCOTTVILLE; ST. MARY'S LAKE; VICTORY; WILEY

MECOSTA
BEVENS LAKE; BIG RAPIDS; COLFAX; FORK; GREEN; HARDY DAM; MARTINY; MECOSTA; MECOSTA LAKE; MORTON; PARIS; SHERIDAN; WHEATLAND

MIDLAND
EDENVILLE; GENEVA; JEROME; LARKIN; MILLS; MT. HALEY; MT. PLEASANT; PORTER; SANFORD

MISSAUKEE
CANNON CREEK; EAST NORWICH; ENTERPRISE; FALMOUTH; FORWARD; MCBAIN; PIONEER; PROSPER; PROSPER, SOUTH; REEDER; RIVERSIDE; VOGEL CENTER

MONROE
DEERFIELD; SUMMERFIELD

MONTCALM
BELLY ACHERS; BLOOMER; BUSHNELL; CATO; CRYSTAL; DAY; DOUGLASS; EDMORE; EDMORE-RICHLAND; ENTRICAN; HOME; LAKEVIEW; MAPLE VALLEY; PINE; REYNOLDS; RICHLAND; STANTON; TURK LAKE; WINFIELD

MONTMORENCY
ATLANTA; MONTMORENCY

MUSKEGON
CEDAR CREEK; DALTON; EGELSTON; HOLTON; LAKETON; MONTAGUE; MUSKEGON; RAVENNA; TRENT; WHITE RIVER; WOLF LAKE

NEWAGO
ASHLAND; BARTON; BIG PRAIRIE; BISHOP; COLE LAKE; CROTON; ENSLEY; GOODWELL; GOODWELL, EAST; HUBER; KIMBALL LAKE; REEMAN; SHERIDAN; THOMPSON CORNERS; WHITE CLOUD; WOODVILLE

OAKLAND
ADDISON; AVON; LEONARD; LYON; NORTHVILLE; PONTIAC

OCEANA
BENONA; CLAYBANKS; CRYSTAL VALLEY; CRYSTAL VALLEY, SOUTH; ELBRIDGE; FERRY; FOREST RIVER; GILBERT LAKE; HART; MEARS; OTTO; PENTWATER; PENTWATER LAKE; ROTHBURY; SHELBY; STONY LAKE; WEARE

OGEMAW
EDWARDS; LOGAN; ROSE CITY; WEST BRANCH

OSCEOLA
ASHTON; ASHTON, EAST; BURDELL; CAT CREEK; CEDAR; EVART; FORK, NORTH; HARTWICK; HERSEY; LEROY; MIDDLE BRANCH; MINERAL SPRINGS; PECKS LAKE; REED CITY; REED CITY, EAST; ROSE LAKE; SEARS; SYLVAN

OSCODA
MIO

OTSEGO
BAGLEY; CHARLTON; CHESTER; DOVER; HAYES; OTSEGO; OTSEGO LAKE

OTTAWA
COOPERSVILLE; DENNISON; FILLMORE; MARNE; POLKTON; ROBINSON; WRIGHT; ZEELAND

PRESQUE ISLE
ALLIS; BELKNAP; BISMARCK; CASE; NORTH ALLIS; PULAWSKI

ROSCOMMON
HEADQUARTERS; NELLSVILLE; ST. HELEN

SAGINAW
BIRCH RUN; BIRCH-BELA; CHESANING; FREMONT; LAKEFIELD; RICHLAND; SAGINAW; ST. CHARLES; TAYMOUTH

SHIAWASSEE
NEW LOTHROP

SAINT CLAIR
ADAIR; ALGONAC; ALPINE; BERLIN; BIG HAND; BOYD; CHINA BELLA; CHINA; CHINA, SOUTH; COLUMBIS; COLUMBUS, NORTH; COTTRELLVILLE; DIAMOND CRYSTAL SALT; EAST CHINA; KIMBALL; MARINE CITY; MARINE CITY, SOUTH; PETERS; PETERS, EAST; PORT HURON; ST. CLAIR; STARRVILLE; WALES; YANKEE

TUSCOLA
AKRON; AKRON, EAST; ARBELA; ELKLAND; ELMWOOD; FOSTORIA; VASSAR

VAN BUREN
BANGOR; BLOOMINGDALE; BREEDSVILLE; CLEAR LAKE; COFFEE LAKE; GENEVA; LACOTA; LAWTON; PAW PAW

WASHTENAW
CLINTON; FREEDOM; LYNDON; NORTHVILLE

WAYNE
NEW BOSTON; NORTHVILLE; ROMULUS

WEXFORD
CHERRY GROVE; HENDERSON; WEXFORD

CROSS-REFERENCE LIST - FIELDS BY PRODUCING FORMATION

A-1 CARBONATE
AKRON; ALPENA; CHESTER; DOVER; KALKASKA; LEE; OLIVET; ROMULUS; STOCKBRIDGE; WASHINGTON

A-2 CARBONATE
AKRON; PENTWATER; PULLMAN, EAST

A-1 C NIAGARAN
BAGLEY

A-2 C LOWER NIAGARAN
CHARLTON; CHESTER

ANTRIM
ALGONAC; CHARLTON; CHESTER; DOVER; MAYFIELD; OTSEGO; OTSEGO LAKE

BEREA
ADAMS, NORTH; BEAVER; BIRCH RUN; BUCKEYE, SOUTH; CEDAR CREEK; CHASE; CLAYTON; COOPERSVILLE; DEEP RIVER; DORR; EGELSTON; FERRY; FOSTORIA; FREMONT; HAY; KAWKAWLIN; LARKIN; LOGAN; MARATHON; MARNE; NEW LOTHROP; OTISVILLE; OTTER LAKE; OTTO; RAVENNA; RAVENNA; RICH; ROTHBURY; SAGINAW; STONY LAKE; WALKER; WILLIAMS; WOLF LAKE; WRIGHT; ZEELAND

DETRIOT RIVER SOUR ZONE
ADAMS; AKRON; ATLANTA; AU GRES; BILLINGS; BUCKEYE, SOUTH; CANNON CREEK; CLAYTON; CRANBERRY LAKE; DORR; DWIGHT; EXCELSIOR; GARFIELD; GRANT; GROUT; HEADQUARTERS; KAWKAWLIN; LYNDON;

MARATHON; OTTER LAKE; REED CITY; RICH; SALEM; SKEELS; STERLING; VASSAR; VERNON; WALKER; WEST BRANCH; WISE

DRIFT
GRANT

DUNDEE - REED CTY
COLFAX; WINFIELD

DUNDEE
ADAMS; ADAMS, NORTH; AKRON; ARBELA; ASHTON; BARD; BEAVERTON; BEAVERTON, SOUTH; BEAVERTON, WEST; BELLY ACHERS; BENTLEY; SEVENS LAKE; BIG PRAIRIE; BIG RAPIDS; BILLINGS; BILLINGS, SOUTH; BIRCH RUN; BIRCH-BELA; BRINTON; BROOMFIELD; BUCKEYE, NORTH; BUCKEYE, SOUTH; BURDELL; BUSHNELL; BUTMAN; CAT CREEK; CEDAR; CLAYTON; COLDWATER; COLDWATER, SOUTH; COLFAX; CRANBERRY LAKE; CRANBERRY LAKE, EAST; CRUMP; CRYSTAL; CRYSTAL VALLEY; CURRIE; DAY; DEEP RIVER; DOUGLASS; EAST NORWICH; EDEN; EDENVILLE; EDWARDS; ELKLAND; ELMWOOD; ENTRICAN; ESSEXVILLE; EVART; FALMOUTH; FORK; FORK, NORTH; FREEDOM; FREEMAN; FREEMAN-LINCOLN; FREEMAN-REDDING; FREMONT; GENEVA; GIBSON; GILMORE; GOODWELL, EAST; GREENWOOD; GROUT; HAMILTON; HARRISON; HATTON; HEADQUARTERS; HOME; HUBBARDSTON; ISABELLA; JEROME; KAWKAWLIN; LAKE GEORGE; LAKEFIELD; LAKETON; LEATON; LINCOLN; MARATHON; MCBAIN; MEARS; MILLS; MINERAL SPRINGS; MOFFATT; MT. FOREST; MT. HALEY; MT. PLEASANT; NELLSVILLE; NORTHVILLE; OTISVILLE; PARIS; PECKS LAKE; PENTWATER; PINCONNING; PINE RIVER; PORT HURON; PORTER; PROSPER; PROSPER, SOUTH; REED CITY; RIVERSIDE; ROBINSON; ROLLAND; ROSEBUSH; SAGE; SANFORD; SECORD; SHERMAN; SKEELS; STERLING; SYLVAN; VERNON; VOGEL CENTER; WEST BRANCH; WHEATLAND; WHITE RIVER; WINTERFIELD; WISE

MARSHALL
BARTON; ENSLEY

MICHIGAN STRAY
ASHTON; ASHTON, EAST; SEVENS LAKE; BIG PRAIRIE; BIG RAPIDS; BROOMFIELD; CEDAR; CHERRY GROVE; CLARE CITY; COLFAX; DAY; DOUGLASS; EDMORE-RICHLAND; ELBA; ENTERPRISE; EVART; FALMOUTH; FORK, EAST; FORK, NORTH; FORK, WEST; FORWARD; FREMONT; GILMORE; GOODWELL, EAST; GREEN; HAMILTON; HARRISON; HARTWICK; HEADQUARTERS; HERSEY; ISABELLA; ITHACA; LEATON; MAPLE VALLEY; MARTINY; MCKAY; MECOSTA; MECOSTA LAKE; MIDDLE BRANCH; MINERAL SPRINGS; MORTON; NEWARK; NORTH STAR; PARIS; PINE; PROSPER; REDDING; REEDER; RICHLAND; ROLLAND; SEARS; SHERIDAN; SURREY; SYLVAN; TURK LAKE; UNION; VERNON; WHEATLAND; WISE

NIAGARAN
ADDISON; ALLIS; ALPINE; AURELIUS; AVON; BAGLEY; BEAR LAKE; BELKNAP; BENONA; BERLIN; BIG HAND; BISMARCK; BLAIR; BLUE LAKE; BOARDMAN ; BROOKFIELD; BROWN; BRUCE; CAL-LEE; CASE; CHARLTON; CHESTER; CHESTERFIELD; CHINA; CHINA BELLA; CLARENCE; CLAYBANKS; CLEON; COLD SPRINGS; COLFAX; COLUMBUS; COLUMBUS, NORTH; CONVIS; COON CREEK; COTTRELLVILLE; DIAMOND CRYSTAL SALT; DOVER; EAST BAY; EAST CHINA; EATON RAPIDS; EXCELSIOR; FILER; FOREST; FREDERIC; GRANT; GREEN OAK; HAMLIN; HAYES; INGHAM; IOSCO; KALKASKA; KIMBALL; LEE; LEE; LENOX; LEONARD; LYON; MANCELONA; MANISTEE; MAPLE FOREST; MAPLE. GROVE; MARILLA; MAYFIELD; MONDORENCY; NORTH ALLIS; NORTHVILLE; ONEKAMA; ONONDAGA; OTSEGO; PARADISE; PLEASANTON; PONTIAC; PORT HURON; RAPID RIVER; RICHMOND; SOUTH BOARDMAN UNIT; SPRINGDALE; STARRVILLE; UNION; VEVAY; VICTORY; WASHINGTON; WEXFORD; WHITE OAK; WHITEWATER; YANKEE

PRAIRIE DU CHEIN
LIME LAKE

REED CITY
BURDELL; CATO; EDEN; FOUNTAIN; GOODWELL, EAST; HARDY DAM; KIMBALL LAKE; LEROY; LUTHER, NORTH; PEACOCK; REED CITY; REYNOLDS; SCOTTVILLE

RICHFIELD
ADAMS; AKRON; AKRON, EAST; AU GRES; BEAVER CREEK UNIT; BENTLEY; BUTMAN; CEDAR; CLAYTON; CRANBERRY LAKE; CRANBERRY LAKE, EAST; EAST NORWICH; ENTERPRISE; EVART; FALMOUTH; FORK; FREEMAN-LINCOLN; GROUT; HAMILTON; HEADQUARTERS; HENDERSON; LOGAN; MARATHON; MIO; NELLSVILLE; PROSPER; PROSPER, SOUTH; REED CITY; ROSE CITY; ROSEBUSH; SKEELS; SOUTH BRANCH; ST. HELEN; STANDISH; STERLING; WEST BRANCH; WINTERFIELD

SAGINAW
EDENVILLE

SALINA A-1 CARBONATE
HILLIARDS

SALINA A-2 CARBONATE
FILLMORE

SALINA B UNIT
COOPER

SALINA E ZONE
DIAMOND SPRINGS; LEE

SALINA A-1 CARBONATE
CLARENCE

SALINA - NIAGARAN
ADAIR; BEAR LAKE; BLUE LAKE; BOYD; BROWN; CHARLTON; CHINA, SOUTH; CLARENCE; COLD SPRINGS; COLD SPRINGS; CONVIS; COTTRELLVILLE; DOVER; EAST BAY; EATON RAPIDS; FOWLERVILLE; GRANT; HAMLIN; HAYES; INGHAM; KALKASKA; LEE; LESLIE; MANISTEE; MAPLE GROVE; MARINE CITY; MARINE CITY, SOUTH; MAYFIELD; MONTAGUE; NORTHVILLE; ONONDAGA; OTSEGO LAKE; PARADISE; PENNFIELD; PETERS; PETERS, EAST; PULAWSKI; SPRINGDALE; ST. CLAIR; UNION; WALES; WASHINGTON; WHITE OAK

SALINA
CHINA; CRYSTAL VALLEY; DORR; HEATH; HOPKINS, WEST; KAWKAWLIN; MANISTEE; MT. CLEMENS; SALINAEM; WAYLAND; ZEELAND

SYLVANIA
JEFFERSON

TRAVERSE - DUNDEE
MUSKEGON

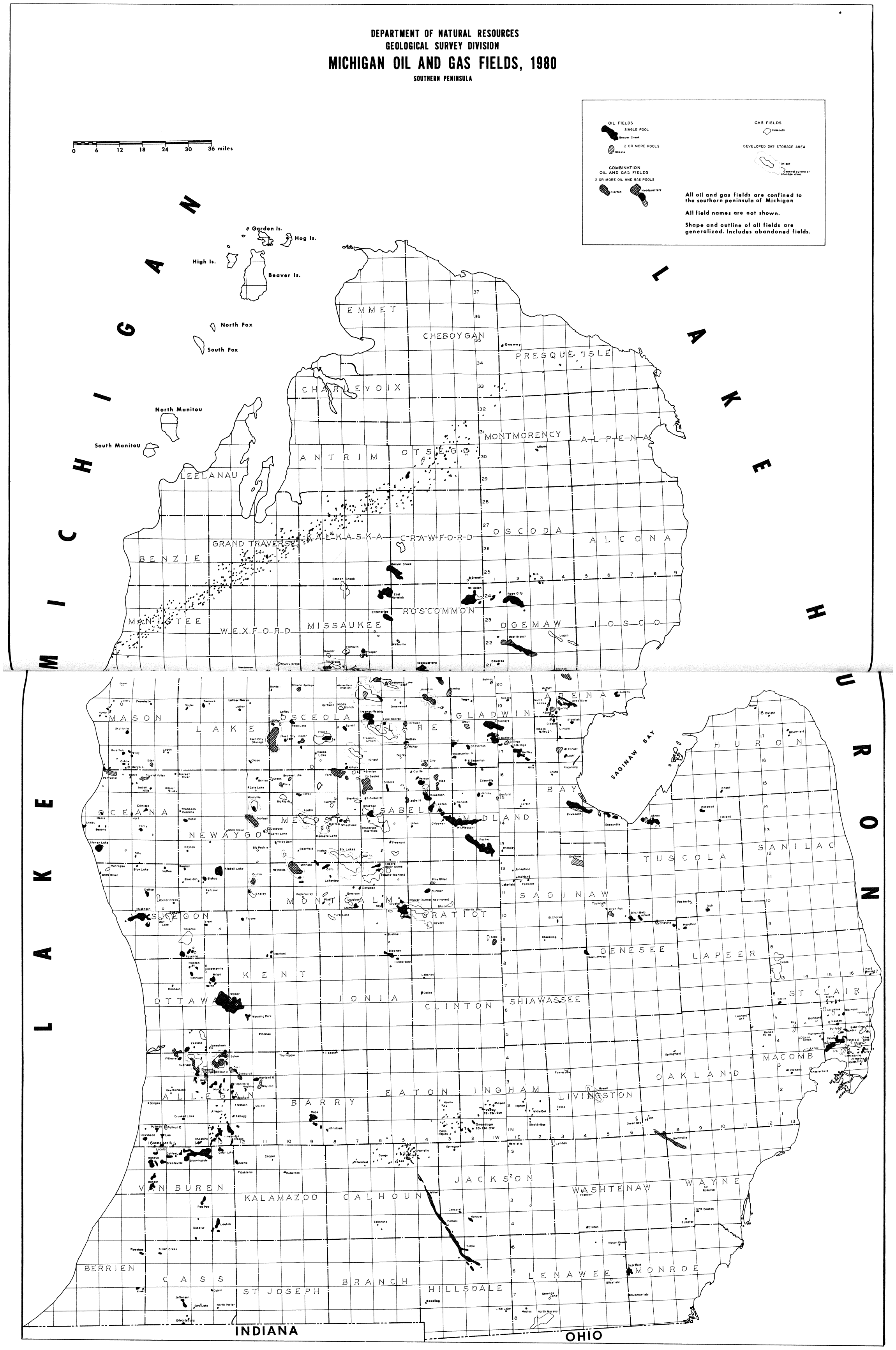
TRAVERSE
ADAMS; ADAMSVILLE; ALAMO; ALBION; ALLEGAN; ASHLAND; ASHTON; BANGOR; BARTON; BEAVERTON, SOUTH; BENONA; BENTLEY; SEVENS LAKE; BISHOP; BLOOMER; BLOOMINGDALE; BREEDSVILLE; BROOMFIELD; BUCKEYE, SOUTH; BUTMAN; CALVIN; CANNON CREEK; CASCO; CEDAR CREEK; CHERRY GROVE; CHESANING; CHESHIRE; CHESTER; CHIPPEWA; CLEAR LAKE; CLINTON; COFFEE LAKE; COLDWATER; COLE LAKE; COMSTOCK; CONCORD; CRANBERRY LAKE; CRANBERRY LAKE, EAST; CROOKED LAKE; CROTON; CRYSTAL; CRYSTAL VALLEY; CRYSTAL VALLEY, SOUTH; DALLAS; DALTON; DAY; DEMINGS LAKE; DENNISON; DIAMOND SPRINGS; DORR; DOUGLASS; DUNNINGVILLE; EAST NORWICH; EDEN; EDMORE; ELBA; ELBRIDGE; ENSLEY; ENTRICAN; EXCELSIOR; FALMOUTH; FERRY; FILLMORE; FOREST RIVER; FREEDOM; FREEPORT; FREMONT; GENEVA; GIBSON; GILBERT LAKE; GOODWELL; GREENWOOD; HART; HAWKHEAD; HEADQUARTERS; HEATH; HILLIARDS; HOLTON; HOME; HOPE; HOPKINS; HOPKINS, SOUTH; HOPKINS, WEST; HUBER; JEFFERSON; JOHNSTOWN; JUNO LAKE; KIMBALL LAKE; LACOTA; LAKETON; LAKEVIEW; LAWTON; LEBANON; LEE; LINCOLN; LUCHT; LUTHER; LYNDON; MARTIN; MEARS; MOFFAT; MONTEREY; MT. FOREST; NELLSVILLE; NEW RICHMOND; NILES; NORTH MORENCI; NORTH PORTER; OTISVILLE; OTSEGO; OTTO; OVERISEL; OXBOW; PARADISE; PARIS; PAW PAW; PEACOCK; PENTWATER; PENTWATER LAKE; PINCONNING; PINE; PINE RIVER; PIONEER; PIPESTONE; POLKTON; PROSPER; PULLMAN; PULLMAN, EAST; RABBIT RIVER; RAPID RIVER; RAVENNA; REED CITY; REED CITY, EAST; REEMAN; REYNOLDS; RICHLAND; RIVERSIDE; RIVERTON; ROCKFORD; ROSE LAKE; SALEM; SANFORD; SAUBLE; SCOTTVILLE; SHELBY; SHERIDAN; SHERMAN; SKEELS; ST. CHARLES; ST. MARY'S LAKE; STANTON; STERLING; STONY LAKE; SUMNER; TAYMOUTH; THOMPSON CORNERS; THORNAPPLE; TRENT; TROWBRIDGE; TYRONE; UNION; VEVAY; VICTORY; WALKER; WAYLAND; WAYLAND, NORTH; WEARE; WEST BRANCH; WHITE CLOUD; WILEY; WINTERFIELD; WISE; WOLF LAKE; WOODSTOCK; WOODVILLE; WRIGHT; WYOMING PARK; ZEELAND

TRENTON BLACK RIVER
ALBION...SCIPIO TREND; BLISSFIELD; GREEN OAK; HANOVER; MACON CREEK; MEDINA; NORTHVILLE; OLIVET; SPRINGPORT; SUMMERFIELD

TRENTON
DEERFIELD; FREEDOM; HENRIETTA; NEW BOSTON; NEWBURG; READING; RIDGEWAY; TEKONSHA

WEIR
LOGAN

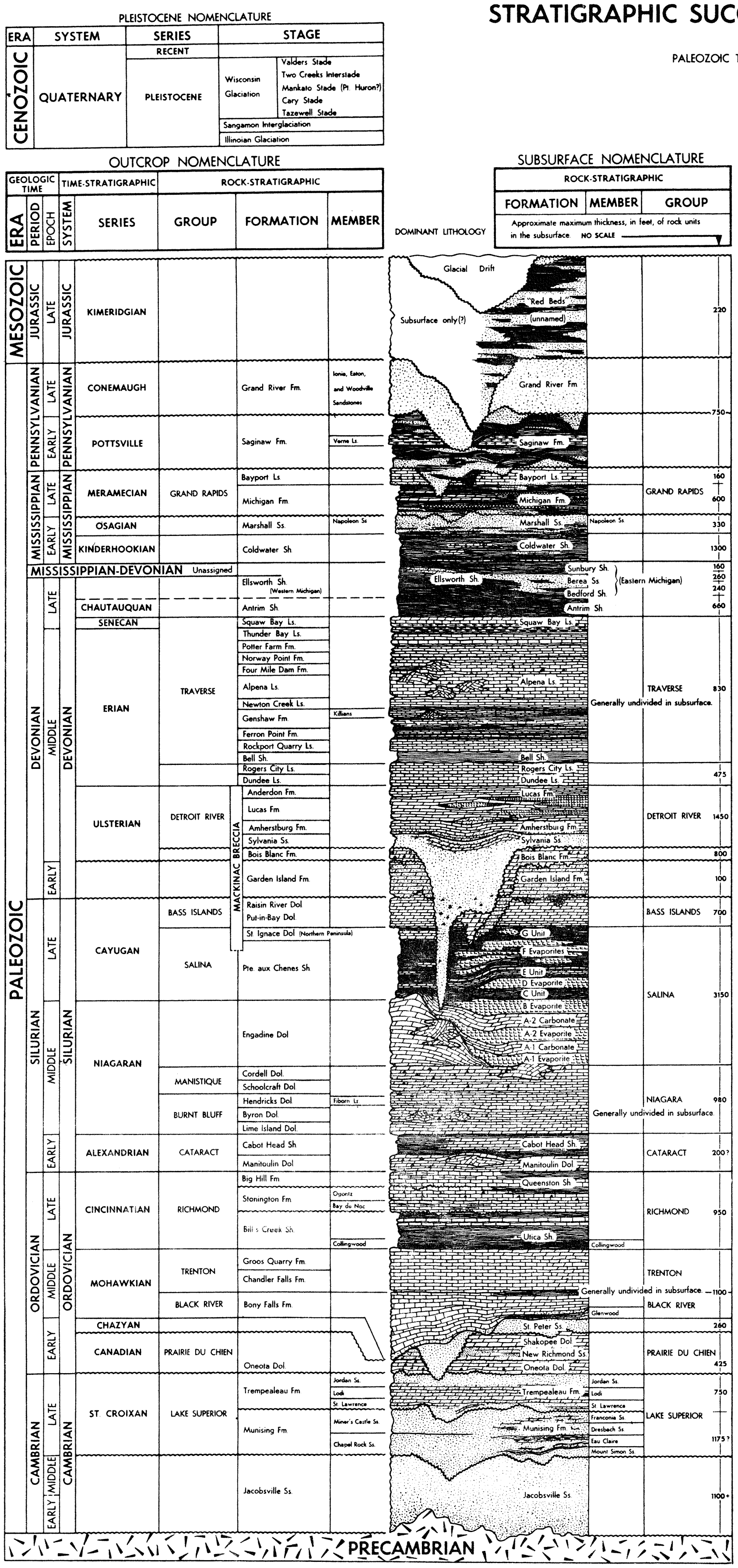
[Michigan Oil and Gas Fields Map]



[Stratigraphic Succession in Michigan]

STRATIGRAPHIC SUCCESSION IN MICHIGAN

PALEOZOIC THROUGH RECENT



MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Howard A. Tanner, Director

GEOLOGICAL SURVEY DIVISION

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GEOLOGIC NAMES COMMITTEE

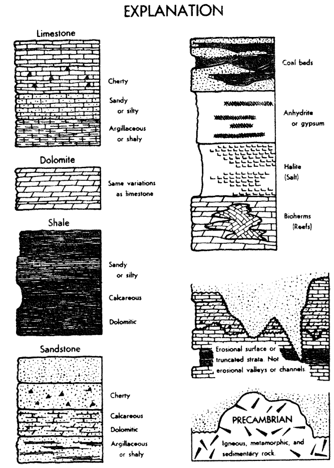
Garland D. Ells, Chairman; Robert W. Kelley, Secretary; Harry J. Hardenberg, L. David Johnson, Harry O. Sorensen

INFORMAL TERMS

Principal oil and gas pays, and informal terms used in petroleum exploration and applied to parts of formations or groups in the subsurface.

STRATIGRAPHIC POSITION	INFORMAL TERMS	PAYS
Basal sandstones of Saginaw Fm.	Parma sandstone	
In lower part of Michigan	triple gyp brown lime stray-stray ss. stray dol. stray ss.	 Gas Gas & Oil
Marshall Ss.		Gas & Oil
Coldwater Sh.	Coldwater lime Weir sand Coldwater red-rock	 Gas
In upper part of Ellsworth Sh.	"Berea" (Western Michigan)	Oil & Gas
Berea Ss.	Berea sand (Eastern Michigan)	Oil & Gas
Squaw Bay Ls.	Squaw Bay	Oil & Gas
Upper part of Traverse Group in Western Michigan	Traverse formation Traverse lime Stoney Lake zone	 Oil & Gas Oil & Gas
Rogers City Ls.		Oil & Gas
Dundee Ls.		Oil & Gas
Dundee Ls. (?), Upper part of Lucas Fm. (?)	Reed City zone	Oil & Gas
In Lucas Fm.	massive salt big salt sour zone massive anhydrite big anhydrite Richfield zone	 Oil & Gas Oil & Gas
Amherstburg Fm.	black lime	
Part of Salina Group E Unit	E zone (or Kintigh zone)	Oil
Divisions of A-2 Carbonate in Western Michigan	A-2 dolomite A-2 lime	Gas
A-1 Carbonate	A-1 dolomite	Oil & Gas
Upper part of Niagaran Series	brown Niagaran gray Niagaran white Niagaran	Oil & Gas
Part of Niagaran Series	Clinton shale (Eastern Michigan)	
Trenton Group		Oil & Gas
Black River Group	Black River formation Black River shale Van Wert zone	Oil & Gas
Oneota Dol.		Oil

EXPLANATION



GEOLOGIC NAMES COMPILATIONS: Harry O. Sorensen, Cambrian and Ordovician; Robert W. Kelley, Early and Middle Silurian; Garland D. Ells, Late Silurian through Detroit River Group of Devonian age; Harry J. Hardenberg, Dundee Limestone through Traverse Group of Devonian age; L. David Johnson, Antrim Shale through the Pennsylvanian System; F. Wells Terwilliger, glacial geology of the Cenozoic.

CHART 1

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