STUDY AND CORRELATION OF THREE WELLS IN CHAUTAUQUA COUNTY, NEW YORK

by

IRVING H. TESMER

Howard Yonkers No. 1 Well drilled by
E. Rolland Rich and Rolland T. Blodgett
Chautauqua County, N. Y., Sheridan Township

Robert Bates No. 1 Well drilled by
C. E. Bournique and others
Chautauqua County, N. Y., Ellery Township

Kyle Morse No. 1 Well drilled by
E. Glaros and N. Katras
Chautauqua County, N. Y., Harmony Township

A Report from the New York State Geological Survey

NEW YORK STATE MUSEUM
AND SCIENCE SERVICE
BULLETIN NUMBER 362

The University of the State of New York
The State Education Department

Albany, N. Y. November 1957

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With years when terms expire

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SAMPLE STUDY AND CORRELATION OF THREE WELLS IN CHAUTAUQUA COUNTY, NEW YORK

by

Irving H. Tesmer

State University of New York
College for Teachers at Buffalo

A Report from the New York State Geological Survey

Howard Yonkers No. 1 Well
Dunkirk Quadrangle: 4,750 feet west of Longitude 79°15′ W.
12,000 feet north of Latitude 42°25′ N.
Commenced: July 13, 1954
Completed: October 15, 1954
Elevation: 875 feet
Total Depth: 1,447 feet
Result: Salt water

Robert Bates No. 1 Well
Chautauqua Quadrangle: 4,900 feet east of Longitude 79°20′ W.
11,700 feet south of Latitude 42°10′ N.
Commenced: September 14, 1948
Completed: April 14, 1949
Elevation: 1393 feet
Total Depth: 3,000 feet
Result: Abandoned as dry hole

Kyle Morse No. 1 Well
Chautauqua Quadrangle: 300 feet east of Longitude 79°25′ W.
5,500 feet south of Latitude 42°05′ N.
Commenced: March 18, 1954
Completed: 1956
Elevation: 1,572 feet
Total Depth: 7,100 feet
Result: 180 MCF of gas at 4,250-4,254 feet
90 MCF of gas at 6,880 feet

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This is the fourth in a series of reports inaugurated by the New York State Geological Survey on well sample studies and correlation of important New York wells. This paper has been compiled under the direction of William Lynn Kreidler, Senior Geologist.

These reports are made possible by the cordial cooperation of the producing companies and individuals operating the wells. This bulletin is considered to be of interest in showing some of the facies changes which occur within the Devonian rocks of southwestern New York, along a north-south meridian.

The rock-color chart prepared by the National Research Council in 1948 was used as a standard for color comparison of well cuttings.

CONTENTS

SAMPLE STUDY AND CORRELATION OF THE HOWARD YONKERS NO. 1 WELL*

SUMMARY OF SAMPLE ANALYSIS

DEVONIAN SYSTEM
UPPER DEVONIAN (CHAUTAUQUAN) SERIES
ARKWRIGHT GROUP

Depth		
From	*To*	*Description*
0	20	Mantle

CANADAWAY FORMATION

Gowanda member

20	95	65% Shale, light gray to medium gray
		25% Shale, medium dark gray to dark gray
		10% Siltstone, light gray to medium light gray; fresh water; shows of gas from 45 feet to 800 feet
95	130	60% Shale, light gray to medium gray
		40% Shale, medium dark gray to dark gray
130	175	85% Shale, light gray to medium gray
		15% Shale, medium dark gray
175	235	70% Shale, medium dark gray to dark gray
		30% Shale, light gray to medium gray

South Wales member

235	270	90% Shale, light gray to medium gray
		10% Shale, medium dark gray
270	320	70% Shale, medium dark gray to dark gray
		30% Shale, light gray to medium gray

Dunkirk member

320	360	100% Shale, medium gray to grayish black

SENECA GROUP

CHEMUNG FORMATION

Hanover member

360	420	85% Shale, light gray to medium gray, w/some pyrite
		15% Shale, medium dark gray to dark gray
420	440	100% Shale, medium light gray to medium gray
440	465	60% Shale, medium dark gray
		40% Shale, light gray to medium gray

Pipe Creek member

465	470	100% Shale, medium gray to dark gray

* The stratigraphic nomenclature employed herein follows the revisions suggested by Tesmer (1955) and has not yet been officially adopted by the Geological Survey, New York State Museum and Science Service.

Depth From	To	Description
Angola member		
470	615	95% Shale, light gray to medium gray
		5% Shale, medium dark gray
615	625	70% Shale, medium dark gray to dark gray, w/some pyrite
		30% Shale, medium light gray to medium gray
625	695	90% Shale, light gray to medium gray
		10% Shale, medium dark gray
695	760	50% Shale, light gray to medium gray
		50% Shale, medium dark gray to dark gray
Rhinestreet member		
760	885	100% Shale, medium gray to dark gray, calcareous, concretions near top and bottom
NAPLES and GENESEE FORMATIONS		
Cashaqua member		
885	915	50% Shale, medium light gray to medium gray
		50% Shale, medium dark gray
Middlesex member etc.		
915	925	100% Shale, medium gray to dark gray
MIDDLE DEVONIAN (ERIAN) SERIES HAMILTON GROUP		
MOSCOW-LUDLOWVILLE FORMATIONS		
members undifferentiated		
925	945	50% Limestone, white to light gray, bryozoans, w/pyrite
		30% Shale, medium gray
		20% Shale, medium dark gray
945	1,030	70% Shale, medium dark gray to dark gray, calcareous at bottom
		30% Shale, medium gray
1,030	1,070	85% Shale, medium dark gray, calcareous
		15% Shale, medium gray
SKANEATELES FORMATION		
Levanna member		
1,070	1,120	100% Shale, dark gray, calcareous
MARCELLUS FORMATION		
Stafford member		
1,120	1,135	80% Limestone, white to dark gray
		20% Shale, dark gray, calcareous
Oatka Creek member		
1,135	1,195	90% Shale, dark gray to black calcareous
		10% Limestone, white to dark gray

Depth From	To	Description
ONONDAGA FORMATION		
Moorehouse member		
1,195	1,335	100% Limestone, very light gray to medium gray, w/light gray to medium gray chert, w/calcite
Nedrow member		
1,335	1,370	100% Limestone, very light gray to medium dark gray, w/light gray to medium dark gray chert, w/calcite
1,370	1,390	100% Limestone, light gray to medium dark gray, w/medium gray to medium dark gray chert, w/calcite
Edgecliff member		
1,390	1,415	100% Limestone, very light gray to light gray, w/very light gray chert, w/calcite
1,415	1,425	60% Siltstone, very light gray to medium light gray, w/glauconite; Springvale sand horizon probably representing reworked Oriskany; salt water; show of oil 40% Limestone, very light gray to light gray, w/very light gray chert, w/calcite
SILURIAN SYSTEM		
UPPER SILURIAN (CAYUGAN) SERIES		
AKRON (?) FORMATION		
1,425	1,447	100% Limestone, light gray to medium gray, dolomitic

SAMPLE STUDY AND CORRELATION OF THE ROBERT BATES NO. 1 WELL

SUMMARY OF SAMPLE ANALYSIS

DEVONIAN SYSTEM
UPPER DEVONIAN (CHAUTAUQUAN) SERIES

Depth		
From	*To*	*Description*
rock units undifferentiated		
0	237	No samples
237	261	100% Siltstone, light gray to medium light gray
261	342	No samples
342	348	100% Siltstone, light gray to medium light gray
348	397	No samples
397	407	100% Siltstone, light gray ; oil and gas
407	453	No samples
453	478	100% Siltstone, light gray ; gas
478	518	90% Siltstone, light gray to medium light gray 10% Shale, medium gray
518	525	No samples

ARKWRIGHT GROUP

CANADAWAY FORMATION

Northeast member		
525	630	50% Shale, medium light gray to medium gray 30% Siltstone, light gray to medium light gray 20% Shale, medium dark gray
630	680	90% Shale, medium light gray to medium gray 10% Shale, medium dark gray
680	743	70% Shale, medium light gray to medium gray ; gas 20% Shale, medium dark gray 10% Siltstone, light gray
743	770	50% Shale, medium light gray to medium gray ; good gas 30% Siltstone, light gray 20% Shale, medium dark gray
Shumla member		
770	797	60% Siltstone, light gray to medium light gray 30% Shale, medium dark gray 10% Shale, medium gray
Westfield member		
797	815	60% Shale, medium light gray to medium gray 25% Shale, medium dark gray 15% Siltstone, light gray
815	890	85% Shale, medium light gray to medium gray 15% Shale, medium dark gray

Depth From	To	Description
890	990	70% Shale, medium light gray to medium gray
		30% Shale, medium dark gray
990	1,045	75% Shale, medium light gray to medium gray
		15% Shale, medium dark gray
		10% Siltstone, medium light gray to medium gray
Laona member		
1,045	1,070	40% Siltstone, light gray to medium light gray
		40% Shale, medium light gray to medium gray
		20% Shale, medium dark gray
Gowanda-South Wales members		
1,070	1,112	70% Shale, light gray to medium gray
		20% Shale, medium dark gray
		10% Siltstone, light gray to medium light gray
1,112	1,203	75% Shale, light gray to medium gray
		25% Shale, medium dark gray
1,203	1,278	65% Shale, medium light gray to medium gray
		30% Shale, medium dark gray
		5% Siltstone, medium light gray
1,278	1,410	50% Shale, medium dark gray to dark gray
		45% Shale, light gray to medium gray
		5% Siltstone, light gray to medium light gray
1,410	1,450	75% Shale, medium light gray to medium gray
		25% Shale, medium dark gray to dark gray
1,450	1,522	55% Shale, medium light gray to medium gray
		45% Shale, medium dark gray to dark gray
Dunkirk member		
1,522	1,564	100% Shale, medium gray to dark gray

SENECA GROUP

CHEMUNG FORMATION

Hanover member		
1,564	1,633	85% Shale, light gray to medium gray
		15% Shale, medium dark gray to dark gray
1,633	1,671	100% Shale, medium light gray to medium gray
Pipe Creek member		
1,671	1,685	100% Shale, dark gray
Angola member		
1,685	1,735	100% Shale, medium light gray to medium gray
1,735	1,798	75% Shale, light gray to medium gray
		25% Shale, medium dark gray to dark gray
1,798	1,880	95% Shale, medium light gray to medium gray
		5% Shale, medium dark gray
1,880	1,903	55% Shale, medium dark gray to dark gray
		45% Shale, medium light gray to medium gray

Depth From	To	Description
1,903	1,938	40% Siltstone, light gray to medium light gray
		35% Shale, medium dark gray to dark gray
		25% Shale, medium gray
1,938	2,000	55% Shale, medium light gray to medium gray
		45% Shale, medium dark gray to dark gray
2,000	2,048	90% Shale, light gray to medium gray
		10% Shale, medium dark gray
2,048	2,122	70% Shale, medium dark gray to dark gray, calcareous at bottom
		30% Shale, light gray to medium gray
Rhinestreet member		
2,122	2,266	100% Shale, medium gray to grayish black, calcareous, concretions near middle and bottom, w/some pyrite
NAPLES and GENESEE FORMATIONS		
Cashaqua member		
2,266	2,292	50% Shale, medium gray
		50% Shale, medium dark gray
Middlesex member etc.		
2,292	2,313	95% Shale, medium dark gray
		5% Shale, medium gray
MIDDLE DEVONIAN (ERIAN) SERIES		
HAMILTON GROUP		
MOSCOW-LUDLOWVILLE FORMATIONS		
members undifferentiated		
2,313	2,352	70% Shale, medium dark gray, calcareous, w/some pyrite
		30% Shale, medium gray
2,352	2,375	70% Shale, medium gray, calcareous
		30% Shale, medium dark gray
2,375	2,403	100% Limestone, white to medium dark gray; "Tully" of drillers*
2,403	2,442	100% Shale, medium gray, calcareous
2,442	2,508	65% Shale, medium dark gray, calcareous
		35% Shale, medium gray
SKANEATELES FORMATION		
Levanna member		
2,508	2,555	90% Shale, medium dark gray to dark gray, calcareous
		10% Shale, medium gray
MARCELLUS FORMATION		
Stafford member		
2,555	2,567	60% Limestone, white to dark gray
		40% Shale, medium dark gray to dark gray, calcareous

* "Tully" of drillers is not the true Tully but it is one of several limestone members found in the Hamilton Group of Chautauqua County. See comment 7, page 19.

Depth From	To	Description
Oatka Creek member		
2,567	2,622	100% Shale, medium dark gray to grayish black, calcareous

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ONONDAGA FORMATION

Moorehouse member		
2,622	2,703	100% Limestone, very light gray to medium gray, w/light gray to medium gray chert, w/calcite
2,703	2,720	100% Limestone, very light gray to medium dark gray, w/light gray to medium dark gray chert, w/calcite
2,720	2,731	100% Limestone, very light gray to medium gray, w/light gray to medium gray chert, w/calcite
Nedrow member		
2,731	2,796	100% Limestone, light gray to medium dark gray, w/medium gray to medium dark gray chert, w/calcite
Edgecliff member		
2,796	2,816	100% Limestone, very light gray to light gray, w/very light gray chert, w/calcite
2,816	2,822	50% Siltstone, very light gray to medium light gray, w/glauconite; Springvale sand horizon probably representing reworked Oriskany 50% Limestone, very light gray to light gray, w/very light gray chert, w/calcite

LOWER DEVONIAN (ULSTERIAN) SERIES

ORISKANY FORMATION

2,822	2,827	100% Sandstone, white to medium light gray, coarse grained, w/glauconite

SILURIAN SYSTEM
UPPER SILURIAN (CAYUGAN) SERIES

AKRON (?) FORMATION

2,827		100% Limestone, light gray to medium gray, dolomitic; good show oil at 2,830-41 feet

Total Depth: 3,000 feet

SAMPLE STUDY AND CORRELATION OF THE KYLE MORSE NO. 1 WELL

SUMMARY OF SAMPLE ANALYSIS

DEVONIAN SYSTEM
UPPER DEVONIAN (CHAUTAUQUAN) SERIES

Depth *From*	*To*	*Description*
rock units undifferentiated		
0	450	No samples
450	515	80% Siltstone, light gray to medium gray
		20% Shale, medium gray
515	548	100% Siltstone, light gray to medium gray
548	645	70% Siltstone, light gray to medium gray
		30% Shale, medium gray

ARKWRIGHT GROUP

CANADAWAY FORMATION

Northeast member

645	801	70% Shale, light gray to medium gray
		30% Siltstone, light gray to medium light gray
801	971	75% Siltstone, light gray to medium light gray
		20% Shale, medium light gray to medium gray
		5% Shale, medium dark gray
971	1,094	80% Shale, medium light gray to medium gray
		10% Siltstone, light gray to medium light gray
		10% Shale, medium dark gray
1,094	1,107	45% Siltstone, light gray to medium light gray
		35% Shale, medium gray
		20% Shale, medium dark gray

Shumla member

1,107	1,139	60% Siltstone, light gray to medium light gray
		25% Shale, medium dark gray
		15% Shale, medium gray

Westfield member

1,139	1,221	55% Shale, medium light gray to medium gray
		30% Shale, medium dark gray
		15% Siltstone, light gray
1,221	1,308	90% Shale, medium light gray to medium gray
		10% Shale, medium dark gray
1,308	1,423	75% Shale, medium light gray to medium gray
		15% Shale, medium dark gray
		10% Siltstone, light gray to medium light gray

Depth From	To	Description
Laona member		
1,423	1,466	50% Siltstone, light gray
		30% Shale, medium light gray to medium gray
		20% Shale, medium dark gray
Gowanda-South Wales members		
1,466	1,730	70% Shale, medium light gray to medium gray
		15% Shale, medium dark gray to dark gray
		15% Siltstone, light gray to medium light gray
1,730	1,790	70% Shale, medium gray
		30% Shale, medium dark gray
1,790	1,816	50% Shale, medium dark gray to dark gray
		50% Shale, light gray to medium gray
Dunkirk member		
1,816	1,866	100% Shale, medium dark gray to grayish black
		SENECA GROUP
CHEMUNG FORMATION		
Hanover member		
1,866	1,971	75% Shale, light gray to medium gray, sl/calcareous
		25% Shale, medium dark gray to dark gray
Pipe Creek member		
1,971	1,983	100% Shale, dark gray to grayish black
Angola member		
1,983	2,057	95% Shale, medium light gray to medium gray
		5% Shale, medium dark gray
2,057	2,097	70% Shale, medium light gray to medium gray
		20% Shale, medium dark gray
		10% Siltstone, light gray to medium light gray
2,097	2,217	75% Shale, medium light gray to medium gray
		25% Shale, medium dark gray to dark gray
2,217	2,251	80% Shale, medium light gray to medium gray
		10% Shale, medium dark gray
		10% Siltstone, light gray to medium light gray
2,251	2,320	85% Shale, medium light gray to medium gray
		15% Shale, medium dark gray to dark gray
2,320	2,355	65% Shale, light gray to medium gray
		35% Shale, medium dark gray to dark gray
		5% Siltstone, medium light gray
2,355	2,431	70% Shale, medium light gray to medium gray
		30% Shale, medium dark gray to dark gray
Rhinestreet member		
2,431	2,550	100% Shale, medium gray to grayish black, calcareous
NAPLES and GENESEE FORMATIONS		
Cashaqua member		
2,550	2,575	50% Shale, medium gray
		50% Shale, medium dark gray

Depth From	To	Description
Middlesex member etc.		
2,575	2,600	85% Shale, medium dark gray, w/some pyrite
		15% Shale, medium gray

MIDDLE DEVONIAN (ERIAN) SERIES
HAMILTON GROUP

MOSCOW-LUDLOWVILLE FORMATIONS

members undifferentiated		
2,600	2,626	60% Shale, medium dark gray to dark gray, calcareous
		30% Shale, medium light gray to medium gray
		10% Limestone, very light gray to light gray, w/some pyrite
2,626	2,659	100% Limestone, white to dark gray; top of "Tully" of drillers*
2,659	2,701	75% Shale, medium dark gray to dark gray, calcareous
		15% Shale, medium gray
		10% Limestone, very light gray to dark gray
2,701	2,720	85% Limestone, white to dark gray; base of "Tully" of drillers
		10% Shale, medium dark gray to dark gray, calcareous
		5% Shale, medium gray
2,720	2,767	90% Shale, medium gray, calcareous
		10% Shale, medium dark gray
2,767	2,814	65% Shale, medium dark gray, calcareous
		35% Shale, medium gray

SKANEATELES FORMATION

Levanna member		
2,814	2,835	100% Shale, medium dark gray to dark gray, calcareous

MARCELLUS FORMATION

Stafford member		
2,835	2,841	50% Limestone, white to dark gray
		50% Shale, medium dark gray to dark gray, calcareous
Oatka Creek member		
2,841	2,904	100% Shale, medium gray to grayish black, calcareous

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ONONDAGA FORMATION

Moorehouse member		
2,904	2,969	100% Limestone, very light gray to medium gray, w/light gray to medium gray chert, w/calcite
2,969	2,985	100% Limestone, very light gray to medium dark gray, w/light gray to medium dark gray chert, w/calcite

* "Tully" of drillers is not the true Tully but it is one of several limestone members found in the Hamilton Group of Chautauqua County. See comment 7, page 19.

Depth *From*	*To*	*Description*
2,985	2,992	100% Limestone, very light gray to medium gray, w/light gray to medium gray chert, w/calcite
Nedrow member		
2,992	3,070	100% Limestone, light gray to medium dark gray, w/medium gray to medium dark gray chert, w/calcite
Edgecliff member		
3,070	3,100	100% Limestone, very light gray to light gray, w/very light gray chert, w/calcite
3,100	3,135	80% Siltstone, very light gray to medium light gray, w/glauconite; Springvale sand horizon probably representing reworked Oriskany 20% Limestone, very light gray to dark gray, w/very light gray to medium gray chert, w/calcite, w/some gypsum

SILURIAN SYSTEM
UPPER SILURIAN (CAYUGAN) SERIES

AKRON (?) FORMATION

3,135		100% Limestone, light gray to medium gray, dolomitic, w/gypsum

Total Depth: 7,100 feet

TENTATIVE STRATIGRAPHIC LOG OF YONKERS NO. 1 WELL

DEVONIAN SYSTEM

Series	*Group*	*Formation*	*Member*	*Depth From*	*To*	*Thickness*
Chautauquan	Arkwright	Canadaway	Gowanda	(?)	235	
			South Wales	235	320	85
			Dunkirk	320	360	40
	Seneca	Chemung	Hanover	360	465	105
			Pipe Creek	465	470	5
			Angola	470	760	290
			Rhinestreet	760	885	125
		Naples and Genesee	Cashaqua	885	915	30
			Middlesex etc.	915	925	10
Erian	Hamilton	Moscow-Ludlowville	——	925	1,070	145
		Skaneateles	Levanna	1,070	1,120	50
		Marcellus	Stafford	1,120	1,135	15
			Oatka Creek	1,135	1,195	60
	——	Onondaga	Moorehouse	1,195	1,335	140
			Nedrow	1,335	1,390	55
			Edgecliff	1,390	1,425	35

SILURIAN SYSTEM

Cayugan	——	Akron (?)	——	1,425	(?)	

TENTATIVE STRATIGRAPHIC LOG OF BATES NO. 1 WELL

DEVONIAN SYSTEM

Series	*Group*	*Formation*	*Member*	*Depth From*	*Depth To*	*Thickness*
Chautauquan	Arkwright	Canadaway	Northeast	(?)	770	
			Shumla	770	797	27
			Westfield	797	1,045	248
			Laona	1,045	1,070	25
			Gowanda-South Wales	1,070	1,522	452
			Dunkirk	1,522	1,564	42
	Seneca	Chemung	Hanover	1,564	1,671	107
			Pipe Creek	1,671	1,685	14
			Angola	1,685	2,122	437
			Rhinestreet	2,122	2,266	144
		Naples and Genesee	Cashaqua	2,266	2,292	26
			Middlesex etc.	2,292	2,313	21
Erian	Hamilton	Moscow-Ludlowville	——	2,313	2,508	195
		Skaneateles	Levanna	2,508	2,555	37
		Marcellus	Stafford	2,555	2,567	12
			Oatka Creek	2,567	2,622	55
	——	Onondaga	Moorehouse	2,622	2,731	109
			Nedrow	2,731	2,796	65
			Edgecliff	2,796	2,822	26
Ulsterian	——	Oriskany	——	2,822	2,827	5

SILURIAN SYSTEM

Cayugan	——	Akron (?)	——	2,827	(?)	

TENTATIVE STRATIGRAPHIC LOG OF MORSE NO. 1 WELL

DEVONIAN SYSTEM

Series	*Group*	*Formation*	*Member*	*Depth From*	*Depth To*	*Thickness*
Chautauquan	Arkwright	Canadaway	Northeast	(?)	1,107	
			Shumla	1,107	1,139	32
			Westfield	1,139	1,423	284
			Laona	1,423	1,466	43
			Gowanda-South Wales	1,466	1,816	350
			Dunkirk	1,816	1,866	50
	Seneca	Chemung	Hanover	1,866	1,971	105
			Pipe Creek	1,971	1,983	12
			Angola	1,983	2,431	448
			Rhinestreet	2,431	2,550	119
		Naples and Genesee	Cashaqua	2,550	2,575	25
			Middlesex etc.	2,575	2,600	25
Erian	Hamilton	Moscow-Ludlowville	——	2,600	2,814	214
		Skaneateles	Levanna	2,814	2,835	21
		Marcellus	Stafford	2,835	2,841	6
			Oatka Creek	2,841	2,904	63
	——	Onondaga	Moorehouse	2,904	2,992	88
			Nedrow	2,992	3,070	78
			Edgecliff	3,070	3,135	65

SILURIAN SYSTEM

Cayugan	——	Akron (?)	——	3,135	(?)	

COMMENTS

1. The upper contact of the Northeast member of the Canadaway formation was not determined in the Bates and Morse wells because of incomplete well cuttings and lack of faunal evidence.

2. The black shale band which marks the base of the Gowanda member of the Canadaway formation in surface exposures and in the Yonkers well is not recognized in the other two wells. Hence, the Gowanda and South Wales members of the Canadaway formation are not separated in the Bates and Morse wells.

3. Considerable variation in the thickness of the combined Gowanda-South Wales members between the Bates and Morse wells may indicate a disconformity at the base of the overlying Laona siltstone member of the Canadaway formation.

4. The rather rapid increase in thickness of the Angola member of the Chemung formation from the Yonkers well to the Bates well is accompanied by an increase in siltstone content. The presence of this siltstone may indicate a rather rapid local accumulation of sediments at the site of the Bates well during a portion of Angola time.

5. The boundary between the Chemung and Naples formations is redrawn at the Rhinestreet-Cashaqua contact as the latter is distinct across western New York. (Pepper, de Witt & Colton, 1956)

6. The rock unit designated Middlesex etc. probably includes two or more thin subdivisions but these cannot be differentiated in the well cuttings. They may include the West River, Genundewa and/or Geneseo, hence the combined term Naples and Genesee formations.

7. Variations in lithology do not permit easy subdivision of the Moscow and Ludlowville formations which are not separated in this report. Pyrite or marcasite occurs at the top of the Moscow which may be represented by gray shale or by interbedded shale and limestone as in the Yonkers well. This is at or near the horizon of the Tully pyrite of western New York, renamed the Leicester marcasite by Sutton (1951). The limestone beds which occur at greater depth within the Moscow-Ludlowville formations are relatively free of pyrite or marcasite. These beds occur in the Bates and Morse wells and are called "Tully" limestone by drillers. This seems improper for the limestone lies within shales, possibly near the contact between the Moscow and Ludlowville. Thus the

"Tully" limestone is not Tully in age but may actually be the Tichenor limestone or represent some unit not exposed at the surface.

8. The members of the Onondaga limestone are determined largely on the basis of the color of the limestone and accompanying chert. The Nedrow member contains relatively dark limestone and chert whereas the Moorehouse and Edgecliff members are composed of relatively light-colored limestone and chert. These members may be interbedded locally. The youngest Seneca member of the Onondaga, characterized by a thin layer of bentonite, is not recognized in any of the well cuttings.
9. The basal portion of the Edgecliff member of the Onondaga limestone usually contains an abundance of siltstone with glauconite, called the Springvale sand horizon. This is believed to represent reworked Oriskany sandstone.
10. The true Oriskany sandstone is noted only in the Bates well where it consists of about five feet of coarse grains of transparent to translucent sand containing considerable amounts of glauconite.

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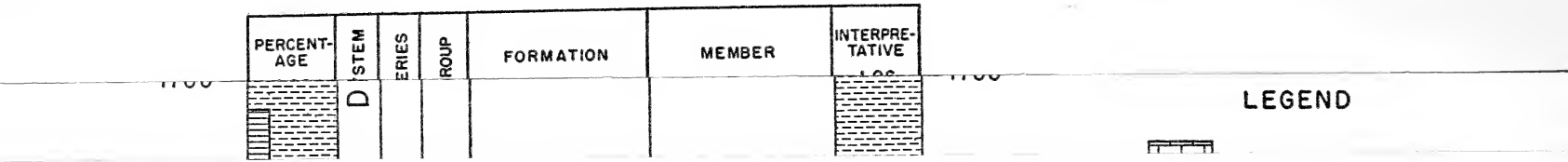
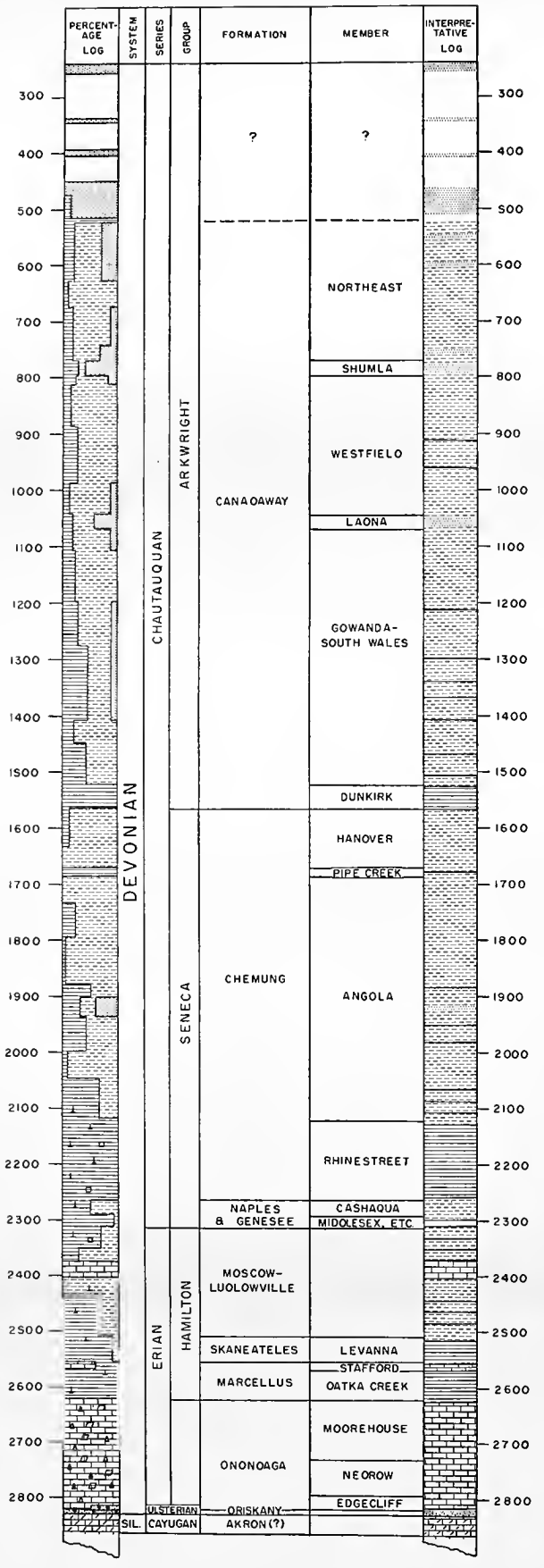

PERCENT-AGE
STEM
ERIES
ROUP
FORMATION
MEMBER
INTERPRE-TATIVE
LEGEND

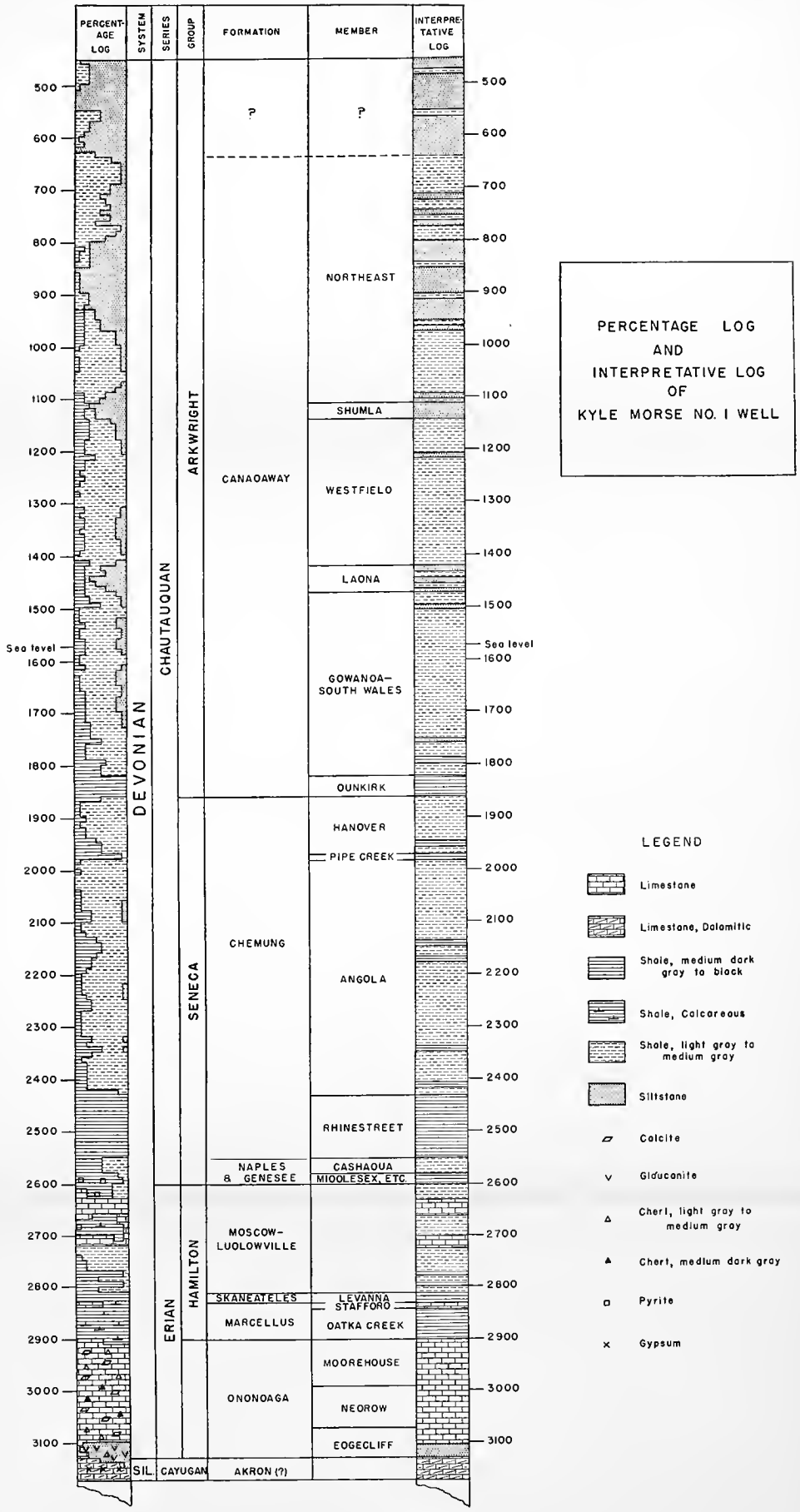


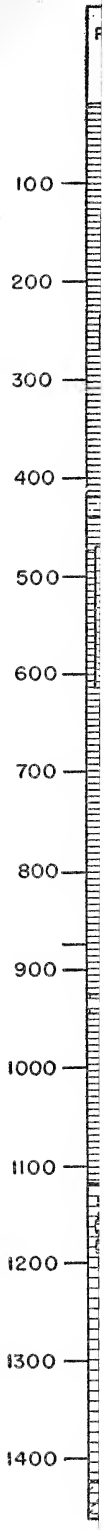
PERCENTAGE LOG
AND
INTERPRETATIVE LOG
OF
ROBERT BATES
NUMBER 1 WELL

LEGEND

- Limestone
- Limestone, Dolomitic
- Shale, medium dark gray to black
- Shale, Calcareous
- Shale, light gray to medium gray
- Siltstone
- Sandstone
- Calcite
- Glauconite
- Chert, light gray to medium gray
- Chert, medium dark gray
- Pyrite

PERCENT-AGE	STEM	RIES	ROUP	FORMATION	MEMBER	INTERPRE-TATIVE


PERCENTAGE LOG
AND
INTERPRETATIVE LOG
OF
KYLE MORSE NO. I WELL
PERCENT-AGE LOG
SYSTEM
SERIES
GROUP
FORMATION
MEMBER
INTERPRE-TATIVE LOG
DEVONIAN
CHAUTAUQUAN
ERIAN
SIL.
ARKWRIGHT
SENECA
HAMILTON
CAYUGAN
?
?
CANADAWAY
NORTHEAST
SHUMLA
WESTFIELD
LAONA
GOWANDA–SOUTH WALES
DUNKIRK
HANOVER
PIPE CREEK
ANGOLA
RHINESTREET
CHEMUNG
NAPLES & GENESEE
CASHAQUA MIDDLESEX, ETC.
MOSCOW-LUDLOWVILLE
SKANEATELES
LEVANNA
STAFFORD
MARCELLUS
OATKA CREEK
MOOREHOUSE
ONONDAGA
NEOROW
EDGECLIFF
AKRON (?)
Sea level
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
LEGEND
Limestone
Limestone, Dolomitic
Shale, medium dark gray to black
Shale, Calcareous
Shale, light gray to medium gray
Siltstone
Calcite
Glauconite
Cherl, light gray to medium gray
Chert, medium dark gray
Pyrite
Gypsum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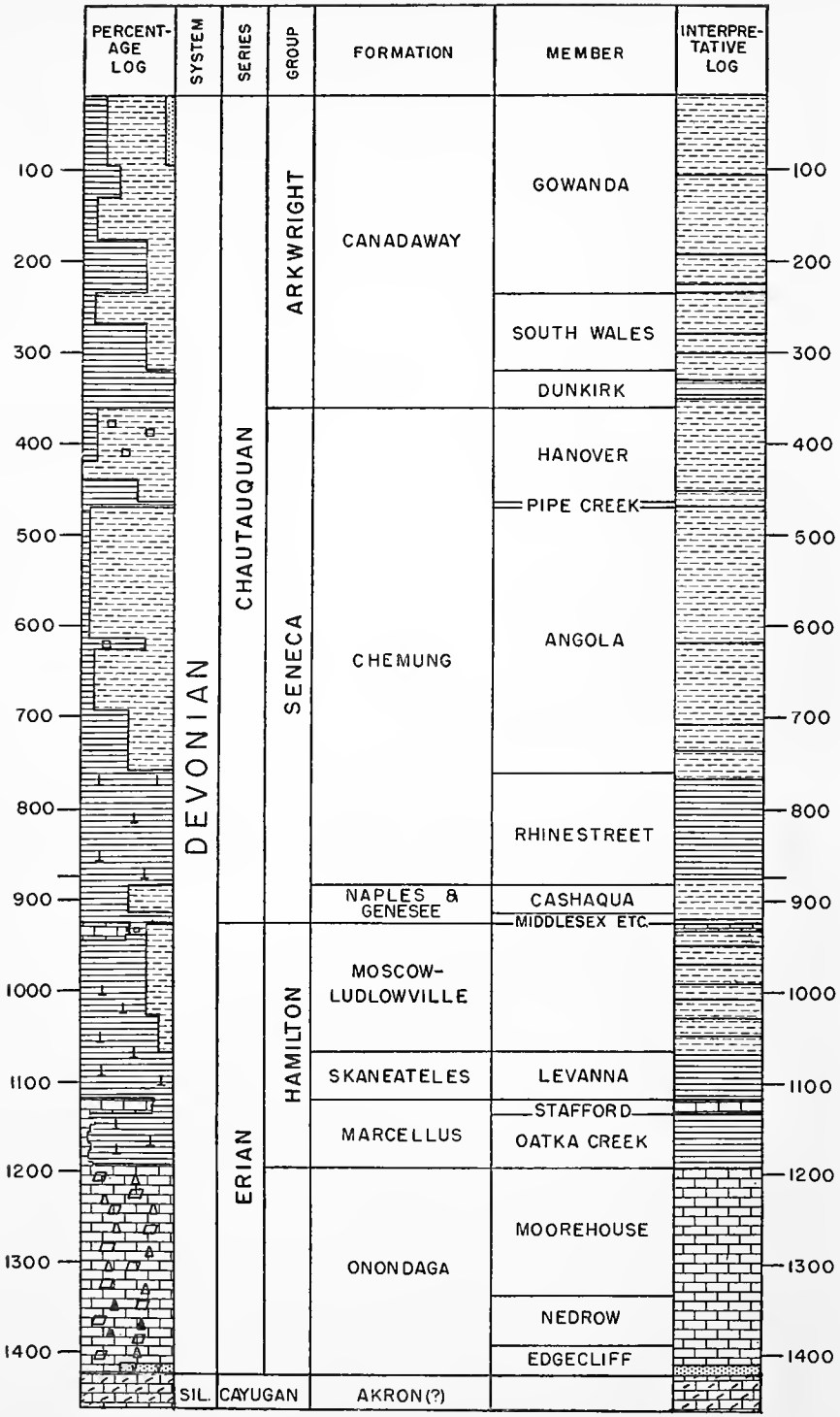
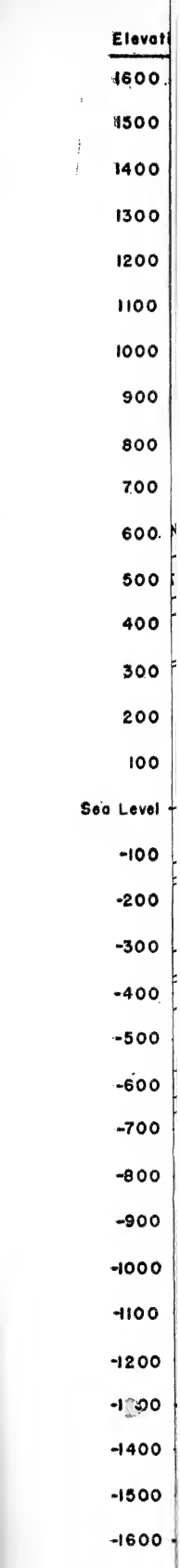
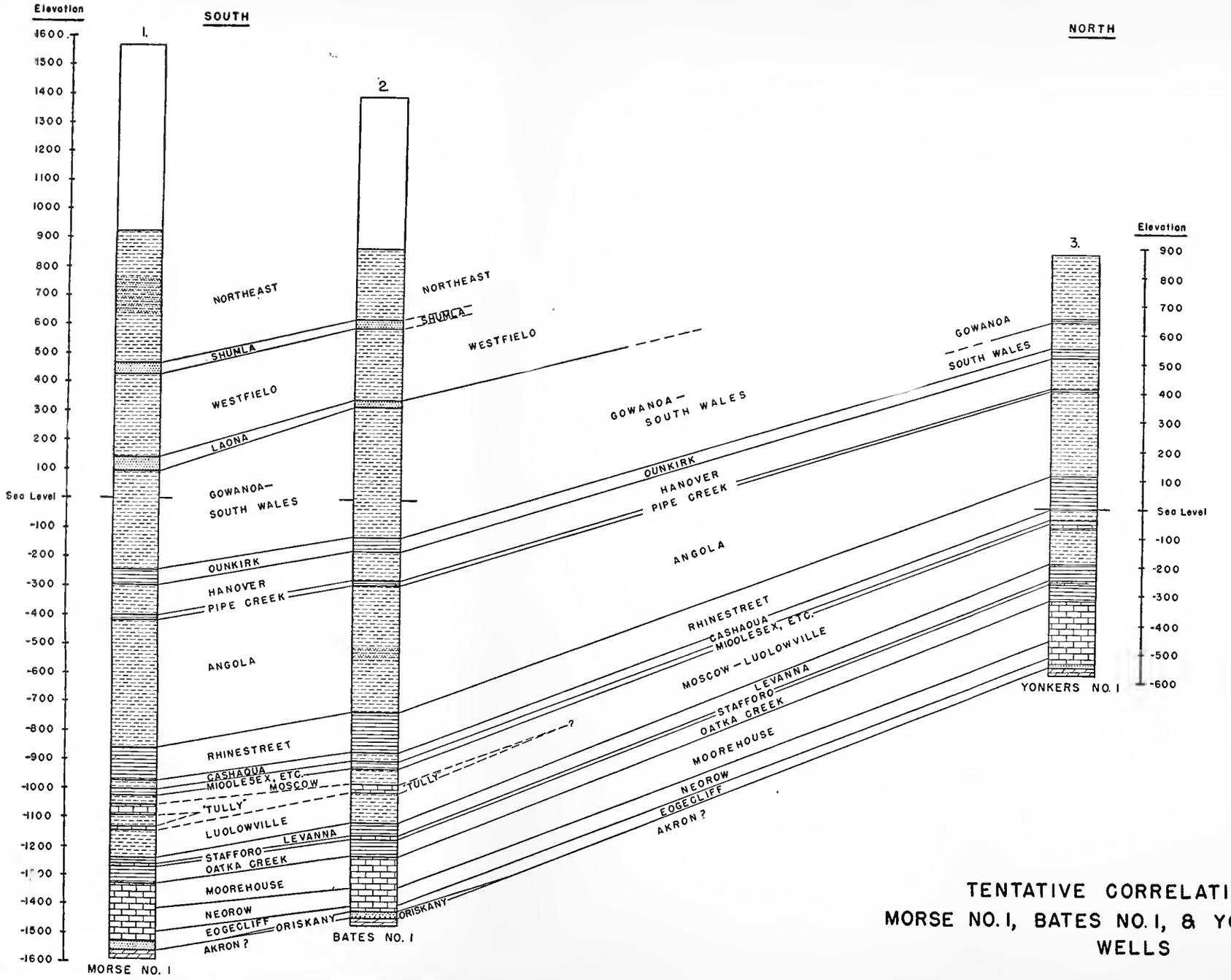


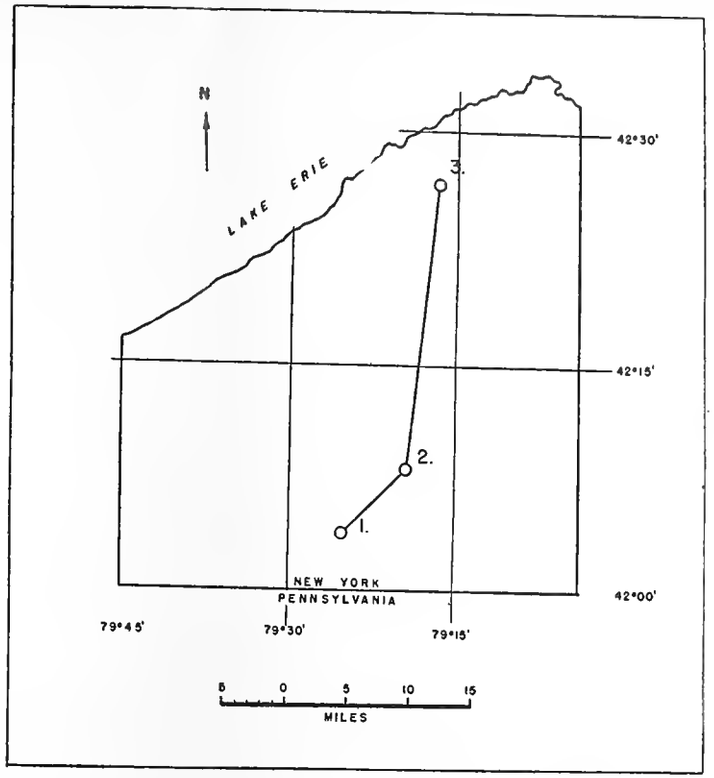
PERCENTAGE LOG
AND
INTERPRETATIVE LOG
OF
HOWARD YONKERS
NUMBER I WELL

LEGEND

- Limestone
- Limestone, Dolomitic
- Shale, medium dark gray to black
- Shale, Calcareous
- Shale, light gray to medium gray
- Siltstone
- Calcite
- Glaucanite
- Chert, light gray to medium gray
- Chert, medium dark gray
- Pyrite


Elevati
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
Sea Level
-100
-200
-300
-400
-500
-600
-700
-800
-900
-1000
-1100
-1200
-1300
-1400
-1500
-1600





TENTATIVE CORRELATION OF MORSE NO. 1, BATES NO. 1, & YONKERS NO. 1 WELLS

- LIMESTONE, DOLOMITIC
- LIMESTONE
- GRAY SHALE
- BLACK SHALE
- SILTSTONE
- SANDSTONE