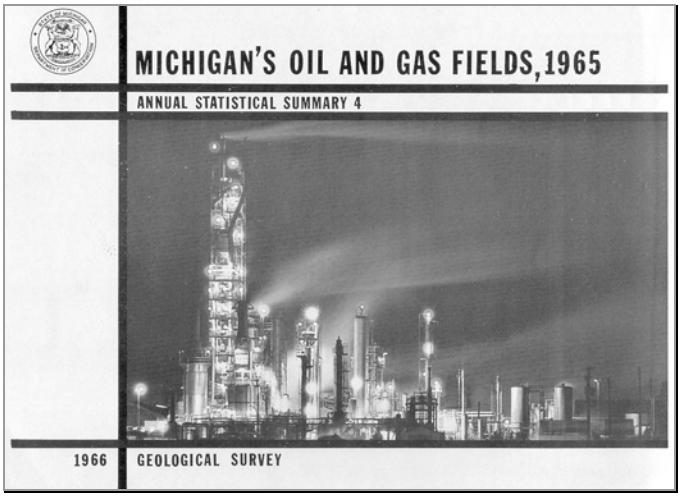

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LANSING
1966

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THE STATE GEOLOGICAL SURVEY OF MICHIGAN

History

The State Geological Survey was established originally in 1837 by the First Legislature, which provided funds through 1845. The office was instituted again from 1859 through 1862. The present Survey was organized in 1869, and has served from that date without interruption. In 1921, however, agencies administering natural resources were combined into a single organization. Thus the Geological Survey, headed by the State Geologist, became part of the Department of Conservation.

Mission

To collect, interpret, and disseminate basic geologic information for understanding and developing the mineral and water resources in this state, to carry out the oil and gas conservation laws, and to evaluate all metallic mining properties.

Principal Governing Statutes (Compiled Laws, 1948):

Geological Survey, organic act	321.1
Department of Conservation, organic act.	299.2
Oil and gas conservation	319.1
Mines appraisal.	211.24
Mineral statistics	319.202
Aerial and topographic surveys	321.51, 321.101,321.151

PREFACE

This publication relating essentially to petroleum exploration and production activities is the fourth of a new series of annual statistical summaries. It brings together under one cover many related oil and gas field statistical data not usually found in any other industry or government publication. Information of historical and general interest is thus preserved herein for future reference. It is a source of information most useful in evaluating Michigan's past history and future prospects as a petroleum and natural gas province. Furthermore, the gathering, maintenance, and compilation of the many statistical data reflects, in part, the varied functions of the Oil and Gas Section of the Survey.

New and useful items have been included in this issue. Addition of oil and gas field maps, together with specific field location data, make this publication more functional than previous oil and gas summaries. Field location lists, which specified township, range, and producing sections, were previously published as mimeograph separates. Such charts will probably be included periodically in the oil and gas summaries.

Current oil and gas production figures are provided by the Michigan Department of Revenue. Other statistics are based upon data gathered and maintained by the Geological Survey.

This report is compiled from records kept by staff members of the Oil and Gas Section supervised by L. W. Price. Oil and gas unit supervisors who assembled and provided the major basic records for this summary are:

R, M. Acker, geologist and head, Regulatory Control

W. G. Smiley, geologist and head, Production and Proration.

R. E. Ives, geologist and head, Petroleum Geology.

James L. Lorenz, T. L. Culver, and A. B. Collins, Production and Proration, provided the chart, graphs, and special resume on the Albion-Scipio Trend.

Publication design, arrangements, and manuscript preparation was made by G. D. Ells.

Technical advise on publication preparation was provided by R. W. Kelley, Editor, Geological Survey.

Preparation of manuscript plates was made by the secretarial and technical staff, Geological Survey.

Printed and assembled by Office Services, Department of Conservation.

Lansing, Michigan
June 9, 1966

G. D. Ells
Compiler

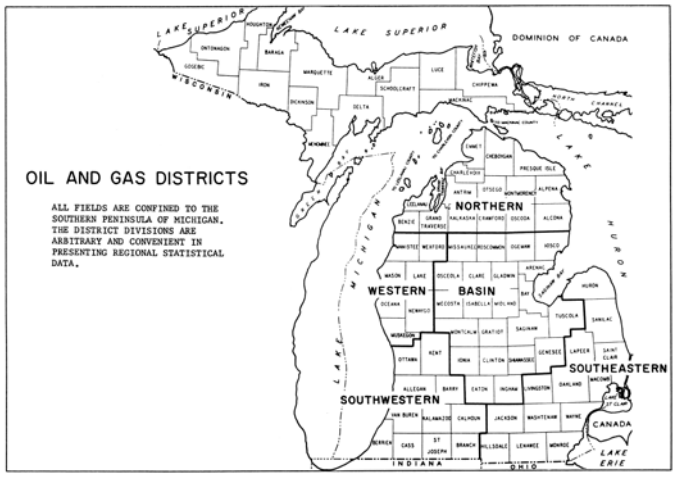
ABBREVIATIONS

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
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

PETROLEUM INDUSTRY IN MICHIGAN IN 1965

[Oil and Gas Districts (Map)]



INTRODUCTION

Overall exploratory and field development activity continued to decline during 1965. No large fields were found in 1965 or during the preceding year. Lack of large new field discoveries, smaller size of newly found fields, and greater well spacing, contribute to the decline in oil and gas field activities.

Contributions by the petroleum exploration industry to Michigan's economy are considerable. Total oil and gas production was valued at more than $50,340,000 as compared with $52,000,000 in 1964. In addition, a greater sum was no doubt spent in drilling, in field development, leasing, and the many other activities related to the search for new oil and gas fields.

Part I of this publication is a discussion and summary of significant information on last year's oil and gas field activities and related work of the Oil and Gas Section of the Geological Survey. Part 2 contains specific information related to oil and gas fields, production, and related data. Part 3 contains cumulative records of lesser importance to the petroleum industry.

* * * DRILLING PERMITS * * *

Fewer permits were issued for oil or gas well tests, gas storage reservoir wells, and other types drilled under oil and gas permits. Geographic distribution by district (see above map) of permits issued through a 3-year period is shown on the following chart.

DRILLING PERMITS BY DISTRICT

DISTRICT	Permits Issued		
	1963	1964	1965
Basin	147	166	117
Northern	7	9	7
Southeastern	375	267	247
Southwestern	100	77	63
Western	75	64	60
Totals	704	583	494

Permits for 106 service wells, drilled mainly in gas storage reservoirs, are included in the above figures. The fluctuation in the number of permits issued for this type of well through a 3-year period is shown as follows.

Service Wells	1963	1964	1965
Gas Storage, Observation, Injection, Etc.	83	122	106

Permits for Geological Tests are not included in any of the preceding figures. None were issued in 1964 but 9 were issued in 1965. Five were issued for Bay County, and 1 each for Clare, Missaukee, Newaygo, and Mecosta Counties.

* * * WELL COMPLETIONS * * *

The number and class of well completions by month and district for 1965 is shown on Table 1. The number and class of well completions by counties for 1965 is shown on Table 2. Cumulative completions by year and county are shown on Tables 17 and 22.

The following tabulation shows exploratory and development well completions over a 3-year period. The figures do not include deepened wells, reworked wells, gas storage reservoir wells, or others not directly related to exploratory or oil and gas pool development drilling.

EXPLORATORY AND DEVELOPMENT WELL COMPLETIONS

	Exploratory Wells			Development Wells			Totals
	Oil	Gas	Dry	Oil	Gas	Dry	
1963	11	7	220	124	66	163	591
1964	7	5	221	75	43	155	506
1965	6	6	189	47	28	102	378

Exploratory well completions were about 15 percent fewer than in 1964. St. Clair and Macomb Counties which have been the most active part of the State in exploratory and development drilling the past several years, again accounted for nearly 36 percent of the exploratory wells drilled.

* * * DRILLED FOOTAGE * * *

Total drilled footage for exploratory and field development wells continued to decline. The average drilled footage per exploratory well was about 3,000 feet and for development wells, 3,320 feet. Total drilled footage for service wells (gas storage, etc.) increased in 1965. The average drilled footage for service wells was about 2,377 feet. The fluctuation in drilled footage through a 3-year period is as follows:

Footage Class	Amount of Drilled Footage		
	1963	1964	1965
Exploratory	698,551	654,224	602,682
Development	1,064,645	924,584	587,457
Service	88,800	217,027	254,403
Total	1,851,996	1,795,835	1,444,542

* * * GEOPHYSICAL EXPLORATION * * *

Accurate data on geophysical exploration is not available, but most was done in the St. Clair - Macomb County area of eastern Michigan. Gravimeter exploration was reported to be well below the 38 crew-months reported for 1964. Seismograph exploration was reported to exceed that of previous years. Reports indicate that between 30 and 36 crew-months were spent at this type of survey.

* * * DISCOVERY WELLS * * *

The ratio of discoveries to exploratory tests was 1:16 as compared to about 1:19 in 1964. Over a third of the exploratory wells were drilled in St. Clair and Macomb Counties. The discovery to dry hole ratio for these counties was about 1:18 as compared with 1:64 in the previous year. Details on all 1965 discoveries are shown on the page below. The following chart gives an analysis of discoveries by geologic system through a 3-year period.

ANALYSIS OF DISCOVERY WELLS BY GEOLOGIC SYSTEM

System	Formation or Pay	Number of Discoveries		
		1963	1964	1965
Pennsylvanian		0	0	0
Mississippian	"Michigan Stray Ss."	1	3	1
	"Berea"	0	0	0
	Antrim Shale	0	0	1
Devonian	"Traverse Lime"	7	5	5
	Dundee	4	1	1
	"Reed City"	0	0	1
	Detroit River "Sour Zone"	0	1	0
	Richfield	0	1	0
Silurian	Salina-Niagaran reef			
	Niagaran reef	5	1	4
Ordovician	Trenton-Black River	3	0	0
	Prairie du Chien	0	0	0
Cambrian		0	0	0

* * * UNDEVELOPED ACREAGE * * *

Figures for the amount of privately-owned undeveloped acreage under lease for oil and gas at the end of 1965 is not available. But it is thought to be considerably less than the estimated 1,064,000 held in 1964.

Records indicate 329,110 acres of state-owned land under lease for gas and oil at the end of 1965, a substantial decrease from the 410,000 acres, held at the end of 1964. The total revenue from oil and gas bonus, rental, and royalty amounted to $516,074 in 1965 as compared with $553,692 in 1964. The fluctuations in the amount of state lands under lease and the derived revenue over a period of years are shown graphically on page 5.

1965 DISCOVERY WELLS

Field	County and Location	Operator and Lease	Permit Number	Comp. Date	Total Depth	Depth to Pay	Initial Production (N) IP=n (T)IP=t BOPD MCFGPD	Prod. Form.	Basis for Loc.
* * NEW FIELDS * *									
New Richmond	Allegan 16-3N-15W	J. Ely, Godfrey #1	25776	1-8	1365	1363	P10+wtr. t (Abandoned in 1965)	Trav.	Nt.
Paradise	Grand Traverse 16-25N-10W	Miller Bros., Weaver #1	25948	6-22	1897	1889	850t	Trav.	Sub.
Union, Sec. 6	Isabella 6-14N-4W	Merrill Drlg. Co., Thering #1	25935	9-8	1385	1382	Est. 5400t	Stray	Sub.
Luther	Lake 14-19N-12W	The MOCO, Hoover Heirs #1	25855	3-2	2567	2565	P45t	Trav.	Sub.
Romeo	Macomb 11-4N-12E	J.Barwick Van Den Brouck #1	25957	8-25	2565	3290	2200n	Niag.	Sub.
Laketon	Muskegon 15-10N-17W	C.P. Co. & Calvert McMahan #1	26193	10-29	2198 PBTD	1697	50t	Trav.	Sub.
Forest River	Oceana 12-16N-15W	J. W. Lang, Forest River Land Co. #1	26018	7-12	2598	1954	P20t (Abandoned in 1965)	Trav.	Sub.
Leroy	Osceola 27-19N-10W	The MOCO, Gustafson & Garnett #1	25897	6-9	3800	3796	P10t	R.C.	Sub.
Marsac Creek	St. Clair 30-4N-15E	Cons. Power Co. Kuskowski #1	26008	6-25	2775	2438	Est. 1647n	Niag.	Grav.
Columbus, Sec. 23	St. Clair 23-5N-15E	Sun Oil Co., Chase #1	26257	12-10	3211	2900	Est. 9000n	Niag.	Seis.
Hessen	St. Clair 3-4N-15E	Sun Oil Co.&C.P.Co. Swierkosz-May #1	25952	6-11	2887	2499	No gauge	Niag.	Grav.
* * NEW POOLS * *									
Big Rapids	Mecosta 10-15N-10W	N. Donley, Toth #1 (Reworked dry hole)	20833	6-19	3475	3420	Est. 500t	Dd.	Sub.
Chester, Sec. 15	Otsego 14-29N-2W	M. Welch State-Chester #1	26074	9-15	1505	1439	Est. 4000n	Antrim	Sub.

NOTE: (T) IP refers to Initial Potential after acid, sand-fracture, or a combination of well stimulation methods.
(N) IP refers to Natural Initial Potential or Production.

* * * OIL AND GAS PRODUCTION * * *

Oil production continued to dip slightly. No significant oil reserves were found or developed in 1965 that would offset the decline. Production dropped to 14,728,223 barrels as compared with 15,601,704 barrels in 1964. Gas production which has steadily increased the past 7 years continued to rise during 1965. Gas production amounted to 35,120,368 MCF as compared with 32,615,685 MCF in 1964. Oil and gas production by county in 1965 is shown on Table 2. Production by individual fields or pools is found in Part 2 of this summary.

Oil and gas production by month and by geographic district is shown on the following charts.

OIL AND GAS PRODUCTION BY MONTH

Month	Production	
	Barrels Oil	MCF Gas
January	1,216,931	3,719,449
February	1,125,468	3,312,132
March	1,259,872	3,932,219
April	1,226,366	2,304,578
May	1,234,889	3,333,974
June	1,204,800	3,447,896
July	1,244,639	2,685,838
August	1,220,344	2,321,656
September	1,272,452	2,334,837
October	1,237,630	2,494,869
November	1,227,441	2,473,895
December	1,257,390	2,759,025
Totals	14,728,223	35,120,368

OIL AND GAS PRODUCTION BY DISTRICT

District	Production	
	Barrels Oil	MCF Gas
Basin	4,000,431	2,773,358
Northern	81,423	379,116
Southeastern	7,450,001	27,427,725
Southwestern	2,892,116	4,471,041
Western	304,252	69,128
Totals	14,728,223	35,120,368

The Albion-Scipio Trend fields produced over 59 percent of the states oil and 29 percent of the states gas production in 1965. The impact of the Albion-Scipio field on the Michigan industry has prompted the publishing of supplemental data to demonstrate in part, the outstanding performance of this field. The supplemental data are presented on pages 10 through 12.

* * * OIL FIELDS * * *

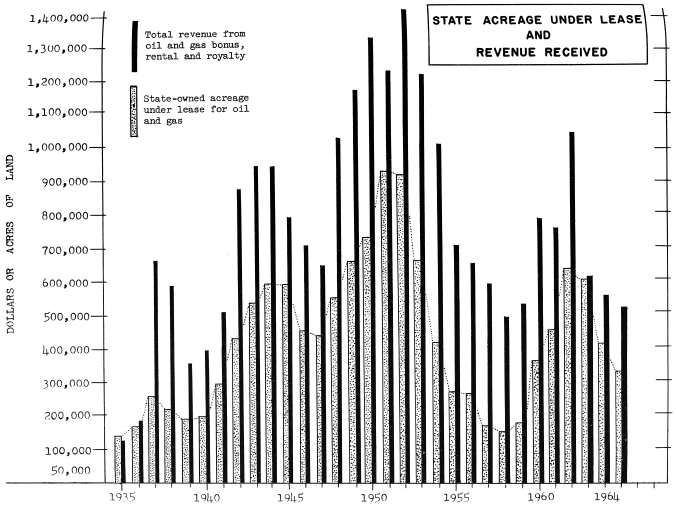
New oil field discoveries in 1965 increased the number of active oil fields to 187. There were 5 fields or pools abandoned and 1 pool re-activated during the year. New well completions, including reworks and wells deepened to new pay zones, increased the year-end total of producible wells in the state to 4,368. These wells include 332 wells which were shut down or shut in, but it does not include gas wells or injection wells which produced some oil during the year. The number of producing wells at year's end was 4,036.

There were 155 well abandonments. These included pay zones where wells were deepened, re-completed in new pay zones, or converted to injection wells. Data on individual oil fields are found in Part 2.

* * * GAS FIELDS * * *

New gas field discoveries in 1965 increased the number of producible dry gas fields and pools to 89; but only 34 of these fields produce gas for commercial sale. The total number of wells in the fields amounted to 424. Four small gas fields were abandoned in 1965.

[State Acreage Under Lease (Graph)]



* * * DEEP TESTS * * *

General information on wells selected as important deep tests is shown on the chart below. Wells that reached total depth in Cambrian or older rocks were drilled mainly in the shallower part of the Basin. The deepest hole drilled during 1965 bottomed-out at 8,372 feet in the Trempealeau formation. Two Precambrian tests were drilled, one on Harsen's Island, St. Clair County and the other in Berrien County. The Berrien County well was reported to have drilled over 1,000 feet of granite before reaching a total depth of 5,647 feet. The hole was drilled by rotary with water as the primary drilling fluid. Drilling rate in the "granite" was reported to be about 4 minutes to the foot, although the contractors daily drilling record does not seem to verify this. A preliminary study of the samples suggests that the section is detrital, mainly quartz with biotite mica and some feldspar. Petrographic and spectrographic examination is needed to determine whether or not the rock is detrital or unweathered granite. The Harsen's Island well (cable tool hole) bottomed-out in a rock containing quartz, biotite, magnetite, and other dark rock. This rock appears to be a schist containing biotite and chlorite.

Attention is called to the omission on page viii, Annual Statistical Summary 2, 1965, of an important test drilled to a depth greater than 10,000 feet. The omitted well was drilled in 1962 by C. J. Simpson and Sun Oil Company. It was drilled in section 8, T.13N., R.9E., Tuscola County, and reached a total depth of 10,130 feet in Cambrian rocks.

IMPORTANT 1965 DEEP TESTS

County	Location	Operator and Lease	Permit Number	Basis for Location	Total Depth	System and Formation	Expl. Class	Results
Barry	23-4N-7W	J. O'Neill, Jr. Farley #1	25775	Subsurface	3505	Sil., Cl.	NFW	D & A
Barry	34-4N-10W	C.J. Moskowitz, Janose #1	26182	Gravity ?	3708	Sil., Cl.	NFW	D & A
Berrien	10-6S-17W	Security Oil & Gas, Thalman #1	26112	Nt.	5647	Granite	NFW	D & A
Livingston	14-2N-4E	Brazos Oil & Gas Co., Kiser #1	25966	Subsurface	7210	Camb., Dres.	NFW	D & A
Macomb	1-4N-13E	Cons. Power Co., Halmich #3-1 (Drilled as BDW in Boyd Field)	26214	- - - -	5214	Camb., Tremp.	- -	- - -
Manistee	10-24N-14W	P. Fulk, Cons. Power Co. #1	26176	Gravity	5220	Sil., Cl.	NFW	D & A
Osceola	9-20N-7W	Cons. Power Co., Dahmer #1	25964	Subsurface	5184	Dev., D.R.	NFW	D & A
Otsego	2-29N-4W	C. J. Simpson, Lake Horicon Corp. #1	25873	Gravity	8372	Camb., Tremp.	NFW	D & A
Otsego	16-29N-3W	C. J. Simpson, State-Otsego Lake #1	26216	Gravity	6094	Sil., Cl.	NFW	D & A
Ottawa	34-7N-13W	Smith Petroleum Co., Fenske #4-A (DPT in Walker Field)	25800	Subsurface	3106	Sil., Sal	DPT	D & A
Ottawa	27-7N-16W	Miller Bros., Retzlaff #1	25813	Subsurface	3960	Ord., B.R.	NFW	D & A
Ottawa	30-5N-15W	Holland Suco Color Co. - Disposal #1 (Drilled as an Industrial Waste Disposal Well)	None	- - - -	5894	Camb., Jacob.	- -	- - -
Sanilac	9-10N-15E	C. J. Simpson, Hontar #1	25939	Gravity	6793	Camb.,	NFW	D & A
St. Clair	1-6N-15E	Nadco., Conrad #1	26086	Gravity	5498	Camb.,	NFW	D & A
St. Clair	2N-16E	L. Bernhardt, Puzzuoli #1	25780	Nt.	4188	Granite	NFW	D & A
St. Clair	34-8N-13E	Sunray DX, Holcomb & Capac Bank #1 (DPT in Capac Field)	25786	Subsurface	6300	Ord., B.R.	DPT	D & A
Washtenaw	20-4S-3E	Trolz & Assoc., Trolz #1	25950	Subsurface	4650	Ord., P.D.C.	NFW	D & A
Washtenaw	26-2S-7E	E. Rovsek, Jorgensen #1	25714	Subsurface	5002	Ord., P.D.C.	NFW	D & A
Wexford	20-24N-9W	Texaco, State - Liberty #A-1	26022	Subsurface	4901	Dev., Sylv.	NFW	D & A

TABLE 1. DRILLING PERMITS AND NEW WELL COMPLETIONS BY DISTRICTS AND BY MONTHS, 1965

	DISTRICTS					
	Basin	Northern	Western	Southwestern	Southeastern	Totals
PERMITS ISSUED 1/	117	7	60	63	247	494
CLASSIFICATION OF NEW WELL COMPLETIONS						
Oil Wells 2/	7	0	8	18	20	53
Gas Wells 3/	2	3	0	1	28	34
Gas Storage Wells	60	0	1	5	40	106
Geological Information Test	1	0	0	0	0	1
Dry Holes	49	4	46	41	151	291
Total Well Completions 4/	119	7	55	65	239	485
EXPLORATORY WELLS COMPLETED						
Exploratory Tests D & A	35	4	40	21	89	189
Successful Exploratory Tests	2	2	3	1	4	12
Total Exploratory Tests	37	6	43	22	93	201

	MONTHS												
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals
PERMITS ISSUED 1/	42	24	29	32	42	76	45	52	37	39	37	39	494
CLASSIFICATION OF NEW WELL COMPLETIONS													
Oil Wells 2/	4	4	4	1	5	3	7	6	5	3	7	4	53
Gas Wells 3/	9	2	3	0	1	5	2	3	3	3	0	3	34
Gas Storage Wells	2	1	1	5	14	15	16	9	16	20	7	0	106
Geological Information Test	0	0	0	0	0	0	0	0	0	0	0	1	1
Dry Holes	20	18	8	16	21	28	34	31	30	27	31	27	291
Total Well Completions 4/	35	25	16	22	41	51	59	49	54	53	45	35	485
EXPLORATORY WELLS COMPLETED													
Exploratory Tests D & A	13	7	3	10	14	21	25	19	17	18	19	23	189
Successful Exploratory Tests	1	0	1	0	0	4	1	1	2	1	0	1	12
Total Exploratory Tests	14	7	4	10	14	25	26	20	19	19	19	24	201

1/ Includes 101 gas storage permits, and 1 permit for geological information.

2/ Does not include 8 oil wells resulting from rework operations.

3/ Does not include 2 gas wells resulting from rework operations.

4/ Does not include reworks and deepened wells, but does include service wells.

[Drilling Permits, Well Completions, Oil and Gas Production by County, 1965, Table 2]

TABLE 2. DRILLING PERMITS, WELL COMPLETIONS, OIL AND GAS PRODUCTION BY COUNTY, 1965 (Sheet 1 of 2)

County	Permits Issued	Classification of 1965 Well Completions (Does not include reworked wells)							County Production	
		Oil Wells	Gas Wells	Service Wells: SWD	Service Wells: GS	Service Wells: Wtr. Inj.	Service Wells: Geol. Info.	Dry Holes	Total Completions	Barrels Oil	MCF Gas
Allegan	25	13			5			9	27	253,425	310,055
Antrim								1	1		
Arenac	3							4	4	303,389	
Barry	1							2	2	14,240	
Bay	1							2	2	333,913	
Berrien	1							1	1		
Branch	2							1	1		
Calhoun	17	3	1					8	12	2,319,337	3,982,879
Cass	1							1	1	5,229	
Clare	25				22			3	25	651,231	187,067
Clinton	1							1	1		
Crawford										65,664	344,518
Genesee										2,209	
Gladwin	4	2						1	3	438,889	
Grand Traverse	3		1					1	2		
Gratiot	1							1	1	45,627	5,549
Hillsdale	36	6						27	33	4,975,783	4,217,380
Huron	1									2,620	
Ionia	1										
Isabella	3		1					2	3	308,209	4,173
Jackson	17	2						10	12	1,575,997	2,026,253
Kalamazoo	2							3	3		
Kalkaska										14,079	18,709
Kent	2	1						2	3	108,233	
Lake	15	1						12	13	15,346	
Lapeer										26,214	
Lenawee	4		2					3	5	292	
Livingston	21				20			2	22		10,006

TABLE 2. DRILLING PERMITS, WELL COMPLETIONS, OIL AND GAS PRODUCTION BY COUNTY, 1965 Continued (Sheet 2 of 2)

Macomb	36		3		6			28	37	4,027	7,852,714
Manistee	2							2	2		
Mason	11	4						5	9	157,092	
Mecosta	21				14			8	22	23,453	75,466
Midland	2							1	1	236,434	12,000
Missaukee	2		1		1			2	4	432,977	810,703
Monroe	1							1	1	7,668	
Montcalm	23				17			11	28	238,553	42,966
Montmorency											
Muskegon	9	2						4	6	11,418	6,228
Newaygo	9				1			7	8	19,662	963
Oakland	1									286	
Oceana	12	1						13	14	100,734	
Ogemaw	2						1		1	281,088	552,935
Osceola	23	2			6			10	18	404,183	160,844
Oscoda										1,680	
Otsego	4		2					2	4		15,889
Ottawa	6	1						7	8	176,265	178,107
Roscommon								1	1	195,921	921,655
Saginaw	2							2	2	30,815	
Sanilac	1							1	1		
St. Clair	117	12	19		11			69	111	807,792	12,422,513
Tuscola	3	3							3	73,540	
Van Buren	6							7	7	15,387	
Washtenaw	5							5	5	27,903	190,957
Wayne	7		4		3			5	12	21,419	707,902
Wexford	2							3	3		61,937
Totals											
55 Counties	494	53	34		106		1	291	485	14,728,223	35,120,368

-Includes gas storage field observation wells.

Does not include 2 reworks resulting in gas wells.

Does not include 8 reworks resulting in oil wells.

BRIEF PRODUCTION HISTORY OF ALBION-SCIPIO TREND

The Albion-Scipio Field has produced the greatest cumulative oil production of any field in Michigan and will, in the coming year, peak the major gas producing field (51.6 Billion Cu. Ft.) in Michigan in cumulative gas production. This is especially significant considering this field has many years of productive life remaining.

These data represent total field performance only, and although they reflect the effect of the more recent development, primarily in Hillsdale County, they also demonstrate the benefits of prorated production and energy control.

It should be noted here that many of the benefits accruing to producers in this field can be attributed in great part to the efforts of the field engineering committee, representing field operators, working in close harmony with the regulatory agency.

This arrangement has been effective in many ways, some of which are as follows: (1) Resolving production problems in critical areas. (2) Scheduling and planning of sub-surface pressure and gas-oil ratio surveys. (3) Compiling comprehensive well and field data. In general it has provided a forum for discussion and resolution of many common problems, and has contributed a large measure to the following outstanding field history.

These data shown on the chart and graphs are developed from proration files and may differ slightly from data presented elsewhere in the summary. Example: No. of wells in column 2 represent producible wells whereas the total of last two columns represent producing wells and exclude temporary down or reworking wells.

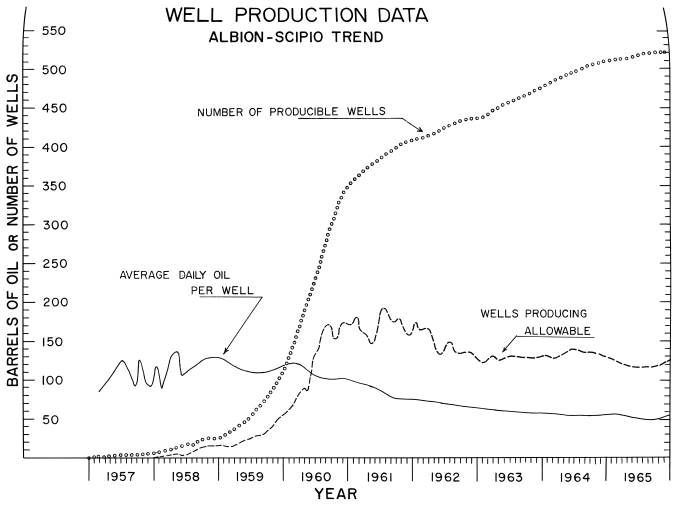
* * * OIL AND GAS VALUATION * * *

The valuation of oil produced in Michigan in 1965 amounted to about $41,036,743 as compared to $43,879,393 in 1964. The average price paid per barrel of oil at the wellhead was $2.79. The valuation of gas produced from Michigan fields amounted to about $9,303,334 as compared with $8,466,921 in 1964. The average price of gas sold at the wellhead was about $.27 per MCF.

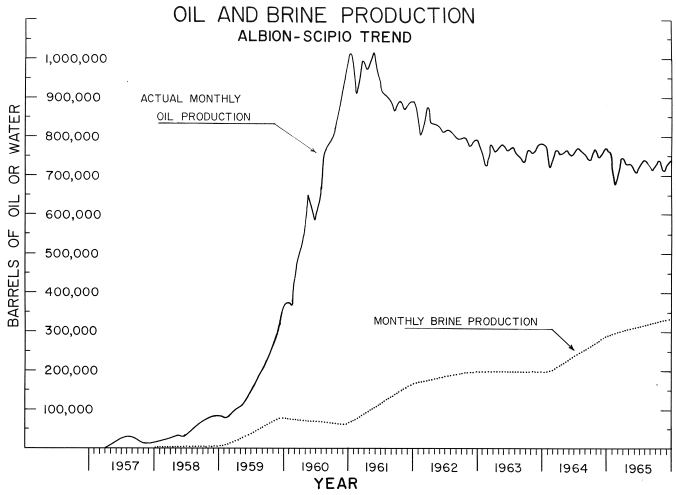
PRODUCTION HISTORY OF ALBION-SCIPIO TREND

END OF YEAR	NUMBER OF PROD. WELLS	NUMBER OF DEVELOPED ACRES	PIPE LINE RUNS - BBLS. CUMULATIVE RUNS PER PROD. WELLS	CUMULATIVE RUNS PER DEVELOPED ACRE	CUMULATIVE RUNS PER TOTAL FIELD	PER YEAR	DAILY	DAILY AVERAGE GAS MCF	DAILY AVERAGE G.O.R. c.f.p.b.	DAILY AVERAGE WATER BBLS.	NO. WELLS PRODUCING ALLOWABLE BY OIL	NO. WELLS PRODUCING ALLOWABLE BY GAS	NO. WELLS PRODUCING BY PUMP	NO. WELLS PRODUCING BY FLOW
1957	6	120	13,695	694	83,307	83,307	466	767.3	2,290	0	1	3	0	4
1958	25	500	24,540	1,227	613,506	530,199	2,384	1,457.4	524	213	17	0	0	24
1959	102	2,040	25,589	1,279	2,610,094	1,996,588	11,795	11,046.0	883	2,406	56	17	8	95
1960	346	6,920	30,580	1,529	10,580,680	7,970,586	32,358	26,491.5	801	2,053	169	35	79	251
1961	406	8,060	53,551	2,697	21,741,645	11,160,965	28,555	26,700.0	928	5,390	178	62	137	261
1962	436	8,580	71,992	3,658	31,388,636	9,646,991	25,211	26,357.0	1,079	6,564	123	42	174	240
1963	479	9,370	84,621	4,326	40,533,495	9,144,859	25,260	23,308.0	1,143	6,431	133	51	205	257
1964	509	9,830	97,490	5,048	49,622,360	9,088,865	24,897	27,411.0	1,171	9,402	134	68	237	239
1965	519	9,930	112,377	5,873	58,323,809	8,701,449	23,695	27,629.0	1,237	10,899	124	65	271	215

[Well Production Data, Albion-Scipio Trend (Graph)]



[Oil and Brine Production, Albion-Scipio Trend (Graph)]



* * * CRUDE OIL IMPORTS AND EXPORTS * * *

Crude oil imports to Michigan refineries amounted to 36,468,716 barrels in 1965. Of this amount, 31,223,464 barrels came from western and mid-western states, and 5,245,252 barrels came via pipeline from western Canada oil fields.

Oil exported to northern Indiana (Ft. Wayne) refineries amounted to 23,245 barrels as compared with 170,779 barrels in 1965.

* * * NATURAL GAS IMPORTS * * *

Records of the Gas Section, Michigan Public Service Commission, indicate 546,690,411 MCF gas was imported by pipeline to Michigan storage fields and markets. Gas imports were from Texas, Louisiana, Oklahoma, and Kansas fields.

* * * LPG EXTRACTION * * *

LPG recovery from gas plant operations increased from 66,187,177 gallons in 1964 to 86,891,724 gallons in 1965. The top 5 fields or plants in LPG production were: Albion-Scipio, 30,083,894 gallons; Belle River Mills, 18,359,800 gallons; Boyd, 16,987,534 gallons; Willow Run, 10,730,995 gallons; and Reed City, 9,716,173 gallons. Most of the increase in LPG recovery came from the Belle River Mills, Boyd, and Reed City plants. Details on gas plant operations are found on Table 15. LPG surface and subsurface storage facilities are shown on Table 14, page 50.

* * * DESCRIPTIVE WELL LOG LIBRARY * * *

About 475 new well logs and 210 well rework records were received in 1965 by the Regulatory Unit of the Oil and Gas Section. Many of these logs and rework records were processed for public distribution by the Petroleum Geology Unit during the year.

The Petroleum Geology Unit processed, published, and incorporated into the well log library 565 new logs. More than 25,565 published well logs are now available for purchase or use and inspection at Survey offices.

During 1965, over 14,200 descriptive well logs were printed and distributed, upon request, to individuals and companies interested in Michigan's oil and gas exploration industry. Individual, log orders ranged from a single log to as many as 3,500. In addition, 45 subscription log orders were mailed out each month to individuals, companies, government-agencies, and universities.

* * * SAMPLE LIBRARY * * *

The Geological Survey maintains a library of well cuttings (sample sets) as a part of its function in gathering and preserving geological data useful to industry, government agencies, universities, and individuals. In 1965, 122 new sets (about 30,830 individual cuts) were acquired, catalogued, and placed in the active library which now contains about 7,470 individual well sets.

In 1965, major oil companies borrowed or examined at the Survey about 150 sample sets. Independent oil companies and consulting geologist borrowed and examined 126 sets, and 114 sets were loaned to universities for post-graduate studies and other projects.

The sample library is operated as a lending library; no fee is charged for use or examination of the sample sets. Some restrictions are necessary for orderly management, service, and preservation of the sets. Individual sets, or parts of sets, may not be "robbed" of cuttings for insoluble residue studies or otherwise destroyed or mutilated. The Survey attempts to supply, on a limited basis, well cutting for use in insoluble residue studies. Sample sets may not be shipped by mail or freight, and they may not be removed from the State of Michigan. In general, most sets may be placed on loan for periods of 2 to 3 weeks and for longer periods depending on demand for particular sets. Policy is geared to general oil and gas field activities which vary from year to year. The Survey has limited space for sample examination on the premises. Operators are encouraged to make sample examinations at their own facilities and with their own equipment.

* * * OIL FIELD BRINE PRODUCTION * * *

Oil field brine production in 1965 amounted to about 145,102 barrels as compared with 148,972 in 1961. There were 18 fields that produced brine in excess of 2,000 barrels per day. These fields account for over 70 percent of the state's daily brine production. The 18 major brine producing fields are shown on the adjacent chart. The table below on this page shows details on brine disposal. Other oil field brine production data are shown on Table 24. See Oil and Gas Field Tables for brine production by individual field.

MAJOR BRINE PRODUCING FIELDS

Field	Rank	1965	1964	1963
Coldwater	1	29,557	31,945	35,701
Albion-Scipio Trend	2	10,273	8,798	6,323
Porter	3	8,685	8,547	9,677
Deep River	4	7,870	7,570	8,800
McBain	5	6,467	5,524	4,526
Freeman-Redding	6	5,560	6,695	7,630
Stony Lake	7	4,397	6,362	6,371
Reynolds	8	3,656	4,210	4,031
Reed City	9	3,416	4,951	6,532
Adams, North	10	3,262	2,857	3,664
Vernon	11	3,240	3,850	2,925
Scottville	12	2,978	2,404	1,714
Prosper	13	2,750	2,925	2,600
Fork	14	2,650	2,475	2,486
Evart	15	2,300	3,025	2,410
Clayton	16	2,079	1,863	1,968
Buckeye, North	17	2,058	2,115	1,710
Gilmore	18	2,000	1,850	1,650
Total		103,198	106,472	108,981
State Total		145,102	148,972	149,696

TABLE 3. OIL FIELD BRINE PRODUCTION AND DISPOSAL DATA IN 1965

BARRELS OF BRINE PRODUCED PER DAY			BARRELS OF BRINE RETURNED TO SUBSURFACE PER DAY										SURFACE DISPOSAL
			Formations used in Subsurface Disposal										Barrels Per Day
Producing Formation	Amount Produced	Amount Returned to Producing Formation	Parma	Marshall	Coldwater	Berea	Traverse	Dundee Reed City	Detroit River	Salina Niagaran	Cambrian	Roads	Pits
Marshall	0	0	-	-	-	-	-	-	-	-	-	-	-
Berea	39	0	0	9	0	0	0	0	0	0	0	12	18
Traverse	29,538	18,660	1,794	2,573	789	0	18,660	2,999	200	0	0	2,215	308
Dundee	101,028	86,950	4,608	2,591	27	176	6,033	86,950	0	0	0	405	238
Detroit River	1,474	5	15	215	0	5	326	627	5	0	0	171	110
Salina-Niagaran	1,875	0	0	0	0	0	61	0	1,609	0	59	96	50
Trenton	11,148	0	0	0	0	0	553	61	0	10,084	0	400	51
Totals	145,102	105,615	6,417	5,388	816	181	25,633	90,637	1,814	10,084	59	3,299	775
			Total brine returned to subsurface: 141,028										
Per cent	100	72.80	4.42	3.71	0.56	0.13	17.67	62.47	1.25	6.95	0.04	2.27	0.53

* * * 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. 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 1965 are summarized on the following chart.

OIL AND GAS HEARINGS IN 1965

Hearing Per Month	January	February	March	April	May	June	July	August	September	October	November	December	Totals
	3	1	3	4	1	3	6	2	3	2	5	4	37
Items or Causes Heard													
Spacing Orders:													
Adopted			1		1		1		1		1	1	7
Amended			1			1	2		1				5
Abrogated			3							1			4
Proration Orders:													
Adopted													0
Amended													0
Abrogated													0
Unitization:													
Adopted												1	1
Denied							1						1
Pooling Orders:													
Adopted							1				1	1	3
Denied													0
Exceptions to Spacing Orders:													
Approved	2		6	2		4	4	1	1	1	5	1	27
Denied													0
Order to Plug and Abandon:									1				1
Items heard, no action, or matter tabled:	1						1						2
Total Items or Causes	3	5	6	3	1	4	9	2	4	3	7	4	51

* * ACTIVE MICHIGAN OIL REFINERIES * *

COMPANY	REFINERY LOCATION	*NOMINAL CAPACITY BBLS. DAY
Bay Refining, Division Dow Chemical Company	Bay City	15,000
Crystal Refining Company	Carson City	6,200
Delta Terminal Company	Rapid River	4,000
Lakeside Refining Company	Kalamazoo	3,500
Leonard Refineries, Inc.		
Leonard Division	Alma	29,000
Roosevelt Division	Mt. Pleasant	7,500
Marathon Oil Company	Detroit	45,000
Marathon Oil Company	Muskegon	15,000
Naph-Sol Refining Company	Muskegon	10,000
Osceola Refining Company	West Branch	5,000
Petroleum Specialties, Inc.	Flat Rock (Inactive)	6,500
Socony Mobil Oil Company	Trenton	40,500
	Total Refinery Capacity	187,200

*Individual refinery operating rates may be less or slightly more than nominal rates shown.

PART 2, OIL, AND GAS FIELDS

EXPLANATION

Part 2 brings together general Information on Michigan's oil and gas fields, gas storage reservoirs and related items. The tables summarize information relating to oil and gas accumulations which have been designated and named as oil or gas fields.

OIL AND GAS FIELDS. 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 of stratigraphic interval and a different depth. Pools for individual fields are shown under PRODUCING FORMATION OR POOL. The PAY ZONE part of the table generally refers to the discovery well for the specific pool. The PAY THICKNESS shown on the tables 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.

LOCATION OF OIL FIELDS, GAS FIELDS, ETC. These tables show the specific locations of the fields and the sections which have, or have had producing wells. Miscellaneous wells which produced some oil but were eventually abandoned as dry holes are also included. Miscellaneous wells reporting some gas production are also included.

OIL AND GAS FIELD MAPS. It is not practical to outline and show the names of all the hydrocarbon accumulations that have been designated fields or pools. In general, the field names shown on the several maps are in agreement with the field names shown on the oil and gas field tables. Certain miscellaneous or single well fields are not shown on the maps but are listed in the tables.

ABANDONED OIL AND GAS FIELDS OR POOLS. Oil and gas fields or pools are considered abandoned when all wells have been plugged to the surface and the equipment has been removed from the area. Fields abandoned during a given year are entered into the abandoned field tables in the following year. Abandoned oil fields with less than 500 barrels of cumulative oil production are not shown in the tables. Production from fields having less than 500 barrels cumulative production is accounted for in the table summaries. Fields or pools may be re-activated from time to time when new producing wells are drilled.

GAS FIELDS. Many gas fields are listed as "shut in" because of lack of marketing facilities slow field development, or lack of substantial reserves. Production from fields listed as "Domestic" or "Lease Fuel" is not metered or considered commercial.

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.

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.

CASINGHEAD GAS PLANT DATA. These tables indicate the distribution of gross input gas to plants and the resulting net hydrocarbons available for market.

FLUID INJECTION INTO PRODUCING FORMATIONS. A number of fields have secondary recovery projects in operation. In most fields listed in these tables the injection of oil field brines back into the producing formation is a combination brine disposal and pressure maintenance project.

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 1955 can be found in issues of the "Summary of Operations", Oil and Gas Fields for 1962, and prior years. 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.

WELL COMPLETIONS AND PRODUCTION BY COUNTY. These tables show the classifications of completed wells on a county basis, and the cumulative amount of oil and gas produced in individual counties. Tables also indicate the total number of dry holes, oil wells, gas wells, etc., that have been drilled under oil and gas drilling permits in an individual county.

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. 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.

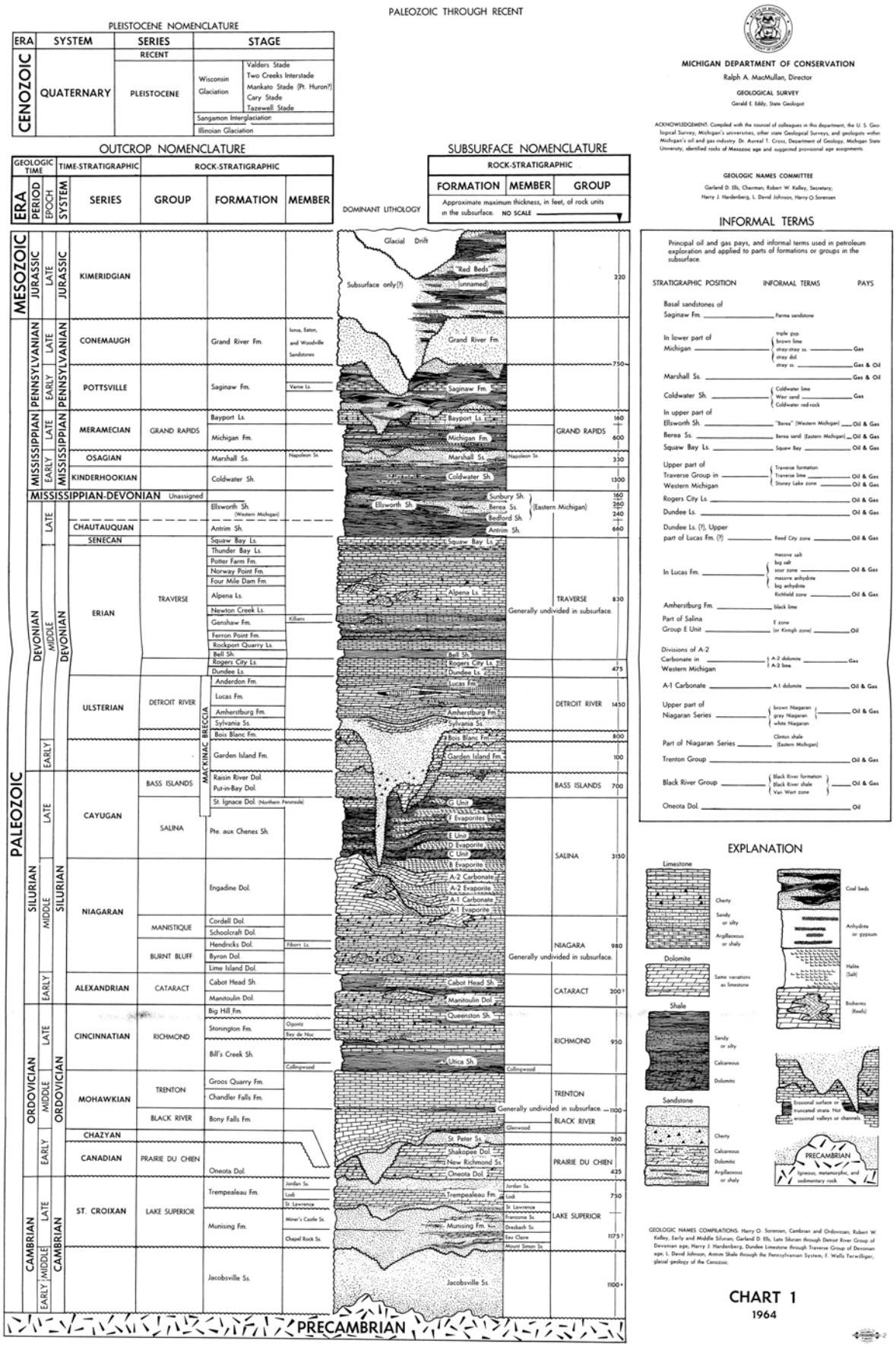
Observation Wells. Most observation wells are related to gas storage projects. They are used to observe underground movement of gas, brines, and other fluids, or to observe pressures.

Brine Disposal Wells. These wells, also called disposal 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 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, or 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.

STRATIGRAPHIC SUCCESSION IN MICHIGAN



Michigan Department of Conservation
Geological Survey Division

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