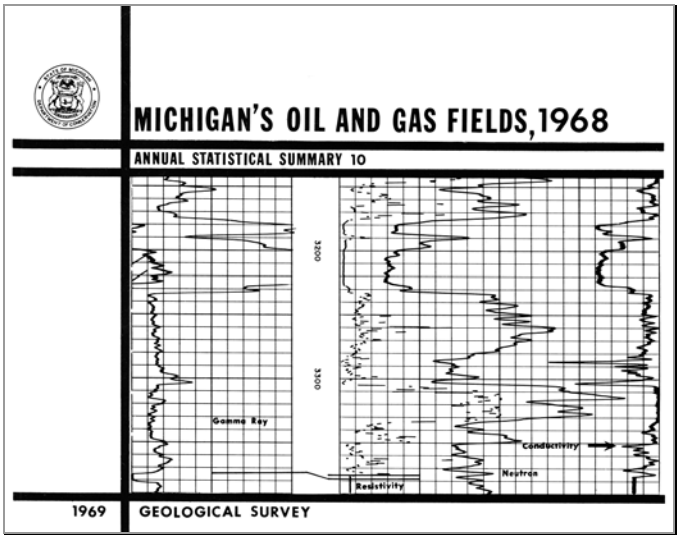

MICHIGAN'S OIL AND GAS FIELDS, 1968

STATE OF MICHIGAN
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DEPARTMENT OF NATURAL RESOURCES
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CONTENTS

ACKNOWLEDGMENTS

The information contained in this publication results from the joint efforts of the Survey's Oil and Gas Section. It brings together under one cover many oil and gas field statistical data not usually found in any other industry or government publication. Oil and gas field data of historical and general interest are included and thus preserved herein for future reference. The summary is, therefore, a source of information most useful in evaluating Michigan's past history and future prospects as an oil and gas province. Futhermore, the gathering, maintenance, and compilation of the many statistical data contained in this summary reflects, in part, the varied functions of the Oil and Gas Section.

Current oil and gas production figures are obtained from Michigan Department of Revenue records. Gas import figures are from Michigan Public Service Commission, Gas Section, compilations. Other statistics are based upon data gathered by the Geological Survey.

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Lansing, Michigan
May, 1969

MICHIGAN'S OIL AND GAS FIELDS, 1968

Introduction

In this issue of Michigan's oil and gas field statistical summary, various facets of the states petroleum exploration and development industry are cited and related, where useful, to similar statistics of the prior year. Factors such as the amount of exploratory and development drilling, the number and size of newly discovered fields and pools, and oil and gas production are useful indices which show the trend of activities from year to year.

The kinds of data listed herein are derived mainly from records received and maintained by the Geological Survey Division. The types of data reported in this summary have been treated uniformly from year to year, and reflect as near as possible the actual activities, developments, and production that should be credited to the past year, 1968.

Certain figures such as the number of exploratory and development wells drilled, number of discoveries, and well classifications may differ from statistical data reported by regional or national trade journals and by commercial, petroleum industry reporting services. Differences are due to methods of gathering and reporting well drilling data. Another factor is the method of determining a cut-off date for reporting statistics on a yearly basis.

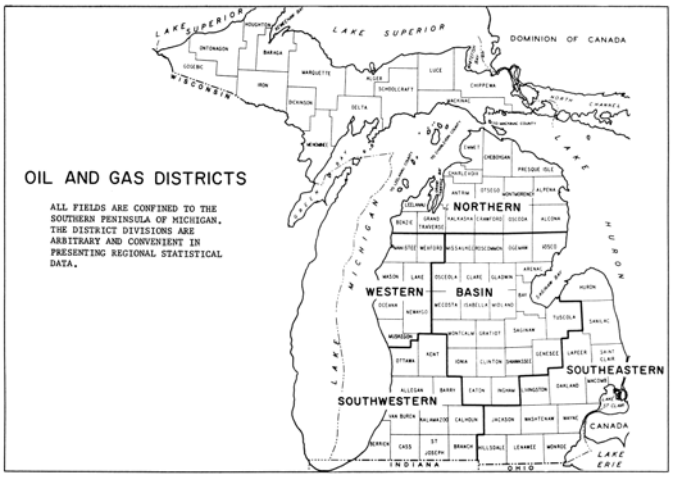
Comparison of 1968 statistics with those of 1967 shows a small but continued decline in overall oil and gas activities. The most active regions of new field exploration and field development drilling were St. Clair County and Macomb County, the northern part of the Albion-Scipio oil field trend, and in central western Michigan. The number of new field discoveries was slightly above that of 1967, but none appear to be of large size. Most of the new fields were outlined by development drilling at year's end. Oil production continued to decline a small percentage. More than 50% of it was produced from the Albion-Pulaski-Scipio fields. Gas production increased due to previously shut-in fields going on line, and an increase in gas processing facilities and production in the previously mentioned fields. The total value of the oil and gas produced during 1968 amounted to about $48,571,380 as compared with $47,820,112 in 1967.

Part 1 of this publication summarizes significant information on oil and gas field activities and related work of the Oil and Gas Section of the Geological Survey during 1968. Part 2 contains specific information on Michigan's oil and gas fields for 1968. Previous summaries contained separate tables for active or abandoned oil or gas fields. All such singular tables have been revised and consolidated into one table with all fields arranged in alphabetical order, regardless of classification or status. Part 3 contains cumulative records of importance to the petroleum industry. Data for 1968 has been included in these cumulative tables.

* * * Drilling Permits * * *

Fewer permits were issued to drill new oil or gas tests, gas storage wells, or other types than in the previous year. Part of the decrease is due to wider well spacing, the small area! extent of the fields, and a general decline in exploration activity. Of the 378 permits issued, 173 were for exploratory tests, 172 for field development wells, 27 for gas storage, and 6 for LPG storage facilities. Also, included are 4 permits which were cancelled and terminated due to failure of operators to commence drilling operations within six months from the issue date.

[Oil and Gas Districts (Map)]



The geographic distribution, by district, of permits issued through a 3 year period is as follows:

DRILLING PERMITS BY DISTRICT

DISTRICT	Permits Issued 1966	1967	1968
Basin	79	91	88
Northern	11	11	17
Southeastern	222	178	143
Southwestern	43	72	61
Western	75	53	69
Totals	430	405	378

The higher figures for the southeastern district reflect exploration and development activity in the St. Clair-Macomb County area, and along the Albion-Pulaski-Scipio Trend. Table 1, page 6, shows the distribution of drilling permits by county. Not included in the above figures are 25 deepening permits. No geological test permits were issued in 1968. The fluctuation in permits issued for gas storage and other types of service wells over a three year span are as follows:

Service Wells	1966	1967	1968
Gas Storage		24	27
L.P.G., Wtr. Inj. Brine Disposal, etc.	7	2	9
	7	26	36

* * * WELL COMPLETIONS * * *

There were 333 new-hole exploratory and development wells completed during the year. The figure does not include gas storage reservoir wells, oil wells drilled to deeper oil or gas pools, reworks, or others not directly related to exploratory or field development drilling. Nearly 40% of the exploratory and 25% of the development wells were drilled in St. Clair and Macomb Counties. About 32% of the development well completions are credited to the Albion-Pulaski-Scipio Trend; most of them being in the Calhoun County part. More details on well completion results, by county, are shown on Table 1. The number and class of well completions according to oil and gas districts and by month in 1968 are tabulated on Table 3. The results of exploratory and development drilling covering a three-year period are summarized as follows:

EXPLORATORY AND DEVELOPMENT WELL COMPLETIONS

Year	Exploratory Wells Oil	Gas	Dry	Development Wells Oil	Gas	Dry	Totals
1966	8	3	175	49	42	111	388
1967	7	2	171	69	38	106	393
1968	9	4	151	61	8	100	333

The fluctuation of drilled footage, including deepenings, over a three-year period is as follows:

Well Class	Amount of Drilled Footage 1966	1967	1968
Exploratory	560,941	539,400	522,384
Development	608,386	686,672	564,827
Service	33,370	88,434	776,026*
	1,202,697	1,314,506	1,163,237

*Includes LPG, GS, Brine and water injection wells.

[Drilling Permits and Completions by County, Table 1]

TABLE 1 DRILLING PERMITS AND WELL COMPLETIONS BY COUNTY, 1968 (Sheet 1 of 2)
Classification of New Hole Completions
Does not include reworked wells or old wells drilled deeper

COUNTY	OIL AND GAS PERMITS ISSUED	OIL AND GAS TESTS Exploratory	Development	RESULTS Oil Wells	Gas Wells	Dry Holes	SERVICE WELLS Brine	GS	Wtr. Inj.	LPG	TOTAL COMPLETIONS
Allegan	6	2	2			4					4
Antrim	2	2				2					2
Arenac	1	1				1					1
Barry	1	1				1					1
Bay	1	2				2					2
Calhoun	39	1	33	11	1	22					34
Cass	1										
Clare	15	1		1				13			14
Crawford	7	1	4	4	1				2		7
Eaton	3	1				1					1
Genesee	6		5	4		1					5
Gladwin	1										
Grand Traverse	3	3				3					3
Gratiot	3	3				3					3
Hillsdale	17	9	13	5		17					22
Ionia	3	2				2					2
Iosco	1	1				1					1
Isabella	10	5	6	3		8					11
Jackson	11	4	8	1		11					12
Kalamazoo	2										
Kalkaska	2	1				1					1
Kent	3	1	2			3					3
Lake	23	4	13	10		7					17
Lapeer	3		4	4							4
Lenawee	2	1			1						1

TABLE 1 DRILLING PERMITS AND WELL COMPLETIONS BY COUNTY, 1968 (Sheet 2 of 2)

Macomb	33	26	10	1	4	31		1			37
Manistee	2	2				2					2
Mason	14	13	1	1		13					14
Mecosta	9	3	2	2		3		5			10
Midland	1	1				1					1
Missaukee	2		5	1		4					5
Montcalm	3	1	2			3					3
Muskegon	9	1	7	3		5					8
Newaygo	16	8	2	2		8					10
Oakland	1		1		1						1
Oceana	5	4	1			5					5
Ogemaw			2	1		1					2
Osceola	24	9	8	4	1	12		5			22
Ottawa	4	3				3					3
Presque Isle	3	3				3					3
Roscommon	1	1				1					1
Shiawassee	4		4	4							4
St. Clair	69	39	32	8	3	60		3			74
Van Buren	5	3	1			4					4
Washtenaw	1	1	1			2	1				3
Wayne	6									6	6
Totals 46 Counties	378	164	169	70	12	251	1	27	2	6	369

Includes 4 permits which were issued and terminated in 1968.

Brine from this well is used for dust and ice control on county roads.

* * * OIL AND GAS PRODUCTION * * *

No large oil reserves were found and developed during 1968 that reversed the general decline in annual oil production. Oil production amounted to 12,974,405 barrels as compared with 13,664,185 barrels in 1967.

Gas production increased from 33,241,640 Mcf. to 39,685,162 Mcf. in 1968. The increase is due in part to new gas fields going on line, and an increase in gas processing and gathering facilities in the Albion-Pulaski-Scipio fields.

LPG production, stripped from Michigan produced gas, amounted to about 1,885,735 barrels. The bulk of LPG

production came from Albion-Pulaski-Scipio, Belle River Mills, Boyd, and Reed City gas plants. An additional 603,965 barrels were stripped from gas imported into Michigan via pipeline and processed at the Willow Run plant. See Tables 9 and 10 for further information on gas plant operations.

Oil and gas production by individual fields or pools is found in Part 2, Table 4. Annual and cumulative production by year, geologic formation, and county can be found in Part 3. See Table 2 in this section for oil and gas production by county in 1968. The following tables show oil and gas production by month and by oil and gas districts.

OIL AND GAS PRODUCTION BY DISTRICT

District	Production	
	Barrels Oil	MCF Gas
Basin	3,958,562	1,898,546
Northern	422,361	459,274
Southeastern	5,721,044	31,246,298
Southwestern	2,607,557	6,026,557
Western	264,880	54,487
Totals	12,974,404	39,685,162

OIL AND GAS PRODUCTION BY MONTH

Month	Production	
	Barrels Oil	MCF Gas
January	1,132,372	3,340,012
February	1,040,183	2,525,937
March	1,103,810	3,386,377
April	1,110,123	3,069,001
May	1,110,957	3,310,233
June	1,047,591	3,104,457
July	1,117,491	3,156,949
August	1,085,189	3,084,110
September	1,043,988	3,649,268
October	1,125,661	3,956,857
November	1,036,872	3,115,270
December	1,020,167	3,986,691
Totals	12,974,404	39,685,162

* * * OIL AND GAS VALUATION * * *

The average price paid at the wellhead for Michigan crude was $2.95 per barrel. The value of this mineral resource amounted to about $38,286,742 as compared with $39,455,290 in 1967. The average price of Michigan gas sold at the well head was $.26 per Mcf. The value of this product amounted to about $10,284,638 as compared with $8,364,822 in 1967. The value of LPG production amounted to about $3,960,043. The estimated price of LPG's, per barrel, amounted to $2.10.

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

Domestic imports via pipeline from western and mid-western states amounted to 25,817,614 barrels, a decrease from the 28,853,856 barrels imported in 1967. Canadian crude oil imports via pipeline from western Canada oil fields increased from 8,407,569 barrels to 14,299,426 barrels in 1968. Total imports to Michigan refineries a-mounted to 40,117,040 barrels compared with 37,250,765 barrels in 1967.

1968 OIL IMPORTS (Bbls.)

	Domestic	Canadian	Total
January	2,285,055	1,297,142	3,582,197
February	1,989,241	1,227,883	3,217,124
March	1,995,582	1,388,615	3,384,197
April	1,601,504	1,565,864	3,167,368
May	1,844,695	1,351,201	3,195,896
June	2,219,837	1,364,129	3,583,966
July	2,059,953	1,212,053	3,272,006
August	1,967,121	1,405,011	3,372,132
September	2,185,535	1,395,300	3,580,835
October	2,542,616	741,365	3,283,981
November	2,957,312	642,305	3,599,617
December	2,169,163	708,558	2,877,721
Totals	25,817,614	14,299,426	40,117,040

Michigan produced crude oil exported to northern Indiana (Ft. Wayne) and Ohio (Cleveland) refineries amounted to 584,063 barrels. The 1967 export figures report in Statistical Summary 8 should have been 503,289 barrels rather than 149,463 barrels reported.

1968 OIL EXPORTS (Bbls.)

January	49,780	July	36,520
February	46,896	August	45,120
March	51,681	September	53,959
April	45,944	October	52,615
May	46,156	November	54,583
June	32,551	December	68,258

Total 584,063

Gas imports to Michigan markets and gas storage fields via pipelines, primarily from Texas, Louisiana, Oklahoma, and Kansas fields increased slightly in 1968. Compilations by the Gas Section, Michigan Public Service Commission, show gas imports of 696,781,346 Mcf. as compared with 661,345,209 Mcf. in 1967. Gas imports by month were as follows:

PIPELINE GAS IMPORTS (Mcf.)

January	42,052,490
February	38,279,574
March	53,639,331
April	63,088,810
May	67,158,538
June	69,656,110
July	71,065,176
August	71,893,001
September	64,938,589
October	61,424,427
November	48,796,640
December	64,491,664
Total	696,781,346

* * * DISCOVERY WELLS * * *

State-wide, the discovery-to-dry hole ratio for exploratory or new field wildcat wells was about 1:12 as compared with 1:20 in 1967. In St. Clair and Macomb Counties, where about 40% of the exploratory wells were drilled, the ratio was about 1:16 as compared with 1:20 in 1967.

Completion details on all discovery wells credited to 1968 are listed on pages 12 and 13. All reached total depth during the year, and most were put on production.

None of the new oil discoveries appears to have an oil or gas yield greater than a Class E field as defined below. The classifications are based on potential yields as defined by the American Association of Petroleum Geologists, Committee on Statistics of Drilling.

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

TABLE 2 -- OIL AND GAS PRODUCTION BY COUNTY IN 1968

County	Barrels Oil	MCF Gas
Allegan	185,086	526,923
Arenac	252,669	---
Barry	11,888	---
Bay	308,631	---
Berrien	---	---
Calhoun	2,325,320	4,865,576
Cass	1,055	---
Clare	562,166	157,540
Crawford	348,960	427,630
Genesee	9,048	---
Gladwin	330,573	---
Gratiot	17,269	7,297
Hillsdale	3,511,411	5,183,408
Huron	1,852	---
Ionia	59	---
Isabella	232,317	2,392
Jackson	1,401,204	2,498,701
Kalkaska	71,833	---
Kent	75,908	18,078
Lake	56,331	---
Lapeer	70,412	43,410
Lenawee	298	69,265
Livingston	868	8,703
Macomb	10,479	4,163,186
Mason	70,207	---
Mecosta	275,826	117,191
Midland	205,782	---
Missaukee	499,169	570,235
Monroe	3,701	---
Montcalm	148,591	7,160
Muskegon	71,651	---
Newaygo	23,411	---
Oakland	979	---
Oceana	57,932	---
Ogemaw	277,797	539,825
Osceola	586,695	195,125
Oscoda	1,568	---
Otsego	---	31,644
Ottawa	77,031	615,980
Roscommon	162,957	301,781
Saginaw	23,183	---
Shiawassee	11,502	---
St. Clair	581,450	19,143,167
Tuscola	70,801	---
Van Buren	10,669	---
Washtenaw	17,224	93,011
Wayne	10,642	43,447
Wexford	---	54,487
Totals:	12,974,404	39,685,162

Most new fields were found in established producing regions. None open large, undrilled areas for exploration. The number of wells completed in the new fields during 1968, and the cumulative production for the field can be found in the oil and gas field tables on the green pages. The location of new fields in relation to older fields is shown on the map segments, page 14.

Devonian and Silurian rocks were again an important drilling objective. About 36% of all wells were completed in Devonian rocks, and about 33% were completed in Silurian, mainly the Niagaran section. About 20% of the wells were completed in Middle Ordovician, Trenton-Black River rocks. The balance were completed in Mississippian rocks or those older than Middle Ordovician. An analysis of discoveries through a three-year period is shown in chart form. Extension discoveries and new pools are included.

* * * DEEP TESTS * * *

About 7% of the 1968 exploratory wells reached total depth in Mississippian rocks, 21% in Devonian Traverse limestones, 17% in Devonian Dundee-Reed City limestones, 43% in Middle Silurian Niagaran rocks, and 12% in Middle Ordovician Trenton-Black River or deeper rocks. One Precambrian basement test was drilled during the year.

ANALYSIS OF DISCOVERY WELLS BY GEOLOGIC SYSTEM

System	Formation or Pay	Number of Discoveries 1966	1967	1968
Pennsylvanian		-	-	-
Mississippian	"Michigan Stray Ss."	1	-	1
	"Berea"	-	1	-
Devonian	Antrim Shale	-	-	-
	"Traverse Lime"	3	1	6
	Dundee	1	3	1
	"Reed City"	3	-	1
	Detroit River "Sour Zone"	-	-	-
	Richfield	-	-	1
Silurian	Salina A-1 or A-2	-	-	-
	Niagaran reef*	2	3	4
Ordovician	Trenton-Black River	-	1	-
	Prairie du Chien	-	-	-
Cambrian	(Gas shows reported)	-	-	-

*Most reefs also have associated Salina A-1 oil or gas pays.

No firm criteria have been established for designating exploratory wells as important deep tests. Actual drilled depth is not the determining factor. Selections are most often based on the geologic age of the strata penetrated in reference to the location of the test within the basin, and the relative abundancy of similar tests in the area. Deeper pool tests in designated fields may also qualify as deep tests. Those selected for 1968 are listed on page 13.

A series of important deep tests were drilled in the northern part of the Southern Peninsula. Most of this region is sparsely explored and not much is known of its oil and gas possibilities. The locations of the more important tests in this region are shown on the small map, page 15. All tests were reported to have been based on gravimeter surveys. Though all were dry holes, the first one drilled was a near-discovery and is partially responsible for the extensive leasing campaign conducted in the northern part of the basin during 1968.

Pan American's No. 1 Draysey was the first well spudded in the exploratory project. Good shows of oil and gas were recovered on drill-stem tests in the Niagaran. These were by-passed and the well was drilled ahead to Middle Ordovician Trenton-Black River rocks where another drill stem test was run from 4364 to 4451 feet. Recoveries and pressures in this interval were unfavorable, and the well was finally drilled to Precambrian basement rock at a total depth of 5940 feet. Well-site geologists picked the top of the Precambrian rock at 5877. The well bottomed out in what are probably altered basalts. Inspection of well cuttings indicates that Precambrian quartzites were encountered at about 5714 feet, thus moving the Precambrian top 167 feet higher, stratigraphically. Samples for this well are on file at the Michigan Geological Survey, Department of Natural Resources, Lansing, Michigan.

1968 DISCOVERY WELLS

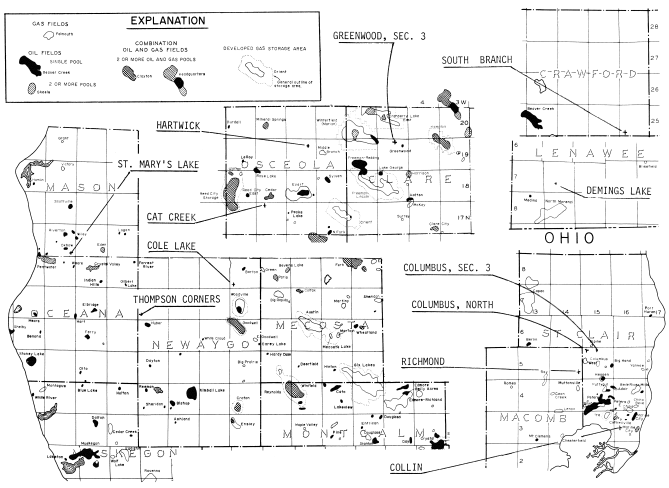
Field	County, Location, Permit No.	Operator and Lease	Comp. Date	Depth to Pay	Total Depth	Initial Production n=(N)IP t=(T)IP BOPD	MCFGPD	Prod. Form.	Basis for Loc.
NEW FIELDS									
Cat Creek	Osceola 4-17N-9W SP 26900	M.C.G.C. & Leonard Oil, Inc. Leach #1	1-23	3696	3755	F50[t]		Dd.	Sub.
Cole Lake	Newaygo 30-16N-11W SP 27347	Black River Petroleum Corp. Englund et ux #1	11-1	2928	2938	P & F60[n]		Trav.	Sub
Collin	St. Clair 20-3N-16E SP 27004	C. W. Collin Fabian #1	1-30	2196	2364	F44[t]		Sal. A-1 Niag.	Grav.
Columbus, North	St. Clair 5-5N-15E SP 27384	McClure Oil Co. Ward #1	9-29	3266	3326	F50[t]		Niag.	Grav.
Columbus, Sec. 3	St. Clair 3-5N-15E SP 27465	Sun Oil Co. & Basin Oil Co. Winn et al #1	11-27	3105	3250	F35[t]		Niag.	Grav.
Demings Lake	Lenawee 27-7S-2E SP 27194	Bell & Gault Drlg. Co. Brower et al #1	3-8	723	741		900[n]	Trav.	Sub.
Greenwood, Sec. 3	Clare 3-19N-5W SP 27390	P. G. Benedum, NADCO, Woods Oil Co. Corlew et al #1	10-20	3438	4048	P60[t]		Trav.	Sub.
Hartwick	Osceola 11-19N-8W SP 27341	John P. Murphy Arndt & Peel et al #1	8-23	1681	1706		2600[n]	Mich. Stray	Sub.
Richmond	Macomb 26-5N-14E SP 27315	Sullivan & Leroux Goetz et al Unit #1	7-23	3195	3254		540[n]	Niag.	Grav.
South Branch	Crawford 32-25N-1W SP 27445	Sun Oil Co. Sheppard #1	11-26	4203	4436		1000[t]	Rich-field	Grav.
St. Mary's Lake	Mason 35-17N-17W SP 27371	Derk Van Raalte Lundberg #1	10-16	1641	1644	F50[t]		Trav.	Sub.
Thompson Corners	Newaygo 30-15N-14W SP 27339	George H. Gordon Stroud #1	9-9	2138	2140	P60[n]		Trav.	Sub.
NEW POOL DISCOVERY									
Wolf Lake	Muskegon 18-10N-15W SP 27223	Flory Drlg. Co. Olsen-Cislo Comm. #1	5-9	1757 1763	1764	P & F15[t]		Trav.	Sub.
EXTENSION DISCOVERY									
Cato	Mecosta 36-13N-9W SP 27149	Thomas H. Mall Paris et al #1	3-19	3556	3558	P22[t]		Reed City	Sub.

NOTE: t=(T)IP refers to initial potential after acid, sand-fracture, or a combination of well stimulation methods.
n=(N)IP refers to natural potential or production.

DEEP TESTS

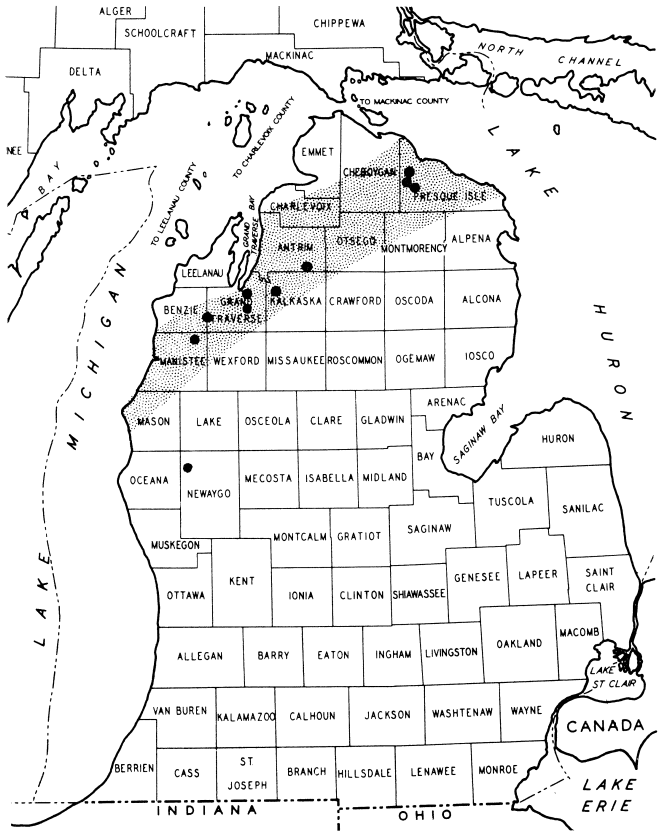
County	Location	Operator and Lease	Permit Number	System and Formation	Total Depth	Explo. Class	Remarks
Alcona	30-28N-5E	North American Drlg. Co. #1 Cranberry Ranch	27060	Dev., D. R.	3040	OWDD	Old TD 2318
Antrim	35-29N-6W	Northern Mich. Explo. Co. #1 Adams Camp-sites	27249	Sil., Niag.	7000	NFW	
Gd. Traverse	5-26N-10W	Northern Mich. Explo. Co. #1 Dreves C.	27454	Sil., Niag	5850	NFW	
Gd. Traverse	32-27N-10W	Northern Mich. Explo. Co. #1 Kennett	27312	Sil., Clinton	6100	NFW	SO & G
Gd. Traverse	30-26N-12W	Northern Mich. Explo. Co. #1 Compton	27321	Sil., Clinton	5459	NFW	
Jackson	30-3S-3W	Nanco, Inc. #1 Smith A.	27137	Camb., Mt. Simon	5936	NFW	
Jackson	21-2S-2W	Swan & M.C.G.C. #1 Graham & Carlson	27478	Ord., P. D. C.	4996	NFW	
Kalkaska	17-27N-8W	Northern Mich. Explo. Co. #1 Keller	27287	Sil., Clinton	6950	NFW	
Manistee	16-24N-13W	McClure Oil Co. #1 Griner	27487	Sil., Niag.	5760	NFW	
Mason	3-20N-17W	Miller Bros. #1 Mikula	27155	Ord., P. D. C.	5519	NFW	SSG
Newaygo	20-15N-14W	Thunder Hollow O. & G. Co. #1 Thompson	26662	Camb., Mt. Simon	8215	OWDD	Old TD 6585
Presque Isle	12-34N-2E	Pan American Pet. Corp. #1 Smith L. B.	27250	Ord., Cinn.	3895	NFW	SO
Presque Isle	29-35N-2E	Cook Bros. & Lanphar O. & G. Corp. #1 Middaugh J.	27469	Sil., Niag.	2767	NFW	SG
Presque Isle	29-35N-2E	Pan American Pet. Corp. #1 Draysey D. E.	27199	Precambrian	5940	NFW	Near Niag. Disc.
Van Buren	16-2S-14W	McClure Oil Co. & Miller Bros. #1 Passmore	27402	Sil., Niag.	1987	NFW	
Washtenaw	21-3S-4E	Sun Oil Co. #1 Hoener L.	27099	Ord., P. D. C.	4505	NFW	SG
DRY DEEPER POOL TESTS 1968							
Genesee	18-8N-5E	Harris Oil, Inc. #2 Mesaros	27244	Dev., D. R.	2607	DPT	New Lothrop
Mason	26-17N-17W	D. B. K. Van Raalte #1 Schober R.	21200	Dev., R. C.	2324	DPT	Oxbow
Missaukee	35-22N-6W	Woods Oil Co. #2 Alderman-McCoy	27105	Dev., D. R.	5223	DPT	Prosper, South
Muskegon	18-10N-15W	Flory Drlg. Co. #1 Cislo F.	27342	Dev., Dundee	2140	DPT	Wolf Lake

LOCATION OF NEW FIELD DISCOVERIES



The Draysey No. 1 was plugged back to 3023 feet and tested in the Niagaran section. Perforations (16 holes) were made at 2772-80 feet, acidized with 500 gallons of 15%, and then swabbed. Swab tests recovered 100 barrels of acid and formation water in 20 hrs. A second swab test recovered about 40 barrels of fluid containing a-bout 10% oil of 44 degree gravity, API. This zone was squeezed to a new PBTD of 2764 feet. New perforations (12 holes) were made at 2742-48 feet, acidized with 500 15% MCA. Swab tests recovered 60 barrels water. The zone was reacidized with 2500 gallons 15% and swab tested with recoveries of 292 barrels water and 17 barrels oil. It was shut in 10 hours and then swabbed 7 hours with recoveries of 143 barrels saltwater and an estimated 15 barrels of oil. These perfs were squeezed and new perforations (12 holes) made at 2742-48 feet. This zone was tested at varying intervals for 6 days with the last test (14 hours) showing a recovery of 16 BOPD and 99 BWPD. The last 2 hours of this test showed an average recovery rate of 8 barrels of fluid per hour, approximately 14% oil. Additional perforations(6 holes) were made from 2734-37 feet, and acidized with 250 gallons. Swab tests of this interval resulted in the recovery of 115 barrels of water and 8 barrels oil in 13 hours. Finally, the perf zones from 2734-37 feet and 2742-48 feet were swab tested 41 hours. Recovery from this test amounted to 385 barrels of water and 41 barrels of oil. A total of 165 barrels of 41.5 gravity oil was recovered and sold. The oil has a low sulphur content and contains about 20 lbs. of salt per 1000 barrels. The well was abandoned as a dry hole.

A farm-out, direct 40 acre offset to Pan American's No. 1 Draysey was drilled with cable tools. This well bottomed-out at a total depth of 2767 feet, in Niagaran rocks. Operations reported an odor of gas in the Salina A-1 Carbonate formation overlying the Niagaran. No shows of oil or gas were reported in the Niagaran section, and the well was abandoned as a dry hole. A second test several miles south of the Draysey No. 1 also had shows of oil in Niagaran cores, but was abandoned as a dry hole. Subsequent exploration in the northern part of the state during 1968 was unfavorable.



Cores from a number of the deep tests drilled in the northern part of the basin are on file at the University of Michigan Subsurface Laboratory and are available for inspection. They are:

Pan Am Petr Corp #1 Draysey	29-35N-2E	Niagaran
Pan Am Petr Corp #1 Smith	12-34N-2E	Salina A-1 into Niagaran
NMECO #1 Campsites *	35-29N-6W	Niagaran
NMECO #1 Keller *	17-27N-8W	Salina A-1 Carb and Salt
NMECO #1 Compton *	30-26N-12W	Salina A-1 into Niagaran
NMECO #1 Kennett *	32-27N-10W	Salina A-1 into Niagaran
NMECO #1 Dreves *	5-26N-10W	Salina A-1 into Niagaran
McClure #1 Griner	16-24N-13W	Salina A-1 into Niagaran
McClure #1 Bailey	24-29N-7W	Salina A-1 to Niagaran
Pan Am Petr Corp #1 State-Blue Lake **	1-28N-5W	Salina A-1

* Northern Michigan Exploration Company
** State-Blue Lake No. 1 was drilled in 1969

* * * STATE ACREAGE UNDER LEASE * * *

State-owned lands under lease for oil and gas development at the end of 1968 amounted to 939,756 acres as compared with 308,177 acres at the end of 1967. Most of the newly leased land is in the northern part of the Southern Peninsula and was leased in connection with exploratory drilling and evaluation of the area. Revenue from oil and gas bonus, rental and royalty amounted to $2,002,870 as compared with $500,501 in 1967.

* * * NEW PUBLICATIONS IN 1968 * * *

Champion, B. L., 1968, Oil-Gas Activity in Michigan; Michigan Manufacturer and Financial Rec., V. 121, No. 5, P. 12, 46.

Ells, Garland D., 1968, Michigan's Oil and Gas Fields 1967: Michigan Geol. Survey Ann. Statistical Summ. 8, 72 pages.

_____ and Layton, F. L., 1968, Developments in Michigan in 1967: Am. Assoc. Petroleum Geologists Bull., V. 52, No. 6, P. 976-980

Ives, R. E. and Eddy, G. E., 1968, Subsurface Disposal of Industrial Wastes: Interstate Oil Compact Comm., P. 109

Michigan Basin Geological Society, Oil and Gas Field Symposium, 1968. This symposium is a collection of papers on selected Michigan oil and gas fields.

* * * PUBLIC HEARINGS * * *

Act No. 61 of the Public Acts of 1939, as amended, provides for hearings on oil and gas matters. Act No. 326 of the Public Acts of 1937, as amended, provides for hearings on matters pertaining to natural dry gas.

Hearings on matters of local concern involving the administration of rules and regulations, such as exceptions to spacing orders, or pooling of interests to form drilling units, are conducted by the Supervisor of Wells, the State Geologist. Hearings on matters involving broad policies and practices having field-wide or state-wide application are conducted by the Supervisor of Wells and before the Advisory Board. Oil and gas hearings held during 1968 are summarized below.

OIL AND GAS HEARINGS

Hearings Per Month	January	February	March	April	May	June	July	August	September	October	November	December	Total
	3	3	3	1	1	1	2	3	5	3	2	2	29
Items or Causes Heard and Actions by the Supervisor													
Spacing Orders:													
Emergency										1			1
Amended						2		1		3	1		7
Adopted			1			1		1			2	1	6
Abrogated							3						3
Proration Orders													
Adopted							1						1
Amended					1								1
Off-Pattern Permits Issued	4	1	2	1	1	0	1	1	6	2	1	2	22
Determine Reservoir Status										1			1
Unitization of Pool							1						1
Items Heard, No Action Taken		2			1	1		1					5
Total Items or Causes	4	3	3	1	1	5	6	5	6	7	4	3	48

TABLE 3. NEW WELL COMPLETIONS BY DISTRICTS, 1968

	DISTRICTS					
	Basin	Northern	Western	Southwestern	Southeastern	Totals
CLASSIFICATION OF NEW WELL COMP.						
Oil Wells (1)	20	4	16	11	19	70
Gas Wells (2)	1	1	0	1	9	12
Gas Storage Wells	23	0	0	0	4	27
Water Injection Wells	0	2	0	0	0	2
LPG Storage	0	0	0	0	6	6
Brine Wells	0	0	0	0	1	1
Dry Holes	44	9	40	37	121	251
Total Well Completions	88	16	56	49	160	369
EXPLORATORY WELLS COMP.						
Exploratory Tests D & A	27	9	29	11	75	151
Successful Explo. Tests*	4	1	3	0	5	13
Total Explo. Tests	31	10	32	11	80	164

DRILLING PERMITS AND NEW COMPLETIONS BY MONTHS, 1968

	MONTHS												
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals
PERMITS ISSUED	32	34	18	25	39	19	26	42	32	46	33	32	378
CLASSIFICATION OF NEW WELL COMPLETIONS													
Oil Wells	7	7	3	5	6	3	7	6	6	9	7	4	70
Gas Wells	2	0	3	0	0	0	2	1	2	1	1	0	12
Gas Storage Wells	0	0	0	0	1	1	6	5	3	3	5	3	27
Water Injection	0	0	0	0	1	0	0	0	1	0	0	0	2
LPG Storage	0	1	1	2	1	0	0	0	1	0	0	0	6
Brine Wells	0	0	0	0	1	0	0	0	0	0	0	0	1
Dry Holes	23	19	18	13	19	18	27	22	24	21	26	21	251
Total Well Completions	32	27	25	20	29	22	42	34	37	34	39	28	369
EXPLORATORY WELLS COMPLETED													
Exploratory Tests D & A	16	9	8	9	7	13	18	16	11	12	17	15	151
Successful Exploratory Tests*	2	0	2	0	0	0	1	1	2	2	3	0	13
Total Exploratory Tests	18	9	10	9	7	13	19	17	13	14	20	15	164

(1) Does not include oil wells resulting from rework operations.
(2) Does not include gas wells resulting from rework operations.
* Does not include new pool discoveries; does include 1 extension discovery.

PART 2

OIL AND GAS FIELDS

Part 2 brings together general information mainly on Michigan's oil and gas fields, gas storage reservoirs, gas plant operations, and LP6 storage facilities. In previous issues of oil and gas summaries, abandoned oil and gas fields have been listed on separate tables apart from active oil and gas fields. Certain cross-references in past published tables have been inconvenient and in some cases, confusing. The past system has been discontinued in favor of a single, consolidated table listing all oil and gas fields, active and abandoned, in alphabetical order. Developed and undeveloped gas storage reservoirs are also integrated in the listing, but for convenience they are also shown on separate tables.

MICHIGAN OIL AND GAS FIELDS, TABLE 4. Most fields consist of one pool with oil or gas production coming from a single formation. A few fields have 2 or more separate pools, each producing from a different formation or stratigraphic interval and at a different depth. Field names are shown in the first column and the producing pool, or pools, are shown under PRODUCING FORMATION OR POOL. The symbol on the left margin of the table indicates the official classification of fields and pools at the end of the year. LOCATION OF FIELDS according to Township, Range, and Sections are found at the bottom of the field block. The listed sections are those which have, or have had, producing wells assigned to the field. Oil and gas fields are considered abandoned when all wells have been plugged to the surface and the field equipment has been removed from the area. Abandoned pools within a multi-pool field are shown by symbol and by abandonment date. The PAY ZONE part of the table generally refers to data for the pool discovery well. The PAY THICKNESS shown does not necessarily indicate net producing pay for the reservoir. The DEEPEST FORMATION TESTED column indicates the deepest total depth and formation penetrated in the field. The NUMBER OF OIL AND GAS WELL columns indicate 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 year, the number abandoned during the year, the number producing at the end of the year, and the number shut in or shut down at the end of the year. Most of the latter category are producible wells but for various reasons they were not in operation. The DRILLED ACRES column indicates the number of acres assigned to the field or pool according to individual well drilling units. A field may have a 10 or 20 acre drilling unit for one pool and a 40 acre drilling unit for a deeper formation pool within the field. Drilling units for oil wells have generally been of 10, 20, or 40 acre size. Gas well units, especially for Michigan Stray Sandstone reservoirs, have generally been 160 acre units. Other sizes currently in use are 40, 80, and 320 acre units. Changes in drilling units, off-pattern wells, etc. complicate the maintenance of accurate acreage figures during the life of a given field or individual pool. Where possible, drilled acreage is shown for individual pools. The figures cited in the column are not entirely accurate but do provide as near as possible an indication of the area! size of the field. The figures do not indicate the area! extent of the oil or gas reservoir. RECOVERY PER DRILLED ACRE figures for oil pools result from dividing the drilled acres figure into the cumulative oil production figure.

OIL AND GAS FIELD MAPS. These insert maps show the general locations of most Michigan fields. It is not practical to outline and show the names of all hydrocarbon accumulations that have been designated as an oil or gas field. In general, the field names shown on the several maps are in agreement with the field names shown on oil and gas field tables.

GAS FIELDS. Because of lack of marketing facilities, slow field development, or small reserves, some gas fields are listed as "shut in" and show no production figures. Others produce small quantities of unmetered gas and are not considered commercial. Production from these fields is used as lease fuel or for domestic use.

GAS STORAGE RESERVOIRS. Most gas storage reservoirs were originally classified as gas fields or pools and upon depletion or near depletion they were converted to storage reservoirs. Undeveloped gas storage reservoirs are gas pools that have been designated to become storage reservoirs at some future time.

The producing sections listed on gas storage reservoir tables do not necessarily relate to current gas storage area or boundaries. The sections, or parts of sections, which are listed are those which contained at least one producible oil or gas well assigned to the field or pool prior to conversion to gas storage. Also, the sections do not necessarily relate to potential or future gas storage area or boundary.

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.

OIL AND GAS WELL RECORDS. Geological logs and drillers logs are available for more than 27,500 oil and gas tests drilled in the Southern Peninsula. Individual logs may be purchased at small cost.

WELL SAMPLE SETS. Well cuttings from about 9000 wells are available for inspection at the Geological Survey, Lansing, 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 prior to 1937 are incomplete. This table shows the reported amount of produced brine and the method of disposal from 1937 to present. Most oil field brine is now returned to subsurface formations. Small quantities are used for dust control or ice and snow removal on county roads in local areas. A small amount of brine is also disposed in burning pits. Brine production and disposal figures should not be considered entirely accurate.

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. Brine disposal well permits are issued for these wells.

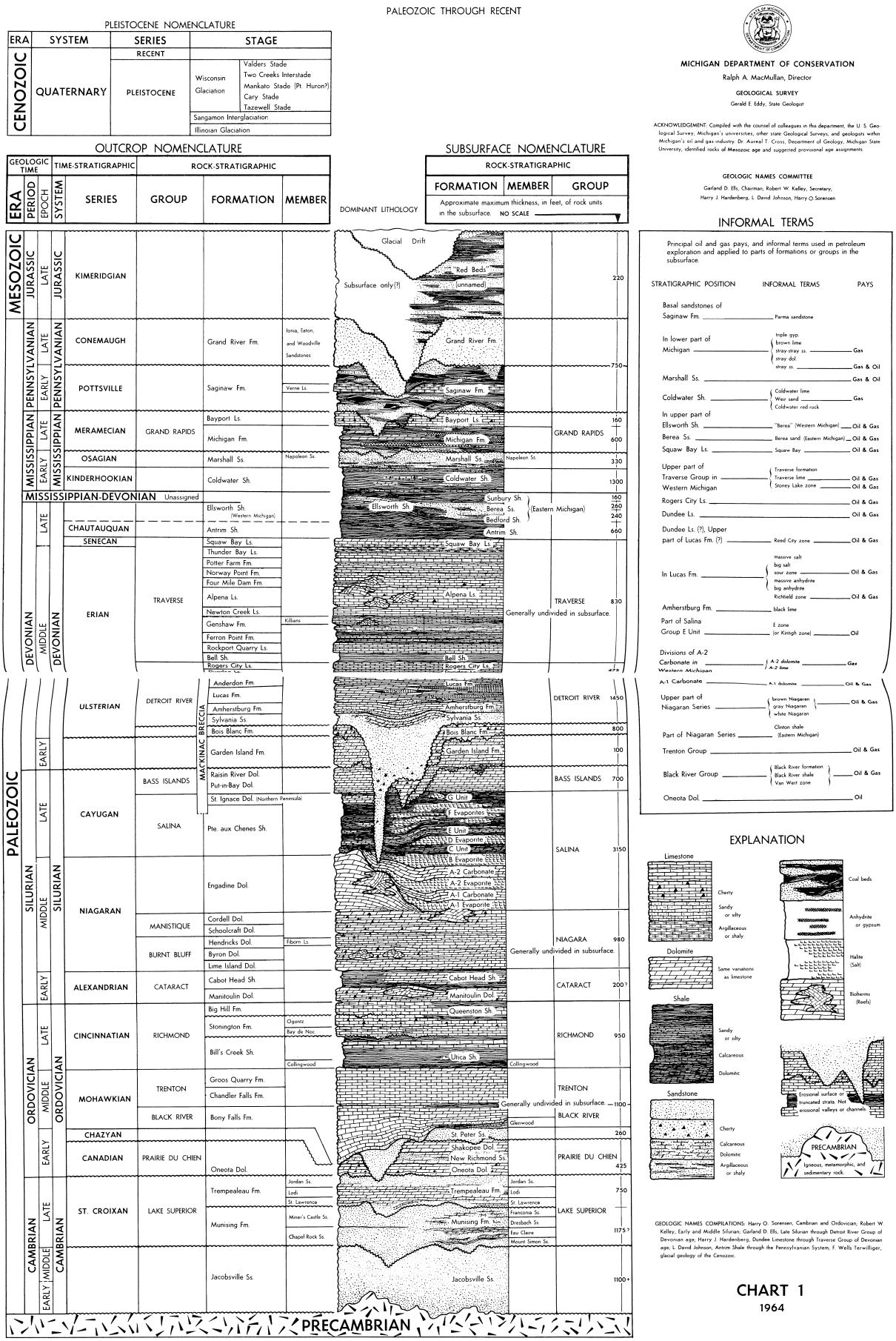
Injection and Pressure Maintenance Wells. These are wells used in secondary recovery, or pressure maintenance projects. They may be new wells drilled specifically for injection or pressure maintenace, or they may be converted oil or gas wells; their status can change from time to time.

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" does not include oil or gas wells converted to service wells.

ABBREVIATIONS

A.A.P.G.	America Assoc. Petrol. Geol.
A.P.I.	American Petroleum Institute
(A) I.P.	(Acid) Initial Production or Potential
A-1 Carb.	A-1 Carbonate
A-2 Carb.	A-2 Carbonate
Bbls.	Barrels
B.B.	Bois Blanc formation
B.D.	Brine Disposal
BDW	Brine Disposal Well
BOPD	Barrels Oil Per Day
B.R.	Black River
Camb.	Cambrian
"Camb."	Unidentified Cambrian
Cat.	Cataract formation
c.f.p.b.	Cubic feet per barrel
C.H.	Cabot Head formation
Cinn.	Cincinnatian
Cl.	Clinton formation
Cold.	Coldwater formation
Compl.	Completion
Coop.	Cooperative
D & A	Dry and Abandoned
Dev.	Devonian
D.R.	Detroit River formation
D.R. SZ	Detroit River Sour Zone
Dres.	Dresbach formation
Dd., DD	Dundee
Dd.-R.C.	Dundee-Reed City
DPT	Deeper Pool Test
E.C.	Eau Claire formation
Explor.	Exploratory
Fran.	Franconia formation
Geo. Test	Geological Test
G.O.R.	Gas-Oil Ratio
Grav.	Gravity, Gravimeter
GS	Gas Storage
GSW	Gas Storage Service Well
Gw	Glenwood
Incs.	Includes
Inj.	Injection
L.P.G.	Liquid Petroleum Gas
Marsh.	Marshall formation
MCF	Thousand Cubic
MCFGPD	Thousand Cubic Feet Gas Per Day
Mich.	Michigan formation
Miss.	Mississippian
M.S.	Mt. Simon ss.
NFW	New Field Wildcat
(N) I.P.	(Natural) Initial Production or Potential
Niag.	Niagaran
Nt.	Nontechnical
OBS	Observation Well
OP	Out Post Well
Ord.	Ordovician
OWDD	Old Well Drilled Deeper
P.D.C.	Prairie du Chien formation
Penn.	Pennsylvanian
Pilot Wtr.	Pilot Water
P.M.	Pressure Maintenance
Prod. Form.	Producing Formation
R.C.	Reed City formation
RW	Reworked Well
Rich.	Richfield formation
Sag.	Saginaw formation
Sal.-Niag.	Salina-Niagaran
SD	Shut Down
Seis.	Seismograph
SO & G	Show Oil and Gas
S.P.	St. Peter formation
Stray	Michigan Stray formation
Sub.	Subsurface geology
SW	Service Well
SWD	Salt Water Disposal
Sylv.	Sylvania formation
SZ	Sour Zone (in Detroit River)
Thick.	Thickness
(T) I.P.	(Treatment) Initial Production or Potential
Trav.	Traverse
Tremp.	Trempealeau formation
Trenton-Blk. River	Trenton-Black River
Trent.	Trenton
Unit.	Unitized

STRATIGRAPHIC SUCCESSION IN MICHIGAN



TECHNICAL STAFF and ORGANIZATION CHART

Geological Survey Division
DEPARTMENT OF NATURAL RESOURCES

ADVISORY BOARD

Oil and gas industry representatives appointed to advise Supervisor of Wells.

DIVISION CHIEF

Gerald E. Eddy, *State Geologist and Supervisor of Wells*

As State Geologist formulates policy, supervises budget, and directs the overall program of the Geological Survey. As Supervisor of Wells administers the oil and gas conservation laws. Represents Governor in Interstate Oil Compact Commission.

Stevens T. Mason Bldg.
Lansing, Michigan 48926 517-373-1256

GLACIAL AND ENVIRONMENTAL GEOLOGY

Maps surface formations. Investigates and reports on glacial features and Pleistocene geology. Advises on the occurrence and significance of glacial deposits relative to land use and environmental planning.

John R. Byerly, *Geologist*

ADMINISTRATIVE SERVICES

Manages fiscal and property accounts and personnel records Liaison with Administrative Services Division. Coordinates stenographic and clerical services in the Survey.

Bernard O. Crothers, *Office Manager*

UPPER PENINSULA OFFICE

Conducts geological investigations in Upper Peninsula as consultant to State Geologist. Reports on geology, hydrology, quality, and development of water resources. Water Well consultant to other divisions. Participates in education-oriented activities.
203 State Office Building
Escanaba, Michigan 49829 906-786-0333

Kenneth A. Gravelle, *Geologist & Supervisor*
Jack L. VanAlstine, *Geologist*

GENERAL GEOLOGY SECTION

Manages geological information center, including reference indexes and library services. Supervises publication and distribution of reports and maps. Coordinates mapping programs, participates in education-oriented activities, and supervises in-service training.

Robert W. Kelley, *Geologist & Head*
Irvin V. Kuehner, *Geologist*

OIL AND GAS SECTION

Supervises and coordinates overall oil and gas program. As Secretary to the Advisory Board, schedules hearings conducted by the Board and promulgates the formal orders of the Supervisor of Wells. Liaison with the State Public Service Commission which supervises the production of natural gas.

Lyle W. Price, *Geologist in Charge*

MINING AND ECONOMIC GEOLOGY SECTION

Prepares valuations of all metallic mining properties. Investigates economic minerals as consultant to State Geologist and other state administrators. Represents Division in cooperative geologic mapping programs involving Precambrian formations of western Upper Peninsula. Compiles mineral statistics in cooperation with U.S. Bureau of Mines. Prepares mineral kits.

Harry J. Hardenberg, *Geologist in Charge*
Robert C. Reed, *Geologist*
Harry O. Sorensen, *Geologist*
R. Thomas Segall, *Geologist*

WATER SECTION

Investigates the geology, hydrology, quality and development of water resources, frequently as consultant to the State Health Department and the Water Resources Division. Represents Survey in cooperative programs involving water resources. Liaison with water well industry. Water well consultant to other divisions. Supervises preparation and distribution of water well logs.

Arthur E. Slaughter, *Geologist & Head*
L. David Johnson, *Geologist*
Richard P. Bissell, *Geologist*
William A. Walden, *Geologist*

REGULATORY CONTROL UNIT

Supervises issuance of permits to drill oil and gas tests and wells. Implements orders of Supervisor of Wells on drilling locations and patterns, casing programs, and brine disposal. Supervises plugging and abandoning procedures. Supervises collecting oil well drilling records.

Robert M. Acker, *Geologist & Head*
Verco F. Sargent, *Geologist & Supervisor of Field Offices*
Donald R. Brackenbury, *Geologist*
Harold E. Rickard, *Oil and Gas Inspector*

POLLUTION AND FIRE CONTROL UNIT

Supervises investigation of pipelines, refineries, oil and gas fields wherever pollution or fire constitute hazards to life or property. Implements corrective measures. Liaison with Fish, Law Enforcement, Forest Fire and Water Resources divisions in such investigations.

Horace A. Young, *Oil and Gas Supervisor & Head*
Douglas C. Sanback, *Conservation Officer & Supervisor*
John B. Frisbey, *Oil and Gas Inspector*
Ronald D. Shaver, *Oil and Gas Inspector*

PRODUCTION AND PRORATION UNIT

Supervises collecting and interpreting reservoir engineering and production data for applying production controls. Implements proration orders of the Supervisor of Wells. Liaison with oil producers on proration and production regulations

William G. Smiley, *Geologist & Head*
James L. Lorenz, *Geologist*
Allan B. Collins, *Geologist*
William M. Iversen, *Geologist*

PETROLEUM GEOLOGY UNIT

Supervises collecting and interpreting petroleum geology data, as consultant to Supervisor of Wells and other state administrators. Supervises oil well sample program. Prepares and distributes oil well logs and oil and gas maps. Publishes oil and gas field development and statistical data.

Robert E. Ives, *Geologist & Head*
Garland D. Ells, *Geologist*
Beverly L. Champion, *Geologist*
Floyd L. Layton, Jr., *Geologist*
Lyle D. Taylor, *Cartographic Draftsman*

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