

STATE OF OHIO
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL SURVEY

REPORT OF INVESTIGATIONS NO. 33

GEOLOGIC CROSS SECTION
of the
PALEOZOIC ROCKS
from
NORTHWESTERN
TO SOUTHEASTERN OHIO

By
George G. Shearrow

COLUMBUS
1957

Reprinted without revision 1968

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CONTENTS

	Page
ABSTRACT.	1
INTRODUCTION	1
STRATIGRAPHY	3
Cambrian.	3
Lower and Middle Cambrian.	3
Upper Cambrian	3
Ordovician	4
Lower Ordovician	4
Middle Ordovician	4
Upper Ordovician.	5
Silurian	5
Lower Silurian	5
Middle Silurian	5
Upper Silurian.	6
Devonian	7
Michigan Basin.	8
Middle Devonian	8
Upper Devonian.	8
Central Ohio	8
Middle Devonian	8
Upper Devonian	9
Appalachian Basin	9
Lower Devonian	9
Middle Devonian	10
Upper Devonian	10
Mississippian	10
Pennsylvanian	10
LITERATURE CITED.	11
SAMPLE DESCRIPTION OF STRATA	12

ILLUSTRATIONS

FIGURES

1. Locations of cross sections	2
2. Diagram showing relationship of Clinton group and Albion series (Medina) in southeastern Ohio	6

PLATES

1. Cross section of Paleozoic rocks from northwestern to southeastern Ohio	insert
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ABSTRACT

Twelve wells used in the accompanying cross section are located in ten counties extending from Fulton County in the northwest to Washington County in the southeast. They range in depth from 1,294 feet to 6,860 feet and include a stratigraphic sequence from Pennsylvanian to Pre-Cambrian.

On the northwestern end of the cross section, wells penetrate the edge of Michigan Basin and range from Bedford to Lockport. East of the crest of the Findlay arch in Wyandot County the samples test the formations from Bass Islands to Pre-Cambrian. In the Appalachian Basin on the southeastern end, the Monongahela to the Albion (Medina) series is represented. The thickness of the Paleozoic rocks ranges from 2,800 feet in Wyandot County to an estimated 13,000 feet in Washington County.

Correlation from the southeastern edge of the Michigan Basin over the Findlay arch into the Appalachian Basin is presented to aid the subsurface stratigrapher in understanding the discrepancies in terminology that exist at political boundaries. These correlations are based on data acquired from the critical study of insoluble residues.



INTRODUCTION

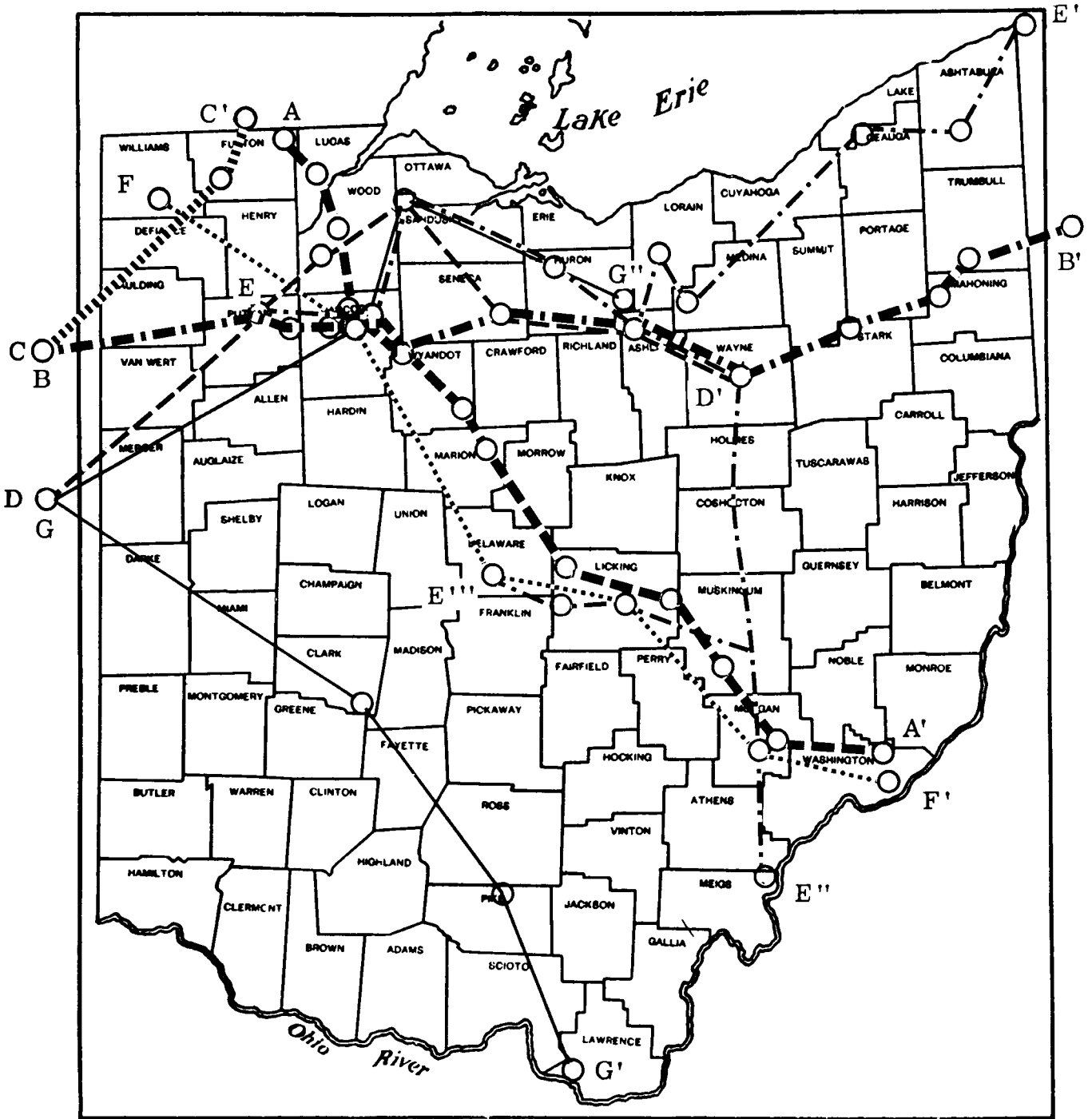
A study of the subsurface stratigraphy with the aid of insoluble residues was begun in Ohio in October 1951, as a supplement to the activities of the oil and gas section. It was undertaken because of a general interest among oil and gas people in clarifying conflicts in interpretation of terminology, lithology, thickness, and extent of the Paleozoic sequence in Ohio.

The method of preparation of the residue samples was essentially identical to the one described by Grohskopf and McCracken (1949) of the Missouri Geological Survey. A measured volume of each sample was treated in hydrochloric acid. Upon complete removal of the calcium and magnesium carbonates the samples were washed, dried and remeasured. The examination of the residue was with the aid of a binocular microscope in the same manner as the unprepared samples. The lithologies of both the carbonates and the insolubles, along with the percentage of insolubles, were plotted on strip logs.

Previous cross sections (fig. 1) B-B' by Pepper (1953), C-C' and D-D' by Cohee (1948 and 1954), E-E'-E''-E''' by Fettke (1948), F-F' by Lafferty (1941), and G-G'-G'' by Wasson (1932) have traversed much of the State. The cross section (A-A') of this paper is roughly parallel to Lafferty's (F-F').

This cross section represents only one of several being studied by the Ohio Geological Survey's oil and gas section. Since this is the first to be completed, it is felt that this section,

FIGURE 1. - LOCATIONS OF CROSS SECTIONS



- A - A' - Shearrow (1957)
- - - - - B - B' - Pepper (1953)
- C - C' - Cohee (1948)
- - - - - D - D' - Cohee (1954)
- - - - - E - E' - E'' - E''' - Fettke (1948)
- F - F' - Lafferty (1941)
- G - G' - G'' - Wasson (1932)

along with a brief discussion of the various formations, should be made available to the general public and specifically the subsurface stratigrapher. The study of future cross sections will afford a regional basis for discussion of the rock units.

Lithologic descriptions of the sample material for each well used in the section are included.

The writer is indebted to members of the oil and gas industry who have contributed well cuttings and to R. J. Bernhagen, Chief, Division of Geological Survey; R. E. Lamborn, Geologist, Division of Geological Survey (retired); Dr. J. E. Carman, Professor Emeritus, Ohio State University; Dr. J. F. Pepper, Regional Supervisor, Fuels Branch, Eastern Division, U. S. Geological Survey, all of whom contributed helpful suggestions and criticisms during the study.

STRATIGRAPHY

This cross section extends from the southeastern edge of the Michigan Basin, over the Findlay arch, into the Appalachian Basin. The Paleozoic rocks encountered in the wells, which range in depth from 1,294 feet to 6,860 feet, are Late Cambrian to Pennsylvanian in age. In Wyandot County 2,800 feet of sedimentary rock overlies the basement complex. The Wood County deep well, on the Burning Springs anticline in West Virginia near the axis of the Huntington-Pittsburgh Basin just south of Washington County, Ohio, was reported by Haught et al. (1956) as having penetrated 13,272 feet of sediments. For this reason it is unlikely that sediments in Washington County would be of a greater thickness.

CAMBRIAN

Lower and Middle Cambrian. - The Lower and Middle Cambrian, although not penetrated by any of the wells in this cross section, is present in the cuttings in the T. D. Friend well located in Clark County, southwestern Ohio. Wasson (1932) tentatively identified Pre-Cambrian and Lower and Middle Cambrian in the Friend well. Since only one well penetrated this section in Ohio, the writer feels a description of these sediments can not be properly discussed at this time. The oldest sedimentary rocks penetrated in north central Ohio are Late Cambrian in age.

Upper Cambrian. - The Upper Cambrian formations in ascending order are the Mount Simon sandstone, Eau Claire dolomitic sandstone, Dresbach and Franconia sandstones, and Trempealeau dolomite. The descriptions are essentially the same as Cohee's (1954) descriptions of the Upper Cambrian in Michigan. Minor changes will be noted concerning the Dresbach and Franconia sandstones.

The Mount Simon sandstone is identified in only one well, the O. G. S. No. 99, Heck well, in which it consists of poorly sorted, fine to coarse, subangular to rounded quartz grains. In the Heck well, thin stringers of dolomite were observed near the top. The lower part contains pink and reddish-brown arkosic material.

The Eau Claire dolomitic sandstone, 437 feet thick in the Heck well, consists of very fine to fine subangular quartz grains with thin partings of dolomite. In the O. G. S. No. 53, Cross well, the top was found to contain small amounts of shale. The dolomite is buff to brown with tints of gray, and contains a small amount of glauconite.

The Dresbach and Franconia sandstones are believed to be present in both the Heck and Cross wells, but the writer has not been able to separate them. Cohee (1954) mentions glauconite

as being present in the Franconia sandstone in Michigan, but the writer found none in the two Ohio wells. The sands similar to those in Michigan consist of fine to medium, angular to rounded, frosted quartz grains. Where the Franconia sandstone is present in southern Michigan it is 15 to 20 feet thick, and the Dresbach is about 100 feet thick. In the Heck well, which lies on the eastern flank of the Findlay arch, the interval is 119 feet, about the same as in southern Michigan. However, in the Cross well, which is located near the crest of the arch, the thickness is 70 feet.

The Trempealeau dolomite, the youngest formation of the Upper Cambrian, is a buff and in part white to gray finely crystalline dolomite. The residues range from 10 to 25 per cent and consist of very fine to fine, subangular to rounded quartz grains with minor amounts of glauconite and shale. The thickness of the Trempealeau can not be determined from the Heck and Cross wells, since the upper part, as well as all of the Lower Ordovician, is missing.

ORDOVICIAN

Lower Ordovician. - The Lower Ordovician Prairie Du Chien group, well developed in the Upper Mississippi Valley, is not present in the wells in north central Ohio. The writer has identified Lower Ordovician sediments in wells located in the southwestern part of the State and believes that these sediments are also present to the southeast, but the wells examined in this study are too shallow to penetrate the section. In the Wood County deep well in West Virginia several hundred feet of Lower Ordovician sediments were found.

Middle Ordovician. - The formations in ascending order are St. Peter sandstone, Glenwood shale, Black River limestone, and Trenton limestone.

Although the St Peter sandstone has been reported in north central Ohio, the writer has found no evidence in well cuttings to verify its presence. Sandy dolomites of the Trempealeau, at the base of the Glenwood, are commonly mistaken by the drillers for St. Peter. The grayish-green dolomitic shale of the Glenwood ranges in thickness from 12 to 35 feet. The insoluble residues range from 20 to 65 per cent, and consist of very fine subangular sand, shale and minor amounts of glauconite. The carbonates, either limestone or dolomite, are brown to green and very finely crystalline.

In north central Ohio the St. Peter, the Lower Ordovician, and the upper part of the Trempealeau are represented by an unconformity. This relationship is shown in the Cross and Heck wells where the Glenwood rests directly on the Trempealeau.

The Black River limestone is a buff to brown lithographic limestone averaging 475 feet in thickness. Thin bentonitic shale zones are commonly present near the top. The residues, seldom totaling over 15 per cent, consist of very finely-porous brown shale, chert, and minor amounts of sand. Cohee (1954) includes green and gray shale, sandy shale, and a dolomite unit (Glenwood) in the Black River. The writer is of the opinion that the Glenwood is a separate lithologic unit and should be separated from the Black River.

The Trenton has a variety of lithologies, but studies reveal that it is generally a highly fossiliferous, buff to brown limestone. In the oil-and gas-producing area of northwestern Ohio, the upper part of the producing zone is a coarsely crystalline, vuggy dolomite. Passing to the south and east into the Appalachian Basin, thin calcareous shale partings are noted. These partings may represent the Cynthiana, but additional studies will be needed to verify this correlation. In the producing area where this shaly phase is absent the Trenton is disconformably overlain by the Upper Ordovician (Cincinnatian) series (Shearrow, 1955).

The insoluble residues of the Trenton are similar to those of the Black River in that they both contain sand, shale, and chert. The main difference is the greater percentage of residues and silicified fossil fragments in the Trenton.

Upper Ordovician. - The Cincinnati series on the surface is a calcareous shale sequence. In the subsurface this sequence becomes less calcareous to the southeast. Dolomite rather than limestone at and near the top of the Cincinnati was found in O. G. S. No. 400, Butz well; O. G. S. No. 53, Cross well; and O. G. S. No. 99, Heck well. Directly over the high point on the Findlay arch in the Cross well there is 535 feet of Cincinnati. Toward the Michigan Basin 688 feet was found in the Butz well, and southeast in the O. G. S. No. 627, Baker well, 1,091 feet was found.

On the basis of lithology and insoluble residues the Cincinnati cannot be broken up easily into subdivisions. However, certain color and lithologic distinctions can be made. The Utica and Eden groups generally are brown to black slightly calcareous shales. On the outcrops in Ohio the Maysville and Richmond groups are gray to green, highly calcareous shales with thin partings of fossil debris. Toward the Appalachian Basin the Maysville thins slightly, but continues as a true marine bed. The Richmond thickens rapidly and grades into a red non-marine shale. This red shale is an excellent marker in determining the top of the Ordovician in well cuttings.

SILURIAN

Disconformably overlying the Cincinnati are Lower Silurian rocks. Although the Silurian is well-represented in the cross section, many facies and nomenclature problems exist which must await additional study before they are solved.

Lower Silurian. - The old term Medina has been used in many different ways, but in this paper it is restricted to the beds from the top of the Richmond to the top of the Brassfield. A less confusing term, Albion series, is now applied to this same sequence. It is hoped that the term Medina will be dropped from Ohio literature and Albion substituted; however, on this cross section both terms are shown because of wide use of the older terminology by drillers and oil companies.

In wells examined in north central Ohio, the Albion (Medina) is represented by only one formation, the Brassfield limestone. In the outcrop area of southwestern Ohio it is 40 to 50 feet thick but thins eastward. Additional shale and sandstone units come into the section below as shown in figure 2. The terms "Clinton" and "Medina" sands are used by the drillers to designate the sands of the Albion.

The sands, deposited in lenses, are fine to very fine, subangular grained, commonly cemented with silica, and interbedded with gray and green shales. In West Virginia the sands are identified as the Tuscarora sandstone. The Brassfield is white to buff, coarsely crystalline limestone and dolomite, with occasional tints of red and green. It is generally fossiliferous and contains minor amounts of chert and large pellets of glauconite.

The maximum thickness of the Albion penetrated in the wells of this cross section was 180 feet, in the O. G. S. No. 210, Murrey well. This is not a total as the well stopped short of the Cincinnati.

Middle Silurian. - The Niagaran series, overlying the Albion, can be divided into two groups: the Clinton and Lockport-Guelph. The Clinton group consists of a series of individual beds of siltstone, shale, limestone, and dolomite. Because of the lack of data the true relationship of the various beds is not understood and, as a result, no subdivisions have been made. In southeastern Ohio, however, well cuttings seem to indicate that the three-phase division of Rose Hill, Keefer, and Rochester, as used in the West Virginia section (Reeves and Price, 1950), is applicable. The Dayton limestone, which overlies the Brassfield in the outcrop area, is separated from the Brassfield by 67 feet of variegated shale in O. G. S. No. 633, Scott well. This shale wedge is believed to be part of the Rose Hill formation.

CROSS SECTION OF PALEOZOIC ROCKS

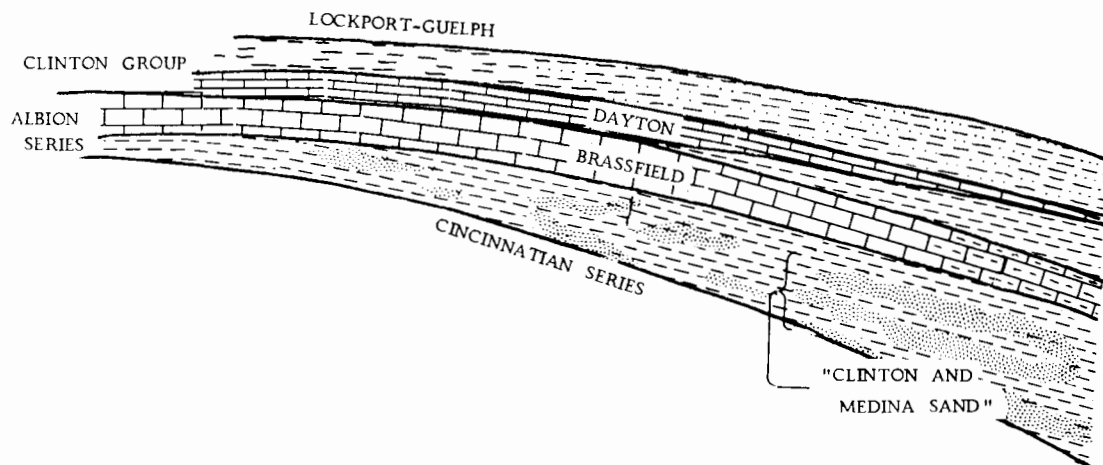


FIGURE 2. - DIAGRAM SHOWING RELATIONSHIP OF CLINTON GROUP AND ALBION SERIES (MEDINA) IN SOUTHEASTERN OHIO

The limestones and dolomites of the Clinton group can generally be distinguished from the Brassfield by the absence of glauconite, red and green chert, and in most instances a lower percentage of insoluble residues. The Clinton group thickens from 50 to 374 feet toward the southeast. The increase in thickness is due to thickening of some of the units as well as other units coming into the section. Minor amounts of sand were noted in O. G. S. No. 633, Scott well, in the residues made from the carbonates. The writer believes this to be an equivalent to the Keefer.

The Lockport-Guelph is discussed as a single unit in this report because it is impossible to make a separation. The unit, easily recognized from one end of the cross section to the other, generally has very small residues. Residues of the Lockport-Guelph are black and brown shale, fine sand, and crystals of gypsum. The unprepared samples are white to gray and buff crystalline dolomite, except in the wells in Morgan and Washington counties where the lower part is a gray-brown, dense to finely crystalline limestone. The upper dolomite, as well as the limestone facies, is correlative with the McKenzie of West Virginia. The thickness ranges from 150 to 275 feet.

Upper Silurian. - The Cuyagan series is represented by carbonates, shales, and evaporites which lie disconformably on the Niagaran. The formations present in northwestern Ohio, in ascending order, are Greenfield, Tymochtee, Put-in-Bay, and Raisin River. To the southeast only the Tymochtee can be identified. It is probable that a Greenfield equivalent is present but further studies of additional well cuttings are needed to evaluate the down-dip relationship of the Greenfield. Well cuttings from eastern Ohio indicate that the Raisin River and Put-in-Bay were not deposited in the Appalachian Basin.

The Greenfield is a buff, brown, and dark gray, finely crystalline dolomite. Residues vary in constituents and percentages from the northwest to the southeast. Gray and brown finely porous shales are noted in both areas but the absence of anhydrite in the northwestern part of the section along with smaller percentages of insoluble residues amounting to 10 to 20 per cent, distinguish the Greenfield from the overlying Tymochtee in that area. To the southeast, larger percentages of insolubles were noted and the residues are very similar to those of the Tymochtee.

The Tymochtee, somewhat darker than the Greenfield, is a brown to dark brown, dark gray, dense, argillaceous dolomite with shale and evaporites. Residues consist of brown and gray shale and anhydrite. Percentages of insolubles range from 20 to 60 per cent. No salt was

SILURIAN SYSTEM

	MICHIGAN	OHIO		WEST VIRGINIA
		Northwest	Southeast	
Cayugan Series	*Bass Island	Raisin River	Cayugan (undifferentiated)	Tonoloway Wills Creek Williamsport
	Salina	Put-in-Bay Tymochtee Greenfield		
Niagaran Series	Lockport	Lockport-Guelph	McKenzie	McKenzie
	Clinton	Clinton (undifferentiated)	Clinton (undifferentiated)	Rochester Keefe Rose Hill
Albion Series	Cataract	Medina Group Brassfield	Albion (undifferentiated)	Tuscarora

* Cohee (1954).

encountered in any of the wells of this cross section, but the salt deposits of northeastern Ohio are in the Tymochtee. Because of the presence of evaporites, the Tymochtee and Greenfield are considered to be the western equivalent of the Salina formation.

The Put-in-Bay and Raisin River need additional studies before contacts can be drawn. The writer has found the residues to consist of chert, finely porous shale, and traces of very fine sand. These limestones and dolomites are generally more crystalline and less argillaceous than the underlying Tymochtee beds.

DEVONIAN

The Devonian system on this cross section bears terminology from the Michigan and Appalachian basins as well as names from the outcrop area in central Ohio. Since there is a difference of sediments in the three areas, each will be considered separately.

Michigan Basin

Middle Devonian. - On the southeastern edge of the Michigan Basin, Lower Devonian sediments are missing and the Silurian is overlain by the Detroit River group of the Middle Devonian. The sequence in ascending order is Detroit River group, Dundee formation, and Traverse group.

In O. G. S. No. 416, Metamora well No. 1, the Detroit River is a buff to brown, dense to finely crystalline dolomite. The residues range from 10 to 20 per cent and consist of anhydrite, gypsum, shale, chert, and rounded frosted quartz sand. The quartz sand that occurs at the base of the Detroit River represents the Sylvania sandstone. Separation of the Sylvania, Amherstburg, Lucas, and Anderdon of the Detroit River was not attempted. The thickness of this group in the Metamora well is 180 feet.

The Dundee in the Metamora well is a brown, crystalline dolomite with minor amounts of evaporites. The residues range from 5 to 15 per cent and consist of anhydrite, gypsum, gray shale, pyrite, and rounded frosted quartz sand. The base of this 60-foot unit is marked by very fine to fine, rounded frosted quartz sand.

The overlying Traverse group has been divided by Stewart (1955) into two formations. The Silica shale is a highly calcareous, gray shale overlain by the Ten Mile Creek dolomite. The residues of the Silica shale indicate that this formation should be called an argillaceous limestone rather than a shale, as the insolubles of the 42-foot section range from 20 to 40 per cent and consist of gray shale and pyrite.

The Ten Mile Creek dolomite, 41 feet thick in the Metamora well, has residues consisting of smooth, white, gray, and brown chert with minor amounts of pyrite. The average percentage of residues is 15 per cent.

Upper Devonian. - The Antrim or Ohio shale, which thins toward the Findlay arch, is a gray to black shale with minor amounts of pyrite. In the Metamora well it is 167 feet thick.

Central Ohio

Middle Devonian. - In central Ohio the Silurian is overlain by the Columbus limestone. The Middle Devonian is divided into three formations; the Columbus, Delaware, and Olentangy. The Columbus has no equivalent in the southeastern edge of the Michigan Basin. The Delaware is correlated with the Dundee and the Olentangy with the Traverse group (Stewart, 1955).

The upper part of the Columbus is a white, gray to buff, dense to crystalline limestone, with minor amounts of chert and silicified fossil debris. The lower part is brown, crystalline, dolomitic limestone and dolomite with minor amounts of chert, sand, and silicified fossil debris. In western Licking County, O. G. S. No. 620, Buxton No. 1 well, 100 feet of Columbus was found. It contains a greater percentage of chert than is normally present on the outcrop. The lower part of the Columbus in the Buxton well was 10 to 25 per cent sand.

At the outcrop area, the Delaware is distinguishable from the Columbus by being darker in color and more cherty. Westgate (1926) estimated the total thickness of the Delaware to be 45 feet. In the subsurface in the adjoining counties to the east of the outcrop area, it is most difficult to distinguish Delaware from Columbus. As the percentage of residues of the Columbus increases to the southeast, the dark chert of the Delaware is lighter in color and very similar to the buff and light gray cherty residues of the Columbus.

DEVONIAN SYSTEM

	FULTON COUNTY		CENTRAL OHIO	SOUTHEASTERN OHIO
Upper	Antrim		Ohio	Ohio
Middle	Traverse Group	Ten Mile Creek	Olentangy	Olentangy ?
		Silica		
	Dundee		Delaware	Delaware ?
Lower	Absent		Columbus	Onondaga Group (undifferentiated)
	Detroit River		Absent ?	
Lower	Absent		Absent	Oriskany
				Helderberg Group

In the Buxton well, the two samples from the top of the carbonate section contain dark chert and brown finely porous shale which might be correlative with Delaware. The residues are slightly larger than in the underlying sample but this is not sufficient evidence to separate the Delaware and Columbus.

The Olentangy in the outcrop area, and in one or two counties to the southeast, is a blue-gray calcareous shale about 100 feet thick. Under cover to the east the characteristics of the Olentangy are similar to those of the Ohio, which is a gray to black shale.

Upper Devonian. - The Ohio shale in the northern part of the state is divided into three members; the Huron, Chagrin, and Cleveland. The Cleveland and Huron are black carbonaceous shales separated by the Chagrin, a gray silty shale.

Appalachian Basin

Lower Devonian. - The Devonian sequence in the subsurface to the southeast is entirely different from the northwestern and central Ohio sections. It more closely fits the West Virginia section, therefore, West Virginia terminology is used on the southeastern part of the cross section.

In the southeastern part of Ohio the Lower Devonian is represented by the Helderberg and Oriskany. In this paper the term Helderberg is applied to the sediments from the top of the

Cayugan to the base of the Oriskany sandstone. This unit is undifferentiated except for the basal member, the Keyser limestone.

The upper part of the Helderberg is a brown cherty dense limestone. The residues range from 20 to 90 per cent and consist of translucent, dead-or dull-appearing, finely porous chert, with minor amounts of glauconite and very fine-grained sand. The thickness of this cherty limestone in O. G. S. No. 633, Harvey Scott No. 1 well, is 124 feet.

The lower part of the Helderberg is a gray-brown mottled dense limestone with insoluble residues ranging from 5 to 20 per cent. The residues consist of gray and brown finely porous shale and traces of very fine-grained sand. Due to the lack of chert, the lower part of the Helderberg is easily separated from the upper part and has tentatively been identified as Keyser limestone.

The Oriskany in the Scott No. 1 well is 58 feet thick. This sandstone is very fine to fine, subangular-grained quartz sand with silica and carbonates as bonding material. The lower part often contains 10 to 15 per cent limestone.

Middle Devonian. - The Onondaga limestone is the only unit recognized in the Middle Devonian and is correlated with the Columbus limestone. The Delaware, if present, is not recognized. Overlying the Onondaga is a gray and black shale sequence which could in part be equivalent to the Olentangy of central Ohio.

The Onondaga is a white, buff to gray, dense to crystalline limestone, with percentages of chert ranging from 5 per cent to as much as 90 per cent. The chert is white, gray, blue and brown, mottled, smooth, and dolocastic.

Upper Devonian. - On the logs and cross section the term Ohio is used to identify the gray and black shales that overlie the carbonates of Middle Devonian. In the middle and upper part of this shale sequence, siltstones have been observed, but these interfinger with the shale. The first 400 feet of shale above the Onondaga is black and unlike the blue-gray calcareous shale of the Olentangy. For this reason no attempt was made to subdivide this shale unit.

MISSISSIPPIAN

The formations of the Mississippian system in ascending order are the Bedford, Berea, Sunbury, Cuyahoga, Logan, and Maxville. The Bedford is a blue and red shale with interbedded siltstones. The Berea is a gray to buff, fine, subangular sandstone. The Sunbury, a gray to black shale, is an excellent marker in the Mississippian. The Cuyahoga and Logan share similar lithologies and often it is difficult to separate one from the other. Both consist of interbedded shales and sandstones. In the Cuyahoga, the sandstones are generally finer grained than the overlying conglomerates and sandstones of the Logan. The shales in the Logan are generally blue-gray, but locally change to reddish brown.

The Maxville is the youngest formation of this system. Only isolated patches of the Maxville, at the Mississippian-Pennsylvanian unconformity, are found in southeastern Ohio. It is a buff to brown, dense to crystalline limestone or dolomite, with minor amounts of sand and chert.

PENNSYLVANIAN

The Pennsylvanian is present in two of the wells in the cross section. Owing to the lack of cuttings and the spacing of the wells no attempt is made to give the general lithology of this system.

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SAMPLE DESCRIPTION OF STRATA

VILLAGE OF METAMORA # 1

O. G. S. File No. #416 - Fulton County - Amby Township - Section 11

Elevation 726.3

From To
0 132 No samples.

BEDFORD

132 150 Siltstone, light gray, slightly calcareous.
150 173 Siltstone and shale, light gray, slightly calcareous.
173 182 Shale, light gray.

OHIO

182 280 Shale, black.
280 305 Shale, light gray with thin stringers of black shale.
305 349 Shale, black with thin stringers of light gray shale.

TEN MILE CREEK

349 355 Dolomite, light brown, dense to finely crystalline, 25% gray shale with minor amounts of pyrite and rough chert.
355 390 Dolomite, light brown, finely crystalline, 15% white to brown smooth chert with minor amounts of pyrite.

SILICA

390 410 Limestone, gray, dense, 20% gray shale with minor amounts of pyrite.
410 432 Limestone, gray, dense, 20-45% gray shale with minor amounts of pyrite.

DUNDEE

432 477 Dolomite, light brown, crystalline, 10-20% very fine grained gypsum sand with minor amounts of gray shale and pyrite.
477 492 Dolomite, white to light brown, crystalline, 10% very fine grained gypsum and quartz sand.

DETROIT RIVER

492 515 Dolomite, light brown, dense to crystalline, 10% residue of smooth chert, gypsum and quartz sand.
515 538 Dolomite, light brown, dense to crystalline, 10% very fine grained gypsum sand with minor amounts of gray shale.
538 560 No samples.
560 583 Dolomite, light brown, dense to crystalline, 10-20% anhydrite.
583 590 No sample.
590 605 Dolomite, light brown, dense to crystalline, 15% anhydrite.
605 655 Dolomite, light brown to gray, dense, 10-20% fine-grained quartz sand and anhydrite with minor amounts of gray shale.
655 660 Dolomite, light brown to gray, dense, 30% fine-to medium-grained, rounded and frosted quartz sand with traces of green shale.
(Sylvania sandstone horizon.)

From	To	CAYUGAN
660	695	Dolomite, light brown, dense, 5% gray, brown and green shale with traces of anhydrite.
695	730	Dolomite, brown to gray, dense, 35-50% anhydrite and 10% gray shale.
730	755	Dolomite, brown to gray, dense, 20-30% gray and brown shale with minor amounts of anhydrite.
755	775	Dolomite, brown, dense, 10-15% gray and brown shale with minor amounts of smooth oolitic chert and anhydrite.
775	785	Dolomite, brown to gray, dense, 25% gray and brown shale with minor amounts of anhydrite.
785	855	Dolomite, brown, dense to crystalline, 10% gray and brown shale with minor amounts of anhydrite and gypsum sand.
855	861	No sample.
861	875	Dolomite, brown to gray, dense, 35% anhydrite with 15% brown shale.
875	975	Shale, gray to brown, 25-50% gray and brown, dense, dolomite with 5-40% anhydrite.
975	985	Dolomite, brown, dense, 20% anhydrite with minor amounts of brown shale.
985	1,010	Anhydrite, 30% brown, dense, dolomite, 10% gray shale.
1,010	1,020	Dolomite, brown to gray, dense, 35% anhydrite, 10% brown shale.
1,020	1,037	Dolomite, brown, dense, 35-50% anhydrite, 5% brown shale.
1,037	1,065	Dolomite, brown, dense to crystalline, 10-15% gray shale and anhydrite.
1,065	1,072	Dolomite, brown, finely crystalline, 25% gray shale with minor amounts of anhydrite.
1,072	1,105	Dolomite, brown, dense to crystalline, 20% gray shale and anhydrite.
1,105	1,125	Dolomite, gray to brown, dense to crystalline, 10% gray shale.
1,125	1,155	Dolomite, brown, dense to crystalline, 5% gray shale with traces of pyrite.
1,155	1,205	Dolomite, gray to brown, dense, 10-15% gray shale.
1,205	1,259	Dolomite, brown, finely crystalline, 5% gray shale and anhydrite.

LOCKPORT - GUELPH

1,259	1,294	Dolomite, white to gray, crystalline, 5% anhydrite and gypsum sand.
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BUTZ # 1

O. G. S. File No. #400 - Lucas County - Monclova Township - SW $\frac{1}{4}$, SW $\frac{1}{4}$ Section 28
Elevation 636

0	35	No samples
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CAYUGAN

35	65	Dolomite, brown to gray, dense, 10-20% finely porous brown shale and anhydrite.
65	135	Dolomite, brown, finely crystalline, 5% gray shale with traces of pyrite.
135	220	Dolomite, brown to gray, dense to crystalline, 5% brown and gray shale.
220	250	Dolomite, brown, finely crystalline, 5% gray shale.
250	305	Dolomite, brown, finely crystalline, 5% gray shale with gypsum and anhydrite.

LOCKPORT-GUELPH

305	410	Dolomite, white to gray, coarsely crystalline, 5% gray shale with very fine grained gypsum sand.
410	465	Dolomite, white to gray, coarsely crystalline, 5% fine-grained gypsum sand and gray shale.

SAMPLE DESCRIPTION

From	To	
465	480	Dolomite, gray, medium crystalline, 5% gray shale and anhydrite.
480	490	Dolomite, gray, medium crystalline, 4% pyrite.

CLINTON GROUP

490	500	Dolomite, brown tinted with red, finely crystalline, 10% gray shale with traces of pyrite
500	515	Dolomite, brown, finely crystalline, 5% rough chert and gray shale with traces of glauconite and pyrite.
515	540	Dolomite, brown to gray, dense to finely crystalline, 10-25% gray and brown shale with minor amounts of rough chert.

MEDINA GROUP

540	580	Dolomite, brown, medium to coarsely crystalline, 5-10% gray shale and rough chert.
580	590	Dolomite, brown to gray, dense, 30% gray-green shale.
590	600	Dolomite, brown to gray, finely crystalline, 10% gray-green shale.
600	620	Dolomite, gray, dense, mottled, 20-50% gray-green shale.
620	645	Dolomite, gray, dense, 10% gray-green shale.

CINCINNATIAN

645	675	Dolomite, gray-green, dense, 40% red, gray, and green shale.
675	800	Shale, red, brown, and green, 10-40% dense dolomite.
800	890	Shale, green, 15-25% dense dolomite.
890	920	Shale, gray, 15-35% dense dolomite, 5-35% siltstone.
920	1,000	Shale, gray, 5-20% dolomite.
1,000	1,010	Shale, gray.
1,010	1,110	Shale, gray to dark gray, 10-35% dolomite.
1,110	1,325	Shale, dark gray to black.
1,325	1,333	Shale, black, 10% dolomite with traces of pyrite.

TRENTON

1,333	1,370	Dolomite, brown, coarsely crystalline, 5% rough chert, finely porous brown shale with traces of pyrite.
1,370	1,385	Limestone, brown, dense to finely crystalline, 5% rough chert and finely porous shale.

H. E. CROSS # 1

O. G. S. File No. 53 - Wood County - Plain Township - SE $\frac{1}{4}$, NW $\frac{1}{4}$ Section 13
Elevation 676

0 40 No samples

CAYUGAN

40	50	Dolomite, brown, dense to crystalline, 5% brown finely porous shale with minor amounts of smooth chert and gray shale.
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LOCKPORT-GUELPH

50	60	Dolomite, white, buff and gray, dense to crystalline, 5% gray shale with minor amounts of brown finely porous shale and very fine-grained sand.
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From	To	
60	70	Dolomite, white to gray, coarsely crystalline, 15-20% fine, subangular grained sand with minor amounts of gray shale.
70	105	Dolomite, white to gray, coarsely crystalline, 5% gray shale and very fine grained sand.
105	140	Dolomite, white, coarsely crystalline, 5% gray shale.
140	165	Dolomite, gray, medium crystalline, 5% gray shale.
165	200	Dolomite, white to gray, medium crystalline, 5% anhydrite and gray shale.
200	225	Dolomite, gray, medium crystalline, 1-5% pyrite with minor amounts of anhydrite.

CLINTON GROUP

225	280	Dolomite, gray to brown, dense, 10-25% gray-green shale with traces of very fine grained sand.
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MEDINA GROUP

280	295	Dolomite, brown, medium crystalline, 10% rough chert, silicified fossil fragments, and gray-green shale.
295	310	Dolomite, brown and gray, mottled, 10% rough chert, silicified fossil fragments, and gray-green shale.
310	330	Dolomite, brown, dense to crystalline, 10% rough chert, silicified fossil fragments, and gray-green shale with traces of glauconite and pyrite.
330	340	No samples.
340	360	Dolomite, brown, crystalline, 10-20% gray-green and brown shale.
360	380	Dolomite, brown to gray, mottled, 10-20% gray-green shale.

CINCINNATIAN

380	405	Shale, red to gray, 20-60% dolomite.
405	445	Shale, red and green, 10-40% dolomite.
445	540	Shale, brown and green, 20-40% dolomite.
540	570	Shale, green, 10-20% dolomite.
570	580	Shale, green, 15% limestone.
580	600	Shale, green, 10-25% dolomite.
600	620	Shale, green, 5-20% limestone.
620	680	Shale, gray, 15-25% dolomite.
680	685	Shale, gray, 45% dolomite.
685	715	Shale, gray, 10-25% dolomite.
715	720	No sample
720	770	Shale, gray, 10-35% dolomite.
770	775	Dolomite, brown to gray, medium crystalline, 20% shale.
775	815	Shale, gray, 10-30% limestone.
815	850	Shale, dark gray, 10% limestone.
850	915	Shale, dark gray.
915	1,115	Shale, dark gray to black

TRENTON

1,115	1,123	Dolomite, brown, medium crystalline, 5% rough chert, finely porous brown shale, and very fine grained sand with traces of pyrite.
1,123	1,225	Limestone, buff to brown, dense to crystalline, fossiliferous, 5-10% rough chert, finely porous brown shale, and very fine grained sand.

BLACK RIVER

1,225	1,240	Limestone, brown, dense to lithographic, 20-30% finely porous brown shale and 10-20% smooth brown chert.
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SAMPLE DESCRIPTION

From	To	
1,240	1,270	Limestone, brown, dense to lithographic, 30% finely porous brown shale.
1,270	1,350	Limestone, buff to brown, dense to lithographic, 10-20% finely porous brown shale.
1,350	1,395	Limestone, buff, dense, fossiliferous, 5-25% finely porous brown shale, 10-20% smooth and mottled brown chert.
1,395	1,410	Limestone, buff, dense, fossiliferous, 10-30% finely porous brown shale.
1,410	1,435	Limestone, buff, lithographic, 10-35% brown finely porous shale and smooth chert with minor amounts of bentonitic shale.
1,435	1,450	Limestone, buff to brown, dense to lithographic, 10-20% white and brown smooth chert with minor amounts of dolocastic chert.
1,450	1,475	Limestone, buff to brown, lithographic, 20-45% brown finely porous shale with minor amounts of bentonitic shale.
1,475	1,495	Limestone, buff to brown, lithographic, 5-10% gray shale and finely porous brown shale.
1,495	1,530	Limestone, buff, lithographic, 5% finely porous brown shale.
1,530	1,555	Limestone, buff, lithographic, 5% gray shale and finely porous brown shale.
1,555	1,635	Limestone, buff, lithographic, 5% finely porous brown shale.
1,635	1,660	Limestone, buff, lithographic, 5% gray shale and finely porous brown shale.
1,660	1,680	Limestone, buff, lithographic, 5% finely porous brown shale.
1,680	1,730	Limestone, buff to brown, lithographic, 5% gray shale and finely porous brown shale.
1,730	1,745	Limestone, buff to brown, lithographic, 5-15% finely porous brown shale.
1,745	1,780	Limestone, buff to brown, lithographic, 5-10% gray shale and finely porous brown shale.
1,780	1,790	Limestone, buff to brown, lithographic, 10% finely porous brown shale.

GLENWOOD

1,790	1,802	Limestone, buff to dark brown, dense to crystalline, minor amounts of dolomite, 10-20% very fine sand, 30-40% gray shale and finely porous green shale.
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TREMPEALEAU

1,802	1,815	Dolomite, brown and gray, crystalline, 15-30% very fine grained sand with minor amounts of gray shale.
1,815	1,830	Dolomite, buff to brown, crystalline, 5% finely porous gray, brown, and green shale.
1,830	1,915	Dolomite, buff to brown, crystalline, 5% gray and brown shale, traces of rounded and frosted grains of sand.
1,915	1,920	Dolomite, buff to brown, crystalline, 10% very fine grained aggregate sand and traces of glauconite.
1,920	1,955	Dolomite, buff to brown, crystalline, 5-10% gray and brown shale with minor amounts of pyrite in the lower part.
1,955	2,000	Dolomite, buff to brown, crystalline, 10-25% very fine grained, aggregate sand with traces of glauconite, brown, and gray shale.
2,000	2,005	Dolomite, buff to brown, crystalline, 50% very fine grained aggregate sand with traces of glauconite.
2,005	2,015	Dolomite, white, buff, and gray, crystalline, 5-10% very fine to coarse grained, rounded, frosted sand.
2,015	2,030	Dolomite, white, buff, and gray, crystalline, 5% very fine to fine grained, subangular sand, brown shale, and pyrite.
2,030	2,078	Dolomite, white, buff, and gray, crystalline, 10-25% fine grained, subangular sand.

DRESBACH - FRANCONIA

2,078	2,090	Sandstone, medium-grained, rounded and frosted, 35% buff, dense dolomite.
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SAMPLE DESCRIPTION

From	To	
2,090	2,105	Dolomite, buff, dense, 35% fine-to medium-grained, subangular to rounded and frosted sand.
2,105	2,148	Sandstone, very fine to medium grained, subangular to rounded and frosted, 10-30% buff, dense dolomite.

EAU CLAIRE

2,148	2,151	Dolomite, buff to gray, dense, 30% fine subangular sand, 15% gray shale.
2,151	2,185	Sandstone, fine grained, subangular, 5-20% dolomite with traces of gray shale and glauconite.

J. G. KAGY, Ct. # 3

O. S. G. File No. 570 - Hancock County - Allen Township - NW $\frac{1}{4}$, NW $\frac{1}{4}$ Section 36
Elevation Rotary Table 826

0 100 No samples

CAYUGAN

100	150	Dolomite, buff to gray, dense, 10-30% gray and brown shale with traces of pyrite.
150	220	Dolomite, buff to gray, dense to crystalline, 30-40% gray and brown shale with minor amounts of anhydrite.
220	230	No sample.

LOCKPORT-GUELPH

230	290	Dolomite, white to gray, crystalline, 10-15%, very fine gypsum sand, gray shale and traces of pyrite.
290	370	Dolomite, white to gray, crystalline, 5% very fine gypsum sand and gray shale.
370	380	Dolomite, gray, crystalline, 5% fine gypsum sand, gray shale, and pyrite.

MEDINA - CLINTON GROUPS

380	400	Dolomite, gray, crystalline, 5% gray shale with traces of pyrite and glauconite.
400	450	Dolomite, buff to gray, crystalline, 5% gray shale with traces of pyrite.
450	460	Dolomite, buff, crystalline, 5% gray and brown shale, rough and smooth chert with traces of pyrite (Top of Medina).
460	470	Dolomite, buff, crystalline, 5% gray and brown shale with traces of pyrite and glauconite.
470	500	Dolomite, buff to gray, dense to crystalline, 15-30% gray and green shale.

CINCINNATIAN

500	540	Shale, red and green, 25-35% limestone.
540	610	Shale, red and green, 10-20% limestone.
610	640	Shale, red and green, 30% limestone.
640	710	Shale, green, 25-40% limestone.
710	720	Limestone, gray, dense, 40% green shale.
720	740	Shale, green, 30% limestone.

SAMPLE DESCRIPTION

From	To	
740	760	Limestone, gray, dense, 35-45% gray shale.
760	770	Limestone, gray, dense, 30% gray shale, 15% siltstone.
770	790	Shale, gray, 35% limestone with minor amounts of siltstone.
790	800	Limestone, gray dense, 35% gray shale, 10% siltstone.
800	810	Limestone, gray, dense, 45% gray shale with minor amounts of siltstone.
810	820	Shale, gray, 40% limestone, 15% siltstone.
820	870	Shale, gray, 30-45% limestone with minor amounts of siltstone.
870	1,010	Shale, gray, 35-50% limestone.
1,010	1,070	Shale, gray, 30-40% limestone.
1,070	1,110	Shale, gray to dark gray, 15-25% limestone.
1,190	1,291	Shale, dark gray to black.

TRENTON

1,291	1,310	Dolomite, brown, crystalline, 5% finely porous brown and gray shale and pyrite.
1,310	1,355	Dolomite, brown, crystalline, 5% gray shale, finely porous brown shale and rough chert with traces of pyrite.
1,355	1,361	Dolomite, brown, crystalline, 10% rough chert and silicified fossil fragments.

BLACK RIVER

1,361	1,364	Limestone, brown, dense to lithographic, 40% brown finely porous shale with minor amounts of rough chert and silicified fossil fragments.
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NORA HECK

O. G. S. File No. 99 - Wyandot County - Crawford Township - SE $\frac{1}{4}$, NW $\frac{1}{4}$ Section 18
Elevation 860

CAYUGAN

0	30	Dolomite, buff to brown, crystalline, 5% brown shale and very fine grained, rounded frosted sand.
30	65	Dolomite, buff and gray, crystalline, 5% brown shale and very fine grained, rounded frosted sand.
65	80	Dolomite, buff and gray, crystalline, 5% brown shale and very fine grained, rounded frosted sand with traces of pyrite.
80	90	Dolomite, buff and gray, crystalline, 5% brown shale, very fine grained, rounded frosted sand with traces of dead chert.

LOCKPORT-GUELPH

90	125	Dolomite, buff and gray, crystalline, 5% fine grained, subangular sand with traces of pyrite.
125	138	Dolomite, gray, crystalline, 2% pyrite.
138	210	Dolomite, gray, crystalline, 5% fine grained, subangular sand with traces of pyrite.
210	236	Dolomite, gray, crystalline, 5% brown finely porous shale, smooth chert and traces of pyrite.

From	To	CLINTON GROUP
236	250	Dolomite, gray, dense, 20-40% gray-green shale, traces of pyrite and silicified fossil fragments.
250	300	Dolomite, gray and brown, crystalline, 10-15% finely porous gray shale and traces of pyrite.
300	313	Dolomite, gray and brown, 10% finely porous gray shale and traces of pyrite, glauconite, and smooth chert.

MEDINA GROUP

313	320	Dolomite, buff to gray, crystalline, 10% rough chert, silicified fossil fragments with traces of pyrite and glauconite.
320	330	Dolomite, buff to gray, crystalline, 35% rough chert, silicified fossil fragments with traces of pyrite and glauconite.
330	345	Dolomite, gray, crystalline, 20% rough chert, finely porous green shale with traces of pyrite.

CINCINNATIAN

345	370	Shale, red.
370	400	Shale, red and green, 30-40% dolomite.
400	475	Dolomite, brown, dense, 25-50% green and brown shale, finely porous green shale.
475	493	Shale, green, 5-10% dolomite.
493	505	Shale, green, 25-45% limestone.
505	520	Shale, green, 20% limestone.
520	525	Limestone, gray, dense, 30% green shale.
545	550	Shale, green, 45% siltstone.
550	590	Shale, green, 15-25% limestone, 20-30% siltstone.
590	630	Siltstone, gray, 25-35% green shale, 10-20% limestone.
630	655	Siltstone, gray, 20-30% green shale, 25-45% limestone.
655	675	Shale, green.
675	685	Limestone, gray, dense, 40% green shale, 10% siltstone.
685	695	Shale, green.
695	705	Shale, green, 20-40% limestone, 10% siltstone.
705	735	Limestone, gray, dense, 25-30% green shale.
735	745	Shale, green, 20% limestone.
745	810	Shale, green, 30-50% limestone.
810	860	Shale, green, 30-40% limestone.
860	870	Shale, green.
870	875	Shale, gray.
875	890	Shale, green.
890	960	Shale, gray.
960	970	Shale, dark gray to black.
970	1,198	Shale, black.
1,198	1,208	No sample.
1,208	1,321	Shale, black.

TRENTON

1,321	1,330	Limestone, brown, dense to crystalline, 30% dolomite, 20% finely porous brown shale and rough chert with traces of pyrite.
1,330	1,348	Limestone, brown, dense to crystalline, 10-20% finely porous shale and rough chert.
1,348	1,391	Limestone, brown, dense, fossiliferous, 20-30% finely porous brown shale, smooth chert and silicified fossil fragments with traces of pyrite.

SAMPLE DESCRIPTION

From	To	BLACK RIVER
1,393	1,410	Limestone, buff to brown, lithographic, 5-10% finely porous brown shale.
1,410	1,435	Limestone, buff, lithographic, 10-20% smooth chert.
1,435	1,500	Limestone, buff to gray, lithographic, 5% rough, dead chert, finely porous brown shale with traces of bentonitic shale.
1,500	1,565	Limestone, buff to brown, lithographic, 5% finely porous brown shale.
1,565	1,675	Limestone, buff to brown, lithographic, 5% finely porous brown shale and rough chert.
1,675	1,700	Limestone, buff to brown, lithographic and crystalline, 5% finely porous brown shale and finely porous chert.
1,700	1,720	Limestone, brown, lithographic and crystalline, 20% dolomite, 5% finely porous brown shale, finely porous chert, and very fine grained, rounded, frosted sand.
1,720	1,750	Limestone, buff to brown, lithographic, 5% finely porous brown shale and smooth chert.
1,750	1,800	Limestone, buff to brown, lithographic, 5% finely porous brown shale and rough chert.
1,800	1,820	Limestone, buff to brown, lithographic, 10-15% gray and brown shale and quartz druse.
1,820	1,830	Limestone, buff to brown, lithographic, 20% finely porous brown and gray shale.
1,830	1,865	Limestone, buff, lithographic, 5-10% gray shale and finely porous brown shale.
1,865	1,885	Limestone, buff, lithographic, 5% gray shale, finely porous brown shale and very fine grained sand with traces of glauconite.

GLENWOOD

1,885	1,905	Shale, green, doloclastic, with traces of pyrite and very fine grained sand, 30% green, crystalline dolomite.
1,905	1,915	Shale, green, doloclastic, 25% very fine grained aggregate sand with traces of glauconite, 35% green crystalline dolomite.

TREMPEALEAU

1,915	1,953	Dolomite, buff and green, crystalline, 25-40% very fine grained, aggregate sand with traces of glauconite.
1,953	1,991	Dolomite, buff, crystalline, 20-30% very fine grained, aggregate sand with traces of glauconite.
1,991	2,010	Dolomite, buff to brown, crystalline, 25-30% very fine grained, aggregate sand with minor amounts of brown shale.
2,010	2,025	Dolomite, buff, crystalline, 10% gray and brown shale and very fine grained sand.
2,025	2,060	Dolomite, white to buff, crystalline, 10% gray shale with rough chert with traces of pyrite.
2,060	2,095	Dolomite, white to buff, crystalline, 10-15% very fine to fine grained, rounded frosted sand.
2,095	2,119	Dolomite, white to buff, dense to crystalline, 20-30% very fine to fine grained rounded frosted sand with minor amounts of gray shale.

DRESBACH - FRANCONIA

2,119	2,140	Sandstone, fine-to coarse-grained, rounded frosted, 20-35% dolomite.
2,140	2,168	Sandstone, fine-to coarse-grained, rounded frosted, 10-20% dolomite.
2,168	2,185	Sandstone, very fine to fine-grained, subangular, with traces of gray shale, 35% dolomite.
2,185	2,210	Sandstone, fine-grained, subangular with traces of gray shale, 20% dolomite.
2,210	2,238	Sandstone, fine-grained, subangular with traces of gray shale, 10% dolomite.

SAMPLE DESCRIPTION

From	To	EAU CLAIRE
2,238	2,249	Sandstone, very fine to fine grained, aggregate with traces of glauconite, 20% brown shale, 10% dolomite.
2,249	2,265	Sandstone, very fine grained, aggregate with traces of glauconite, 20-30% brown shale, 20-30% dolomite.
2,265	2,285	Shale, brown and gray, 10-30% very fine grained aggregate sandstone with traces of glauconite, 10-30% dolomite.
2,285	2,295	Sandstone, very fine grained aggregate, with traces of glauconite, 15-25% brown and gray shale, 35-40% dolomite.
2,295	2,315	Dolomite, brown to gray, crystalline, 35-40% very fine grained aggregate sandstone with traces of glauconite, 5% brown and gray shale.
2,315	2,335	Sandstone, very fine to fine-grained, subangular with traces of glauconite and brown shale, 30% dolomite.
2,335	2,378	Dolomite, gray to buff, crystalline, 15-30% very fine to medium-grained, rounded frosted sand.
2,378	2,403	Sandstone, fine-to medium-grained, rounded frosted, 35-45% dolomite.
2,403	2,432	Sandstone, very fine grained, aggregate, 15-20% dolomite.
2,432	2,455	Sandstone, very fine to fine-grained, subangular with traces of brown shale and glauconite, 20-40% dolomite.
2,455	2,485	Sandstone, fine-grained, subangular with traces of glauconite, 20-35% dolomite.
2,485	2,520	Sandstone, fine-grained, subangular with traces of glauconite and finely porous brown shale, 20-35% dolomite.
2,520	2,560	Dolomite, brown, crystalline, 30-40% fine-to medium-grained, subangular and rounded frosted sand.
2,560	2,595	Sandstone, fine-to medium-grained, subangular and rounded frosted, 10-25% dolomite.
2,595	2,610	Dolomite, brown to gray, crystalline, 30-45% fine-to medium-grained, rounded frosted sand.
2,610	2,630	Sandstone, fine-to medium-grained, rounded frosted, 10-30% dolomite.
2,630	2,675	Sandstone, very fine grained, aggregate and medium-grained, rounded frosted, 10-20% dolomite.

MT. SIMON

2,675	2,720	Sandstone, fine-to coarse-grained, rounded frosted, with traces of pyrite.
2,720	2,750	Sandstone, very fine to medium-grained, rounded frosted, with traces of pyrite.
2,750	2,800	Sandstone, fine-to coarse-grained, rounded frosted.

PRE - CAMBRIAN

2,800	2,801	Granite.
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BESSIE CHATLAIN # 1

O. G. S. File No. 4 - Wyandot County - Antrim Township - SE $\frac{1}{4}$, SE $\frac{1}{4}$ Section 28
Elevation 910

0	54	No samples.
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COLUMBUS

54	65	Limestone, buff to brown, dense to crystalline, 15% smooth and mottled chert with minor amounts of quartz druse and very fine grained sand.
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SAMPLE DESCRIPTION

From	To	
65	70	Limestone, buff to brown, dense to crystalline, 20% smooth and oolitic chert.
70	75	Limestone, buff to brown, dense to crystalline, 5% smooth chert, brown finely porous shale, and traces of pyrite.
75	100	Limestone, brown to gray, crystalline, 5% very fine grained, rounded frosted sand, gray and brown shale, pyrite, and smooth chert.

CAYUGAN

100	115	Limestone, brown to gray, crystalline, 5-15% gray and brown shale, smooth and oolitic chert.
115	120	No sample.
120	160	Limestone, brown to gray, dense, 5% gray and brown shale.
160	185	Dolomite, brown to gray, dense, 5% gray and brown shale and anhydrite.
185	200	Dolomite, brown to gray, dense, 30% limestone, 5% anhydrite and gray and brown shale.
200	210	Dolomite, brown to gray, dense, 20% green and brown shale and anhydrite.
210	250	Dolomite, brown, dense to crystalline, 5% gray and brown shale and anhydrite.
250	290	Dolomite, brown, dense to crystalline, 5% gray and brown shale with traces of anhydrite.
290	295	No sample.
295	330	Dolomite, gray to brown, dense, 5-15% gray and brown shale with traces of anhydrite.
330	360	Dolomite, brown, dense to crystalline, 5-10% gray and brown shale.
360	365	Anhydrite, 20% dolomite.
365	375	Anhydrite, 45% dolomite.
375	380	Dolomite, brown, dense, 30% anhydrite.
380	410	Dolomite, brown, dense to crystalline, 5-15% anhydrite, gray, and brown shale.
410	434	Dolomite, buff-brown, dense to crystalline, 20-30% anhydrite.

LOCKPORT-GUELPH

434	520	Dolomite, gray, coarsely crystalline, 5% gypsum with traces of pyrite.
520	530	Dolomite, gray, coarsely crystalline, 5% gray shale and pyrite.
530	555	Dolomite, gray and brown, coarsely crystalline, 5-10% smooth, rough, dead, and finely doloclastic chert.
555	580	Dolomite, buff to brown, crystalline, 5% brown finely porous shale with traces of pyrite, glauconite, and rough chert.
580	595	Dolomite, buff to pink, 5-10% gray and brown shale with traces of pyrite and silicified fossil fragments.

CLINTON GROUP

595	615	Dolomite, gray to brown, dense, 25-50% gray-green shale with traces of pyrite.
615	640	Dolomite, brown to gray, crystalline, 5-10% gray-green shale with traces of pyrite, and very fine gypsum sand.
640	660	Dolomite, brown, crystalline, 20-25% gray-green shale with traces of pyrite.
660	665	Limestone, brown, crystalline, 25% gray-green shale with traces of pyrite and glauconite.

MEDINA GROUP

665	670	Dolomite, brown to gray, crystalline, 20% rough chert with minor amounts of gray-green shale.
670	680	Dolomitic limestone, brown to gray, crystalline, 25-30% rough chert, 15-25% gray-green shale.

From	To	
680	700	Limestone, brown to gray, crystalline, 20-35% rough chert and silicified fossil fragments, 5-30% gray-green shale.

CINCINNATIAN

700	735	Shale, red and green.
735	760	Limestone, brown, dense, 30-45% red and green shale.
760	770	Shale, green and red, 35% limestone.
770	810	Limestone, gray and brown, crystalline, 20-30% red and green shale.
810	855	Shale, red and brown, 20-35% limestone.
855	875	Shale, green to gray, 30-45% limestone.
875	905	Shale, green to gray, 20-45% limestone, 10% siltstone.
905	935	Shale, gray, 15-30% limestone with traces of siltstone.
935	985	Shale, gray, 30-40% limestone.
985	1,000	Shale, gray, 30% limestone.
1,000	1,040	Shale, gray, 10-25% limestone, traces of siltstone.
1,040	1,080	Shale, gray, 30-45% limestone.
1,080	1,085	No sample.
1,085	1,115	Limestone, brown, dense to crystalline, 30-40% gray shale with minor amounts of siltstone.
1,115	1,180	Limestone, brown, dense to crystalline, 30-50% gray shale.
1,180	1,200	Shale, gray, 30-35% limestone.
1,200	1,215	Limestone, brown, crystalline, 30-50% gray shale.
1,215	1,240	Shale, gray, 35-50% limestone.
1,240	1,325	Shale, gray to dark gray, 15-30% limestone.
1,325	1,340	Shale, gray to dark gray.
1,340	1,375	Shale, gray to dark gray, 15-20% limestone.
1,375	1,385	No sample.
1,385	1,400	Shale, gray to dark gray, 10-15% limestone.
1,400	1,415	Shale, dark gray to black, 10-15% limestone
1,415	1,465	Shale, dark gray to black.
1,465	1,710	Shale, black.
1,710	1,725	Shale, black, 25-45% limestone.
1,725	1,730	Shale, black.
1,730	1,745	Shale, black, 10-20% limestone.
1,745	1,750	Shale, black.
1,750	1,755	Shale, black, 35% limestone.

TRENTON

1,755	1,758	Limestone, brown, dense to crystalline, 30% gray and brown shale, 5% rough chert.
1,758	1,785	Limestone, buff to brown, dense to crystalline, 20% gray and brown shale, 5% rough and smooth chert.
1,785	1,805	Limestone, buff to brown, dense to crystalline, 20% smooth and rough chert, 10% brown shale.
1,805	1,825	Limestone, buff to brown, dense to crystalline, 15-25% finely porous brown shale, with minor amounts of smooth chert.

BLACK RIVER

1,825	1,835	Limestone, buff, dense to lithographic, 25% smooth chert.
1,835	1,850	Limestone, buff, lithographic, 10% gray shale and brown finely porous shale.
1,850	1,860	Limestone, buff, dense to crystalline, 10% finely dolocastic chert and gray shale.
1,860	1,865	No sample.
1,865	1,880	Limestone, buff, dense to crystalline, 5% gray and brown shale with traces of bentonite.

SAMPLE DESCRIPTION

From	To	
1,880	1,905	Limestone, buff to gray, lithographic, 5% gray shale and traces of pyrite.
1,905	1,935	Limestone, buff to gray, lithographic, 5% gray shale and brown and gray finely porous shale.
1,935	1,950	Limestone, buff to brown, lithographic, 5% gray shale.
1,950	2,000	Limestone, brown, lithographic, 5% gray shale and brown finely porous shale.
2,000	2,035	Limestone, buff to brown, lithographic, 5% gray shale.
2,035	2,055	Limestone, buff to brown, crystalline, 5% gray shale and rough, dead, finely dolocastic chert.
2,055	2,150	Limestone, buff to brown, lithographic to crystalline, 5% gray shale with traces of rough chert.
2,150	2,165	Limestone, buff to brown, lithographic to dense, 5% dead chert.
2,165	2,190	Limestone, buff to brown, lithographic to dense, 5-25% gray shale, brown finely porous shale.
2,190	2,245	Limestone, buff to gray, lithographic to dense, 10-15% gray shale and traces of bentonite.
2,245	2,250	Limestone, brown and gray, dense, 35% gray shale and traces of bentonite.
2,250	2,290	Limestone, brown and gray, dense, 10-15% gray shale and brown finely porous shale.
2,290	2,295	No sample.
2,295	2,315	Limestone, buff to brown, dense to crystalline, 10-15% gray shale.
2,315	2,320	No sample.
2,320	2,335	Limestone, buff to brown, dense to crystalline, 10-15% gray shale.

GLENWOOD

2,335	2,340	Limestone, brown and green, dense, 35% gray and green shale.
2,340	2,345	Limestone, brown and green, dense, 25% gray and green shale with traces of pyrite.
2,345	2,350	Limestone, brown and green, dense, 30% dolomite, 40% finely dolocastic shale with traces of pyrite.
2,350	2,360	Shale, green, finely dolocastic, 25-30% dolomite.
2,365	2,370	Dolomite, gray and green, crystalline, 30% finely dolocastic, green shale.

TREMPEALEAU

2,370	2,390	Dolomite, white to gray, crystalline, 10-20% very fine grained aggregate sand, glauconite, and gray shale.
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STANLEY W. BAKER # 1

O. G. S. File No. 627 - Marion County - Claridon Township, NW $\frac{1}{4}$, NW $\frac{1}{4}$ Section 9
Elevation 990

0 322 No samples

CAYUGAN

322	340	Dolomite, brown, dense to crystalline, 10% smooth chert and gypsum.
340	375	Dolomite, brown to gray, dense, 20% finely porous brown shale with minor amounts of anhydrite.
375	420	Dolomite, brown to gray, dense, 30% gray and brown shale with minor amounts of anhydrite.
420	460	Dolomite, brown to gray, dense, 15% gray and brown shale with minor amounts of anhydrite.

From	To	
460	475	Dolomite, brown to gray, dense, 25% anhydrite, 10% gray and brown shale.
475	500	Dolomite, brown, dense to crystalline, 10% anhydrite with minor amounts of brown shale.
500	555	Dolomite, brown, dense to crystalline, 5% finely porous brown shale and anhydrite.
555	635	Dolomite, brown, dense to crystalline, 5-15% gray and brown shale.
635	703	Dolomite, brown to gray, dense to crystalline, 10-20% gray to brown shale with minor amounts of very fine grained gypsum sand.

LOCKPORT-GUELPH

703	780	Dolomite, white to gray, coarsely crystalline, 5% very fine grained gypsum sand and pyrite.
780	805	Dolomite, gray, crystalline, 5% gray shale and pyrite.
805	823	Dolomite, gray, crystalline, 5% smooth and rough chert and pyrite.
823	840	Dolomite, brown, dense to crystalline, 5% finely porous brown shale and pyrite.
840	872	Dolomite, yellow, brown, and pink, crystalline, 5% pyrite and glauconite with minor amounts of rough chert.

CLINTON GROUP

872	885	Dolomite, gray, dense, 10% gray-green shale and pyrite.
885	891	Limestone, brown to gray, crystalline, 5% gray-green shale and pyrite.
891	900	Limestone, brown to gray, crystalline, 35% gray-green shale with minor amounts of pyrite.
900	920	Dolomite, brown to gray, crystalline, 10% rough dead chert, pyrite, and gray-green shale.
920	930	Dolomite, brown to gray, crystalline, 20% very fine grained, aggregate sand.
930	951	Limestone, gray, dense to crystalline, 10-25% very fine grained, aggregate sand with traces of glauconite at the base.

MEDINA GROUP

951	965	Chert, gray, rough, dead, containing silicified fossil fragments, 30-40% limestone.
965	982	Limestone, gray to brown, 25-30% rough chert, silicified fossil fragments and finely porous gray shale.

CINCINNATIAN

982	1,035	Shale, red and green, 30-35% limestone.
1,035	1,047	Limestone, brown, dense, fossiliferous, 30% red and green shale.
1,047	1,105	Limestone, brown, dense, fossiliferous, 10-25% gray-green shale.
1,105	1,140	Shale, gray-green, 30-50% limestone.
1,140	1,170	Shale, gray-green with traces of siltstone, 25% limestone.
1,170	1,180	Limestone, brown and gray, dense, fossiliferous, 30% siltstone, 20% gray-green shale.
1,180	1,210	Shale, gray-green and gray siltstone, 35-40% limestone.
1,210	1,230	Limestone, gray and brown, dense, fossiliferous, 25-30% siltstone, 10% gray-green shale.
1,230	1,240	Siltstone, gray and gray-green shale, 30% limestone.
1,240	1,275	Limestone, brown and gray, dense, fossiliferous, 25-35% gray-green shale, 15% siltstone.
1,275	1,315	Siltstone, gray, and gray-green shale, 20-40% limestone.
1,315	1,340	Limestone, brown and gray, dense, fossiliferous, 20-40% gray-green shale, 10% siltstone.
1,340	1,400	Limestone, brown and gray, dense, fossiliferous, 20-30% gray-green shale with traces of siltstone.

SAMPLE DESCRIPTION

From	To	
1,400	1,430	Limestone, brown and gray, dense, fossiliferous, 30-40% gray shale with minor amounts of siltstone.
1,430	1,460	Limestone, brown and gray, dense, fossiliferous, 25-35% gray shale.
1,460	1,470	Shale, gray, 10% siltstone, 35% limestone.
1,470	1,480	Limestone, brown and gray, dense, fossiliferous, 15% gray shale, 5% siltstone.
1,480	1,505	Limestone, brown and gray, dense, fossiliferous, 30% gray siltstone, 10% gray shale.
1,505	1,515	Shale, gray, 10% gray siltstone, 40% limestone.
1,515	1,590	Shale, gray, 30-50% limestone.
1,590	1,615	Shale, gray, 25% limestone.
1,615	1,750	Shale, dark gray to black, 10-15% limestone.
1,750	1,785	Shale, dark gray to black.
1,785	1,900	Shale, black.
1,900	1,960	Shale, black, 10-15% limestone.
1,960	1,980	Shale, black.
1,980	2,065	Shale, black, 10-20% limestone.
2,065	2,073	Shale, black, 35% limestone.

TRENTON

2,073	2,115	Limestone, buff to brown, dense, 20% finely porous brown shale, 5% smooth mottled chert.
2,115	2,136	Limestone, buff to brown, dense, 20% finely porous brown shale and smooth mottled chert.

BLACK RIVER

2,136	2,150	Limestone, buff, lithographic, 15% smooth chert.
2,150	2,200	Limestone, buff to gray, lithographic, 10% finely porous brown shale and dead chert.
2,200	2,270	Limestone, white to buff, lithographic, 10-15% gray shale, finely porous brown shale, and traces of bentonite.
2,270	2,305	Limestone, buff, lithographic, 20-30% gray shale, finely porous brown shale, and traces of bentonite.
2,305	2,345	Limestone, buff to brown, lithographic to crystalline, 20-30% gray shale with traces of bentonite.
2,345	2,380	Limestone, buff to brown, lithographic to crystalline, 5% finely porous brown shale.
2,380	2,425	Limestone, buff, lithographic to crystalline, 5% finely porous brown shale, rough and smooth chert.
2,425	2,475	Limestone, buff to brown, lithographic to crystalline, 5% finely porous brown shale and dead finely porous and rough chert.
2,475	2,550	Limestone, buff to brown, lithographic to crystalline, 5% finely porous brown shale.
2,550	2,590	Limestone, buff to brown, lithographic, 10-20% finely porous brown and gray shale.
2,590	2,655	Limestone, buff to brown, lithographic to crystalline, 5% finely porous brown and gray shale.

GLENWOOD

2,655	2,661	Limestone, brown, lithographic, 20% finely porous green and brown shale.
2,661	2,666	Shale, green, finely porous, 10% dolomite.
2,666	2,670	Limestone, buff, lithographic, 10% green shale and finely porous brown shale.
2,670	2,675	Shale, green, 40% dolomite.

SAMPLE DESCRIPTION

From	To	TREMPEALEAU
2,675	2,680	Dolomite, white, gray, green, crystalline, 20% very fine grained sand, 10% green shale and traces of pyrite.
2,680	2,690	Dolomite, buff to gray, crystalline, 10-20% very fine grained sand with traces of pyrite and glauconite.
2,690	2,700	Sandstone, very fine, subangular-grained, 10% green shale, traces of glauconite, 20% dolomite.
2,700	2,711	Dolomite, buff to gray, crystalline, 10-30% very fine grained, traces of green shale, pyrite, and glauconite.

WAYNE BUXTON # 1

O. G. S. File No. 620 - Licking County - Hartford Township - Lot 9
Elevation 1,170

0 573 No samples

OHIO

573	585	Shale, light gray and black.
585	810	Shale, black.
810	820	Shale, light gray.
820	830	Shale, black and light gray.
830	855	Shale, gray and black.
855	865	Shale, black and gray.
865	1,000	Shale, black
1,000	1,075	Shale, light gray, calcareous.
1,075	1,095	Shale, gray to dark gray.
1,095	1,100	No sample.

COLUMBUS

1,100	1,110	Shale, brown, finely porous, 20% limestone, 10% smooth chert.
1,110	1,130	Limestone, white to buff, dense, 15% smooth chert, 5% finely porous brown shale with traces of very fine grained sand.
1,130	1,172	Limestone, white to buff, dense, 5-10% rough, dead, dolocastic chert, 5% gray shale with traces of very fine grained sand.
1,172	1,190	Limestone, dolomitic, buff to brown, crystalline, 15% very fine grained sand, 5% rough, dead chert.
1,190	1,200	Limestone, dolomitic, buff to gray, crystalline, 25% very fine to medium-grained sand with traces of green shale.

CAYUGAN

1,200	1,210	Dolomite, buff to brown, dense, 10% finely porous brown shale with traces of anhydrite.
1,210	1,225	Dolomite, buff to gray, dense, 30% finely porous gray and brown shale with traces of anhydrite.
1,225	1,285	Dolomite, buff, dense, 20% anhydrite with minor amounts of finely porous brown shale.
1,285	1,310	Dolomite, buff to gray, dense, 30% anhydrite, 10% brown shale.
1,310	1,330	Dolomite, buff to brown, dense to crystalline, 10% anhydrite with minor amounts of gray and brown shale.

SAMPLE DESCRIPTION

From	To	
1,330	1,350	Dolomite, buff to brown, dense, 15% anhydrite, 5% brown shale.
1,350	1,400	Dolomite, buff to brown, dense, 5% smooth chert, 5% anhydrite.
1,400	1,530	Dolomite, brown, 30-35% gray, brown and green shale with minor amounts of anhydrite.

LOCKPORT-GUELPH

1,530	1,580	Dolomite, dark brown, dense to crystalline, 5% finely porous brown and gray shale, with traces of gypsum and pyrite.
1,580	1,610	Dolomite, dark brown, dense to crystalline, 5% gray shale and very fine grained gypsum sand.
1,610	1,660	Dolomite, dark brown, dense to crystalline, 10-15% gray shale and fine-grained gypsum sand.
1,660	1,670	Dolomite, brown, crystalline, 5% gray shale and very fine grained gypsum sand.
1,670	1,715	Dolomite, gray to brown, crystalline, 20% anhydrite and very fine grained gypsum sand.
1,715	1,757	Dolomite, brown, crystalline, 5% rough and finely porous chert, gray shale, and traces of very fine grained gypsum sand.

CLINTON GROUP

1,757	1,770	Dolomite, gray-brown, crystalline, 25% gray-brown shale with traces of pyrite.
1,770	1,790	Shale, gray-brown, 10% dolomite.
1,790	1,810	Dolomite, gray-brown, crystalline, 35-45% gray-brown shale.
1,810	1,836	Shale, gray-brown, 40-50% dolomite.

MEDINA GROUP

1,836	1,869	Limestone, white, buff, and green, dense to crystalline, 5-15% gray, green, and red shale, traces of glauconite and rough chert.
1,869	1,875	Shale, gray, 30% limestone.
1,875	1,890	Shale, gray-green, 20-40% limestone.
1,890	1,905	Shale, gray, 10-20% limestone with traces of very fine grained sand.
1,905	1,915	Shale, red and green, 30% limestone with minor amounts of limonite concretions.
1,915	1,920	Shale, gray, 5% limestone.
1,920	1,930	Shale, gray, 35% limestone with minor amounts of very fine grained sand.
1,930	1,935	Sandstone, very fine grained, aggregate, 30% limestone.
1,935	1,940	Shale, gray, 30% limestone with minor amounts of very fine grained sand.
1,940	1,950	Shale, gray, 35% limestone
1,950	1,955	Shale, gray, 35% limestone, 10% rough chert.
1,955	1,960	Chert, rough, 20% limestone, 30% gray shale.
1,960	1,970	Shale, gray, 40% limestone, 10% rough chert.
1,970	1,982	Limestone, greenish brown, dense, 35% gray shale.

CINCINNATIAN

1,982	2,045	Shale, red, 10-15% limestone.
2,045	2,075	Shale, red and green, 15-30% limestone.
2,075	2,095	Shale, green, gray, brown, 45% limestone.
2,095	2,130	Shale, brown, 20-30% limestone.
2,130	2,170	Shale, brown, 10% limestone with traces of siltstone.

SAMPLE DESCRIPTION

29

S. M. ROMINE # 3

O. G. S. File No. 610 - Licking County - Hanover Township - 1st Quarter, Lot 2
Elevation 792.9

From	To	
0	60	No samples

CUYAHOGA - LOGAN

60	65	Shale, gray.
65	75	Sandstone, fine subangular grained.
75	95	Sandstone, conglomeratic, fine to coarse, subangular grained.
95	170	Sandstone, conglomeratic, fine to coarse, subangular grained.
170	200	Siltstone, light gray, with fine-grained, aggregate sand.
200	295	Sandstone, fine to medium, subangular grained.
295	305	Siltstone, light gray.
305	325	Siltstone, light gray and gray shale.
325	380	Siltstone, light gray.
380	390	Shale, gray, and light gray siltstone.
390	395	Siltstone, light gray.
395	455	Shale, gray, with minor amounts of light gray siltstone.
455	478	Shale, gray and brown, with light gray siltstone.
478	488	No sample.
488	565	Shale, gray and brown, with light gray siltstone.
565	608	Shale, dark gray.

SUNBURY

608	655	Shale, black.
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BEREA

655	679	Sandstone, very fine subangular grained, aggregate.
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BEDFORD

679	682	Shale, reddish brown.
682	697	Shale, dark gray.

OHIO

697	835	Shale, black, some interbedded gray shale.
835	995	Siltstone, light gray.
995	1,090	Shale, light gray, silty.
1,090	1,185	Shale, gray, minor amounts of brown shale.
1,185	1,300	Shale, dark gray to black.
1,300	1,355	Shale, black, with some greenish gray shale.
1,355	1,380	Shale, greenish gray.
1,380	1,440	Shale, black.
1,440	1,500	Shale, black, with some greenish gray shale.
1,500	1,508	No sample.
1,508	1,540	Shale, black.
1,540	1,590	Shale, black, with some greenish gray shale.
1,590	1,690	Shale, black.
1,690	1,815	Shale, greenish gray and black, very slightly calcareous.
1,815	1,835	Shale, black, slightly calcareous.
1,835	1,863	Shale, dark gray and black, slightly calcareous.

COLUMBUS

1,863	1,905	Limestone, brown, dense, with minor amounts of smooth chert.
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SAMPLE DESCRIPTION

From	To	
1,905	1,955	Limestone, brown, dense, 25-30% smooth chert, with minor amounts of finely porous brown shale and very fine grained sand.
1,955	1,982	Limestone, brown, dense to crystalline, 15% dead dolocastic and mottled chert, 5% very fine grained sand.

CAYUGAN

1,982	1,995	Dolomite, brown, dense, 35% anhydrite, 10% finely porous brown shale.
1,995	2,010	Anhydrite, 35% dolomite, 10% gray shale and finely porous brown shale.
2,010	2,030	Dolomite, gray and brown, dense, 35% gray and brown shale with minor amounts of anhydrite.
2,030	2,060	Dolomite, gray and brown, dense, 25% anhydrite, 10% gray shale.
2,060	2,080	Anhydrite, 30% dolomite, 20% brown shale.
2,080	2,125	Dolomite, brown, dense, 40% anhydrite, 5% brown shale.
2,125	2,140	Anhydrite, 40% dolomite, 5% brown shale.
2,140	2,195	Dolomite, brown, dense to lithographic, 40% anhydrite with minor amounts of brown shale.
2,195	2,210	Shale, gray and brown, 40% dolomite, 10% anhydrite.
2,210	2,235	Dolomite, greenish brown, dense, 20-25% brown shale, 10-15% anhydrite.
2,235	2,275	Dolomite, brown, dense, 25-35% anhydrite, 5-15% brown shale.
2,275	2,305	Dolomite, greenish brown, dense, 35% brown shale with minor amounts of anhydrite.
2,305	2,325	Dolomite, brown, dense, 20% green and brown shale, 10% anhydrite.
2,325	2,355	Shale, green and brown, 35% dolomite with minor amounts of anhydrite.
2,355	2,370	Shale, green and brown, 50% dolomite with minor amounts of anhydrite.
2,370	2,385	Dolomite, brown, dense, 25% green and brown shale, 15% anhydrite.
2,385	2,415	Dolomite, brown to gray, dense to crystalline, 30-35% anhydrite, 5-10% gray and brown shale.
2,415	2,454	Dolomite, dark brown, dense to crystalline, 15% brown shale with minor amounts of anhydrite, gypsum, and traces of sphalerite.

LOCKPORT-GUELPH

2,454	2,465	Dolomite, white, gray to buff, coarsely crystalline, 35% gray and brown shale with minor amounts of gypsum and anhydrite.
2,465	2,485	Dolomite, gray to buff, coarsely crystalline, 20% gray shale with minor amounts of gypsum.
2,485	2,510	Dolomite, white, gray to buff, crystalline, no residue available.
2,510	2,600	Dolomite, white, gray to buff, crystalline, 5-10% gray shale with minor amounts of gypsum.
2,600	2,635	Dolomite, buff to brown, crystalline, 5% gray shale and gypsum.
2,635	2,652	Dolomite, buff to brown, crystalline, 15% smooth and finely porous chert.
2,652	2,700	Dolomite, buff to gray, dense to crystalline, 30% smooth and finely dolocastic chert.
2,700	2,723	Dolomite, gray to brown, crystalline, 10-15% smooth and finely dolocastic chert with traces of gypsum.

CLINTON GROUP

2,723	2,745	Shale, brown, finely porous, 45% dolomite, 5% very fine grained sand with traces of pyrite.
2,745	2,775	Sandstone, very fine grained, 35% dolomite, 10% finely porous brown and gray shale.
2,775	2,785	Limestone, dolomitic, buff, dense to crystalline, 35% very fine sand, 10% gray shale.
2,785	2,795	Limestone, buff, dense, 30% brown shale, 10% very fine sand.
2,795	2,800	Shale, gray-brown, 40% limestone.
2,800	2,810	Shale, gray-brown, 30-40% limestone.

SAMPLE DESCRIPTION

From	To	
2,810	2,830	Shale, gray, green, and red, 30% limestone.
2,830	2,839	Shale, green and red, 10% limestone.
2,839	2,852	Shale, green and red, 10% limestone, 10% smooth chert with traces of glauconite.

MEDINA GROUP

2,852	2,860	Limestone, red and green, dense, 30% green and gray shale, 5% smooth chert with traces of glauconite.
2,860	2,878	Shale, green, limonite concretions and traces of glauconite.
2,878	2,885	Shale, gray, 35% limestone.
2,885	2,890	Shale, gray, and sandstone, very fine grained, aggregate, 35% limestone.
2,890	2,907	Sandstone, very fine grained, aggregate.
2,907	2,917	Sandstone, very fine grained, subangular.
2,917	2,934	Shale, gray-green, with traces of very fine grained sand.
2,934	2,938	Sandstone, very fine grained, aggregate.
2,938	2,950	Sandstone, very fine grained, subangular.
2,950	2,954	Shale, gray-green, with traces of very fine grained sand and limonite concretions.

L. E. UPDYKE

O. G. S. File No. 65 - Muskingum County - Harrison Township - SE $\frac{1}{4}$ Section 6
Elevation 920

0 534 No samples

MAXVILLE

534 542 Limestone, brown, dense.
542 553 Dolomite, buff, crystalline.

CUYAHOGA - LOGAN

553 670 Siltstone, light gray and brown.
670 720 Siltstone, light gray.
720 750 Siltstone, light gray and brown.
750 775 Sandstone, conglomeratic, fine-to medium-grained, rounded, frosted.
775 785 Shale, gray and brown.
785 840 Siltstone, brown and gray shale.
840 870 Shale, gray and brown.
870 925 Siltstone, gray and brown, some gray shale.
925 1,000 Shale, gray and brown.
1,000 1,120 Shale, gray and brown, some gray siltstone.
1,120 1,200 Shale, gray and brown.

SUNBURY

1,200 1,240 Shale, black

BEREA

1,240 1,250 Siltstone, brown
1,250 1,262 Sandstone, very fine grained, aggregate.

SAMPLE DESCRIPTION

From To

BEDFORD

1,262	1,280	Shale, gray and brown.
1,280	1,320	Shale, gray, with minor amounts of brown siltstone.
1,320	1,360	Shale, gray and brown.

OHIO

1,360	1,490	Shale, gray.
1,490	1,645	Shale, dark gray.
1,645	2,250	Shale, gray
2,250	2,375	Shale, dark gray to black.
2,375	2,395	Shale, gray.
2,395	2,425	Shale, dark gray to black.
2,425	2,590	Shale, black.
2,590	2,790	Shale, light to medium gray.
2,790	2,920	Shale, dark gray.

ONONDAGA

2,920	2,935	Limestone, buff, dense, 10% smooth and rough dead chert.
2,935	2,955	Limestone, buff, dense, 25-35% smooth and dead chert.
2,955	2,980	Limestone, buff, dense, 40-45% smooth, mottled chert.
2,980	2,985	Limestone, buff, dense, 40% smooth, mottled, and finely dolocastic chert.
2,985	2,995	Limestone, buff, dense, 40% smooth and finely porous chert with traces of very fine grained sand.

ORISKANY

2,995	3,000	Chert, smooth, 20% very fine grained, aggregate sandstone, 30% limestone.
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HELDERBERG GROUP

3,000	3,015	Limestone, buff, dense, 35% dead, finely porous and smooth chert, 10% very fine grained, rounded, frosted sand.
3,015	3,040	Limestone, buff, dense, 15-20% smooth, mottled chert, 10% very fine grained, rounded, frosted sand.
3,040	3,060	Limestone, buff, dense, 10% very fine grained, rounded, frosted sand, 5% gray shale.
3,060	3,110	Limestone, buff, dense, 5-10% gray shale.
3,110	3,140	Dolomite, buff, dense to crystalline, 25% very fine grained, aggregate sand, 5% gray and brown shale with traces of glauconite.

CAYUGAN

3,140	3,155	Dolomite, brown, dense, 30% anhydrite, 5% brown shale.
3,155	3,160	Dolomite, brown, dense, 40% anhydrite with minor amounts of brown shale.
3,160	3,195	Anhydrite with minor amounts of shale, 35% dolomite.
3,195	3,210	Dolomite, brown, dense, 45% anhydrite with minor amounts of brown shale.
3,210	3,255	Anhydrite, 10-25% brown shale, 20-30% dolomite.
3,255	3,275	Dolomite, brown, 35% anhydrite, 10% dolomite.
3,275	3,285	Anhydrite, 5% brown shale, 30% dolomite.
3,285	3,295	Dolomite, brown, dense, 20% anhydrite.
3,295	3,305	Dolomite, brown, dense, 20% anhydrite, 30% brown shale.
3,305	3,325	Dolomite, brown, dense, 35% anhydrite, 10% brown shale.
3,325	3,360	Dolomite, brown, dense, 25-30% anhydrite with minor amounts of brown shale.
3,360	3,375	Shale, brown, 10% anhydrite, 35% dolomite.
3,375	3,420	Dolomite, brown, dense, 15-30% brown shale, 20-35% anhydrite.

From	To	
3,420	3,450	Dolomite, brown, dense, 35% brown shale with minor amounts of anhydrite.
3,450	3,460	Dolomite, brown, dense, 10% anhydrite, 15% brown shale.
3,460	3,505	Dolomite, brown, dense, 25-30% brown shale.
3,505	3,520	Dolomite, brown, dense, 35% anhydrite, 35% brown shale.
3,520	3,530	Dolomite, brown, dense, 45% brown shale.
3,530	3,575	Dolomite, brown, dense, 20-35% brown shale.
3,575	3,605	Dolomite, brown, dense, 25-35% brown shale with minor amounts of anhydrite.
3,605	3,630	Dolomite, brown, dense, 25% anhydrite, 5% brown shale.
3,630	3,645	Dolomite, brown, dense, 10% anhydrite, 20% brown shale.
3,645	3,660	Dolomite, brown, dense, 20% anhydrite, 10% brown shale.

LOCKPORT-GUELPH

3,660	3,685	Dolomite, gray-brown, dense to crystalline, 5% gray shale and gypsum.
3,685	3,700	Dolomite, gray-buff, dense to crystalline, 5% very fine grained gypsum sand.
3,700	3,718	Dolomite, white, gray, buff, crystalline, 5% gypsum and green, gray, and brown shale.
3,718	3,742	Dolomite, gray-buff, crystalline, 5% gypsum and gray shale, with traces of sphalerite.
3,742	3,747	No sample.
3,747	3,760	Dolomite, gray-buff, crystalline, 5% gypsum and gray shale.
3,760	3,800	Dolomite, gray-buff, crystalline, 5-10% gypsum, smooth chert and gray shale.
3,800	3,820	Dolomite, gray-buff, crystalline, 10-15% gypsum and gray shale.
3,820	3,835	Dolomite, buff, crystalline, 20-30% gray and brown shale.
3,835	3,860	Dolomite, gray-brown, crystalline, 20-50% gray and brown shale, traces of chert in lower part.
3,860	3,880	Dolomite, gray-buff, crystalline, 20% gray and brown shale.
3,880	3,915	Dolomite, white to gray, crystalline, 5% gray shale with traces of pyrite.

CLINTON GROUP

3,954	3,992	Sandstone, very fine grained, aggregate, 30-40% dolomite.
3,992	4,000	Shale, gray, 10% dolomite.
4,000	4,025	Shale, gray and brown.
4,025	4,035	Siltstone, gray, 20-40% gray shale.
4,035	4,040	Shale, gray, 10% siltstone, 30% dolomite.
4,040	4,055	Shale, gray, brown, and red.
4,055	4,081	Shale, gray, 10-35% dolomite.
4,081	4,093	No sample.
4,093	4,124	Shale, gray, green, red, 10-20% dolomite with traces of glauconite.
4,124	4,134	No sample.

ALBION (MEDINA) SERIES

4,134	4,155	Dolomite, brown, dense to crystalline, 50% gray-green shale, some limonite concretions.
4,155	4,165	Shale, gray and green.
4,165	4,185	Shale, gray-green with minor amounts of siltstone.
4,185	4,192	Shale, gray-green with minor amounts of very fine grained, aggregate sand.
4,192	4,207	Sandstone, very fine grained, aggregate with minor amounts of gray-green shale.
4,207	4,212	Sandstone, very fine grained, subangular.
4,212	4,225	Sandstone, very fine grained, aggregate.
4,225	4,235	Sandstone, very fine grained, aggregate with minor amounts of gray-green shale.

SAMPLE DESCRIPTION

From	To	
4,235	4,242	Sandstone, very fine grained, aggregate, red and gray-green shale with limonite concretions.
4,242	4,280	Shale, gray-green.
4,280	4,295	Shale, gray-green, with minor amounts of siltstone.
4,295	4,307	Siltstone, brown.

CINCINNATIAN

4,307	4,324	Shale, red.
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L. F. MURREY # 1

O. G. S. File No. 210 - Morgan County - Meigsville Township - NW $\frac{1}{4}$, SE $\frac{1}{4}$ Section 12
Elevation 865

0 73 No samples

PENNSYLVANIAN

73	110	Limestone, light brown to gray, dense.
110	115	Shale, medium green, slightly calcareous.
115	122	Shale, dark gray.
122	125	Coal (Meigs Creek No. 9).
125	140	Limestone, light brown, dense.
140	160	Limestone, light brown to gray, dense.
160	180	Shale, grayish green.
180	185	Shale, gray, minor amounts of coal.
185	220	Shale, gray.
220	225	Shale, dark gray, traces of coal (Pittsburgh No. 8).
225	245	Limestone, buff to light brown, dense.
245	340	Shale, reddish brown, calcareous.
340	385	Shale, green and brown, calcareous.
385	400	Shale, reddish brown and green, calcareous.
400	402	Limestone, buff, dense.
402	410	Shale, reddish brown and green, calcareous.
410	450	Siltstone, greenish gray.
450	470	Limestone, gray, brown, green, dense, traces of pyrite (Ames).
470	505	Shale, medium green.
505	525	Shale, dark gray.
525	540	Shale, reddish brown.
540	570	Sandstone, white, fine-to medium-grained.
570	580	Shale, reddish brown and gray.
580	590	Sandstone, white, fine-to medium-grained, aggregate.
590	595	Shale, dark gray.
595	600	Sandstone, light gray, very fine to fine grained, aggregate.
600	625	Sandstone, white, fine-to medium-grained, subangular, aggregate.
625	626	Coal, traces.
626	650	Shale, gray.
650	655	Limestone, light brown, dense, cherty.
655	656	Coal, traces.
656	705	Sandstone, white, fine-grained, subangular, aggregate.
705	755	Shale, medium gray.
755	765	Siltstone, light gray.

SAMPLE DESCRIPTION

35

From	To	
765	775	Shale, medium gray.
775	785	Siltstone, light gray.
785	800	Sandstone, white, fine-grained, aggregate.
800	805	Shale, gray.
805	810	Sandstone, white, fine-grained, aggregate.
810	845	Shale, dark gray and brown.
845	850	Shale, dark gray and brown with traces of coal.
850	860	Siltstone, dark gray.
860	870	Shale, dark gray, traces of coal.
870	905	Shale, dark gray.
905	910	Shale, dark gray, traces of coal.
910	920	Sandstone, white, very fine grained, aggregate.
920	925	Shale, gray.
925	945	Shale, medium gray, minor amounts of light gray siltstone.
945	960	Sandstone, white, very fine to fine-grained, aggregate.
960	1,005	Sandstone, white, fine-grained, aggregate.
1,005	1,025	Sandstone, white, very fine grained, aggregate.
1,025	1,055	Siltstone, gray, fragments of limestone, traces of siderite and limonite.

CUYAHOGA - LOGAN

1,055	1,075	Siltstone, calcareous, light blue -gray.
1,075	1,095	Siltstone, light blue-gray, minor amounts of light gray shale.
1,095	1,105	Shale, dark gray.
1,105	1,115	Siltstone, gray.
1,115	1,125	Siltstone and shale, gray.
1,125	1,150	Shale, gray, minor amounts of gray siltstone.
1,150	1,170	Sandstone, conglomeratic, fine-to coarse-grained, subangular sand.
1,170	1,175	Siltstone, gray and brown.
1,175	1,190	Sandstone, conglomeratic, fine-to coarse-grained, subangular sand.
1,190	1,195	Sandstone, very fine grained, aggregate.
1,195	1,230	Shale and siltstone, medium gray.
1,230	1,290	Siltstone, medium gray, minor amounts of gray shale.
1,290	1,350	Shale, medium gray, minor amounts of gray siltstone.
1,350	1,470	Siltstone, medium gray, minor amounts of gray shale.
1,470	1,500	Shale, medium gray.
1,500	1,520	Shale, medium gray, minor amounts of siltstone.
1,520	1,580	Shale, medium gray, minor amounts of brown shale.

SUNBURY

1,580	1,600	Shale, dark gray.
1,600	1,615	Shale, black.

BEREA

1,615	1,620	Sandstone, very fine grained, aggregate.
1,620	1,650	Sandstone, very fine grained, subangular.
1,650	1,700	Siltstone, medium gray.

BEDFORD

1,700	1,705	Siltstone, medium gray, minor amounts of red shale.
1,705	1,740	Shale, medium gray, minor amounts of brown shale.

OHIO

1,740	1,940	Shale, medium to dark gray.
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SAMPLE DESCRIPTION

From	To	
1,940	1,955	Siltstone, medium gray, minor amounts of dark gray shale.
1,955	1,970	Shale, medium to dark gray.
1,970	2,010	Shale, medium gray, minor amounts of gray siltstone.
2,010	2,235	Shale, medium to dark gray.
2,235	2,315	Shale, light to medium gray.
2,315	2,330	Shale, light to medium gray, traces of siltstone.
2,330	2,370	Shale, light to medium gray.
2,370	2,385	Shale, light to medium gray, traces of siltstone.
2,385	2,490	Shale, light to medium gray.
2,490	2,505	Shale, light to medium gray, traces of light gray siltstone.
2,505	2,595	Shale, light to medium gray.
2,595	2,660	Shale, light to medium gray, minor amounts of gray siltstone.
2,660	2,780	Shale, medium to dark gray.
2,780	2,960	Shale, black.
2,960	2,970	Shale, dark gray to black.
2,970	3,190	Shale, black.
3,190	3,620	Shale, light to medium gray, very slightly calcareous.

ONONDAGA

3,620	3,630	Limestone, brown, dense, 10% chert.
3,630	3,660	Limestone, brown to buff, dense, 60-75% chert.
3,660	3,720	Limestone, buff, dense, 50-75% chert, traces of very fine sand.

ORISKANY

3,720	3,728	Sandstone, fine-grained, subangular, 15% limestone.
3,728	3,735	Sandstone, very fine to fine-grained, subangular, 10% limestone.
3,735	3,745	Limestone, buff to white, dense, 40% very fine grained subangular sandstone.

HELDERBERG GROUP

3,745	3,855	Limestone, buff to gray, dense, 20-60% chert.
3,855	3,940	Limestone, buff, dense to finely crystalline, 10% chert (Keyser limestone).

CAYUGAN

3,940	4,050	Dolomite, brown to buff, dense, 40-50% anhydrite, traces of brown and gray shale.
4,050	4,195	Dolomite, buff, dense to finely crystalline, 30-40% brown and gray shale, minor amounts of anhydrite.
4,195	4,390	Dolomite, buff to brown, dense, 20-30% brown and gray shale, minor amounts of anhydrite.
4,390	4,450	Dolomite, brown and green, dense, 40-60% gray, brown, and green shale, traces of anhydrite.
4,450	4,545	Dolomite, buff to brown, dense, 40-50% gray and brown shale, traces of anhydrite.

LOCKPORT-GUELPH

4,545	4,600	Dolomite, brown and gray, finely crystalline, 20% gray and brown shale, traces of gypsum.
4,600	4,670	Dolomite, brown, dense to finely crystalline, 15-20% brown shale, traces of gypsum.
4,670	4,690	Limestone, brown, finely crystalline, 30% gray shale, traces of gypsum.
4,690	4,695	Limestone, brown, finely crystalline, 25% gypsum.
4,695	4,720	Limestone, brown, finely crystalline, 10% brown shale.
4,720	4,735	Limestone, brown, dense to finely crystalline, 20% brown shale.
4,735	4,750	Limestone, brown, dense to finely crystalline, 35% brown shale.

From	To	CLINTON GROUP
4,750	4,765	Shale, gray-brown, 15% brown crystalline dolomite.
4,765	4,775	Shale, gray-brown, 15% very fine grained aggregate sandstone, 10% brown, crystalline dolomite.
4,775	4,805	Dolomite, brown to buff, finely crystalline, 30% very fine grained, aggregate sandstone, 15% gray shale.
4,805	4,815	Shale, gray, 15% very fine grained aggregate sandstone, 10% brown, crystalline dolomite.
4,815	4,830	Shale, gray, 10% gray and brown, dense dolomite.
4,830	4,850	Shale, gray, 15% gray siltstone, 5% gray and brown, dense dolomite.
4,850	4,885	Shale, gray, red, and brown.
4,885	4,905	No sample.
4,905	4,930	Shale, gray, red, and brown.
4,930	4,965	Shale, green, minor amounts of red, traces of glauconite.
4,965	5,005	Shale, calcareous, green, red, and gray.
5,005	5,035	Shale, gray and red.

ALBION (MEDINA) SERIES

5,035	5,050	Dolomite, buff, coarsely crystalline, 15% chert, 30% gray and green shale.
5,050	5,068	Shale, gray-green.
5,068	5,084	Sandstone, very fine grained, aggregate.
5,084	5,100	Shale, gray-green.
5,100	5,108	Sandstone, very fine to fine-grained, aggregate.
5,108	5,124	Sandstone, very fine to fine-grained, subangular.
5,124	5,140	Sandstone, very fine grained, aggregate, minor amounts of gray-green shale.
5,140	5,148	Sandstone, very fine to fine-grained, subangular.
5,148	5,175	Shale, gray, interbedded gray siltstone.
5,175	5,185	Shale, gray.
5,185	5,205	Shale, gray, interbedded gray siltstone.
5,205	5,211	Sandstone, very fine to fine-grained, aggregate.
5,211	5,215	Sandstone, very fine to fine-grained, subangular.

HARVEY SCOTT # 1

O. G. S. File No. 633 - Washington County - Liberty Township - SE $\frac{1}{4}$, NW $\frac{1}{4}$, NE $\frac{1}{4}$ Section 20
Elevation 903.8

PENNSYLVANIAN

0	30	Sandstone, very fine grained, aggregate, weathered.
30	60	Sandstone, conglomeratic, medium-to coarse-grained, subangular.
60	70	Shale, gray.
70	72	Coal (Meigs Creek No. 9).
72	75	Shale, gray.
75	80	Limestone, brown, dense.
80	110	Siltstone, gray.
110	113	Shale, red.
113	118	Shale, gray, with traces of coal.
118	123	Limestone, gray-brown, dense.
123	127	Siltstone, greenish gray.
127	138	Shale, red, calcareous.

From	To	
138	144	Sandstone, very fine grained, aggregate.
144	158	Siltstone, gray.
158	170	Limestone, brown, dense.
170	175	Coal (Pittsburgh No. 8).
175	186	Limestone, brown, dense.
186	198	Shale, red and green, calcareous.
198	207	Siltstone, light gray.
207	220	Shale, brown, calcareous.
220	240	Shale, red and green, calcareous.
240	260	Shale, red, calcareous.
260	265	Limestone, buff, dense.
265	275	Shale, red and yellow, calcareous.
275	360	Shale, red, calcareous.
360	365	Siltstone, greenish-gray.
365	370	Shale, green.
370	385	Shale, red, green, and brown, calcareous.
385	407	Siltstone, greenish gray.
407	460	Sandstone, fine-grained, subangular.
460	475	Limestone, greenish brown, with traces of glauconite (Ames).
475	498	Shale, red, calcareous.
498	505	Siltstone, greenish gray.
505	535	Shale, green and red.
535	550	Shale, dark gray, traces of coal.
550	560	Shale, greenish gray, calcareous.
560	570	Shale, red and green, calcareous.
570	583	Siltstone, greenish gray.
583	595	Siltstone, gray.
595	630	Sandstone, very fine to fine-grained, aggregate.
630	645	Shale, dark gray.
645	650	Shale, dark gray, trace of coal.
650	660	Shale, dark gray.
660	665	Shale, dark gray, trace of coal, fragments of limestone.
665	670	Shale, dark gray, calcareous.
670	680	Shale, gray and brown, calcareous.
680	705	Shale, green and red, calcareous.
705	735	Siltstone, gray.
735	747	Sandstone, fine-grained, subangular.
747	750	Shale, gray.
750	780	Sandstone, fine-grained, subangular.
780	785	Sandstone, fine-grained, subangular, traces of coal.
785	800	Sandstone, fine-grained, subangular.
800	825	Shale, gray and brown.
825	840	Shale, dark gray.
840	855	Sandstone, very fine grained, aggregate.
855	868	Shale, gray.
868	885	Shale, dark gray.
885	890	Shale, dark gray, traces of coal.
890	995	Sandstone, very fine grained, aggregate.
995	1,000	Sandstone, very fine grained, aggregate, traces of coal.
1,000	1,005	Sandstone, very fine grained, aggregate.
1,005	1,010	Shale, dark gray.
1,010	1,020	Sandstone, very fine grained, aggregate.
1,020	1,059	Shale, dark gray.
1,059	1,090	Sandstone, very fine grained, aggregate.
1,090	1,095	Sandstone, very fine grained, aggregate, with traces of coal.
1,095	1,125	Shale, gray.
1,125	1,205	Shale, dark gray.
1,205	1,230	Sandstone, fine-grained, aggregate.

SAMPLE DESCRIPTION

39

From	To	
1,230	1,235	Shale, gray.
1,235	1,295	Sandstone, very fine grained, aggregate.
1,295	1,315	Shale, dark gray.
1,315	1,328	Sandstone, very fine grained, aggregate.
1,328	1,332	Shale, dark gray.
1,332	1,370	Sandstone, very fine to fine-grained, aggregate and subangular.
1,370	1,403	Sandstone, very fine grained, aggregate.

CUYAHOGA - LOGAN

1,403	1,427	Sandstone, conglomeratic, very fine grained, subangular, traces of siderite.
1,427	1,433	Shale, dark gray.
1,433	1,443	Sandstone, very fine grained, aggregate.
1,443	1,455	Sandstone, conglomeratic, very fine to fine-grained, aggregate with limonite staining.
1,455	1,505	Shale, blue-gray, with minor amounts of brown shale.
1,505	1,515	Shale, blue-gray, with minor amounts of light gray siltstone.
1,515	1,565	Shale, blue-gray.
1,565	1,605	Shale, blue-gray and light gray siltstone.
1,605	1,710	Shale, blue-gray.
1,710	1,775	Shale, blue-gray and light gray siltstone.
1,775	1,800	Shale, gray.

SUNBURY

1,800	1,834	Shale, dark gray to black.
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BEREA

1,834	1,842	Sandstone, very fine grained, aggregate.
1,842	1,850	Siltstone, light gray.
1,850	1,878	Shale, silty, light gray.
1,878	1,890	Sandstone, very fine grained, subangular.
1,890	1,900	Shale, light gray, with minor amounts of very fine grained, aggregate sand.
1,900	1,925	Shale, light gray.
1,925	1,995	Sandstone, very fine grained, aggregate and light gray shale.

BEDFORD

1,995	2,035	Shale, reddish brown and gray, with minor amounts of light gray siltstone.
2,035	2,060	Shale, gray .

OHIO

2,060	2,105	Shale, gray to dark gray.
2,105	2,155	Shale, gray, and brown siltstone
2,155	2,245	Shale, gray.
2,245	2,275	Siltstone, brown, and gray shale.
2,275	2,295	Shale, gray, and brown siltstone.
2,295	2,305	Shale, gray.
2,305	2,350	Shale, gray, and brown siltstone.
2,350	2,420	Shale, gray.
2,420	2,445	Shale, gray, and brown siltstone.
2,445	2,455	Shale, gray.
2,455	2,485	Shale, gray, and brown siltstone.
2,485	2,510	Shale, gray, and gray siltstone.
2,510	2,520	Shale, gray.
2,520	2,530	Shale, gray, and brown siltstone.

SAMPLE DESCRIPTION

From	To	
2,530	2,540	Shale, gray.
2,540	2,575	Shale, gray, and brown siltstone.
2,575	2,600	Shale, gray, and gray siltstone.
2,600	2,935	Shale, gray.
2,935	2,970	Shale, gray, and brown siltstone.
2,970	2,995	Siltstone, brown, and gray shale.
2,995	3,015	Shale, gray.
3,015	3,045	Shale, gray, and brown siltstone.
3,045	3,110	Shale, gray.
3,110	3,130	Shale, gray, and brown siltstone.
3,130	3,160	Shale, gray.
3,160	3,225	Shale, gray, and brown siltstone.
3,225	3,250	Siltstone, brown, and gray shale.
3,250	3,280	Shale, gray, and brown siltstone.
3,280	3,330	Siltstone, brown, and gray shale.
3,330	3,375	Shale, gray, and gray siltstone.
3,375	3,625	Shale, gray.
3,625	3,730	Shale, gray and black.
3,730	3,790	Shale, black and gray.
3,790	3,805	Shale, gray.
3,805	3,820	Shale, black.
3,820	3,845	Shale, gray and black.
3,845	3,875	Shale, black.
3,875	3,945	Shale, gray.
3,945	3,970	Shale, black and gray.
3,970	3,980	Shale, gray.
3,980	4,000	Shale, black and gray.
4,000	4,030	Shale, gray.
4,030	4,470	Shale, light gray to gray, slightly calcareous.
4,470	4,500	Shale, gray.
4,500	4,520	Shale, gray to black.
4,520	4,912	Shale, black.

ONONDAGA

4,912	4,915	Limestone, brown, dense, 45% finely porous brown shale with traces of pyrite.
4,915	4,925	Limestone, brown, dense, 20-30% finely porous brown shale, 15-25% smooth chert, traces of pyrite.
4,925	4,950	Chert, mottled, smooth, oolitic, 40% limestone.
4,950	4,975	Chert, mottled, smooth, finely porous, 10-30% limestone.
4,975	4,985	Chert, smooth, dead, finely porous, 20-30% limestone.
4,985	5,005	Chert, mottled, dolocastic, 30-35% dolomitic limestone.
5,005	5,015	Limestone, buff to brown, 40% mottled, smooth chert.
5,015	5,030	Chert, mottled, smooth, 30-40% limestone.
5,030	5,055	Chert, smooth and finely porous, 15-20% limestone.
5,055	5,089	Chert, smooth, 20-40% limestone.

ORISKANY

5,089	5,123	Sandstone, fine-to medium-grained, subangular.
5,123	5,147	Sandstone, very fine grained, aggregate, 10-25% limestone.

HELDERBERG GROUP

5,147	5,155	Limestone, brown, dense to crystalline, 10-20% very fine grained, aggregate sand with minor amounts of finely porous chert.
5,155	5,160	Limestone, brown to gray, dense, 30% dead finely porous and mottled chert, 15% very fine grained, aggregate sand.

From	To	
5,160	5,178	Chert, dead, finely porous and mottled, 10-25% finely porous brown shale, 10-30% limestone.
5,178	5,210	Chert, dead, finely porous, 20% limestone.
5,210	5,232	Limestone, dark brown, dense, 30-45% translucent and dead, finely porous chert with traces of glauconite.
5,232	5,271	Chert, translucent and dead, finely porous, 20-50% limestone.
5,271	5,280	Limestone, gray, dense, mottled, 15% finely porous gray shale, 5% translucent chert (top of Keyser limestone).
5,280	5,291	Limestone, gray, dense, mottled, 15% finely porous gray shale, 5% very fine grained, rounded, frosted, sand.
5,291	5,360	Limestone, gray, dense, mottled, 5-10% finely porous gray shale with traces of anhydrite.
5,360	5,370	Limestone, brown, lithographic, traces of anhydrite (base of Keyser limestone.)

CAYUGAN

5,370	5,395	Limestone, gray-brown, dense, 15-20% mottled chert, 10% finely porous brown shale.
5,395	5,410	Shale, finely porous, brown, 30-35% limestone, 15% mottled chert.
5,410	5,480	Dolomite, brown, dense, 10-30% anhydrite, 10-25% finely porous brown shale.
5,480	5,505	Anhydrite, 30-40% dolomite, traces of finely porous brown shale.
5,505	5,519	Dolomite, brown, dense, 5% gray shale and anhydrite.
5,519	5,535	No sample.
5,535	5,550	Dolomite, gray-brown, dense to crystalline, 5% gray shale and anhydrite.
5,550	5,655	Anhydrite, 20-40% limestone with minor amounts of brown shale.
5,655	5,690	Dolomite, brown, dense, 20-40% anhydrite with minor amounts of brown shale.
5,690	5,700	Dolomite, brown, dense, 45% brown shale, 10% anhydrite.
5,700	5,725	Dolomite, gray-brown, dense, 20-30% brown and gray shale, 10% anhydrite.
5,725	5,740	Dolomite, gray-brown, dense, 10% gray and brown shale, 10% anhydrite.
5,740	5,755	Dolomite, gray-brown, dense, 20% gray and brown shale, 20% anhydrite.
5,755	5,765	Dolomite, gray-brown, dense, 50% gray and brown shale, traces of anhydrite.
5,765	5,775	Anhydrite, 10% gray and brown shale, 35% dolomite.
5,775	5,800	Dolomite, brown, dense, 15% anhydrite, traces of gray and brown shale.
5,800	5,865	Dolomite, brown, dense, 5-10% anhydrite, and very fine grained, gypsum sand.
5,865	5,880	Dolomite, brown, dense, 15% anhydrite,
5,880	5,910	Dolomite, brown, dense, 30% finely porous brown shale, traces of anhydrite.
5,910	5,920	Dolomite, brown, dense, 30% anhydrite, 30% finely porous brown shale.
5,920	5,940	Dolomite, brown, dense to crystalline, 15-20% anhydrite, traces of gray shale
5,940	5,965	Anhydrite, 35-40% dolomite with minor amounts of brown shale.
5,965	5,995	Dolomite, brown, dense to crystalline, 15% anhydrite with minor amounts of gray and brown shale.
5,995	6,025	Dolomite, gray-brown, dense, 50% gray and brown shale, with minor amounts of anhydrite.
6,025	6,040	Dolomite, gray-brown, dense, 30% gray and brown shale, with minor amounts of anhydrite.
6,040	6,070	Shale, finely porous, brown and green, 35-40% dolomite.
6,070	6,080	Shale, gray, brown, and green, 40% dolomite.
6,080	6,110	Dolomite, gray-brown, dense, 25-30% gray, brown, and green shale.
6,110	6,125	Dolomite, gray-brown, dense, 30% gray and brown shale, 10% anhydrite.
6,125	6,140	Dolomite, gray-brown, dense, 30% gray and brown shale with minor amounts of anhydrite.
6,140	6,145	Dolomite, gray-brown, dense to crystalline, 30% gray and brown shale, with minor amounts of anhydrite.

SAMPLE DESCRIPTION

From	To	
6, 145	6, 155	Dolomite, gray-brown, dense to crystalline, 30% gray and brown shale, with minor amounts of anhydrite.
6, 155	6, 200	Dolomite, gray-brown, dense to crystalline, 15-20% gray and brown shale.

LOCKPORT-GUELPH

6, 200	6, 207	Dolomite, gray-brown, crystalline, 5% gray shale, traces of pyrite.
6, 207	6, 265	Dolomite, gray-brown, crystalline, 5% gray shale and gypsum sand.
6, 265	6, 310	Dolomite, gray-brown, crystalline, 5% gray shale.
6, 310	6, 335	Dolomite, gray-brown, crystalline, 5% gray shale and quartzose chert.
6, 335	6, 400	Limestone, gray-brown, crystalline, 5% gray shale and finely quartzose chert.
6, 400	6, 410	Limestone, brown, crystalline, 10% finely porous brown shale.

CLINTON GROUP

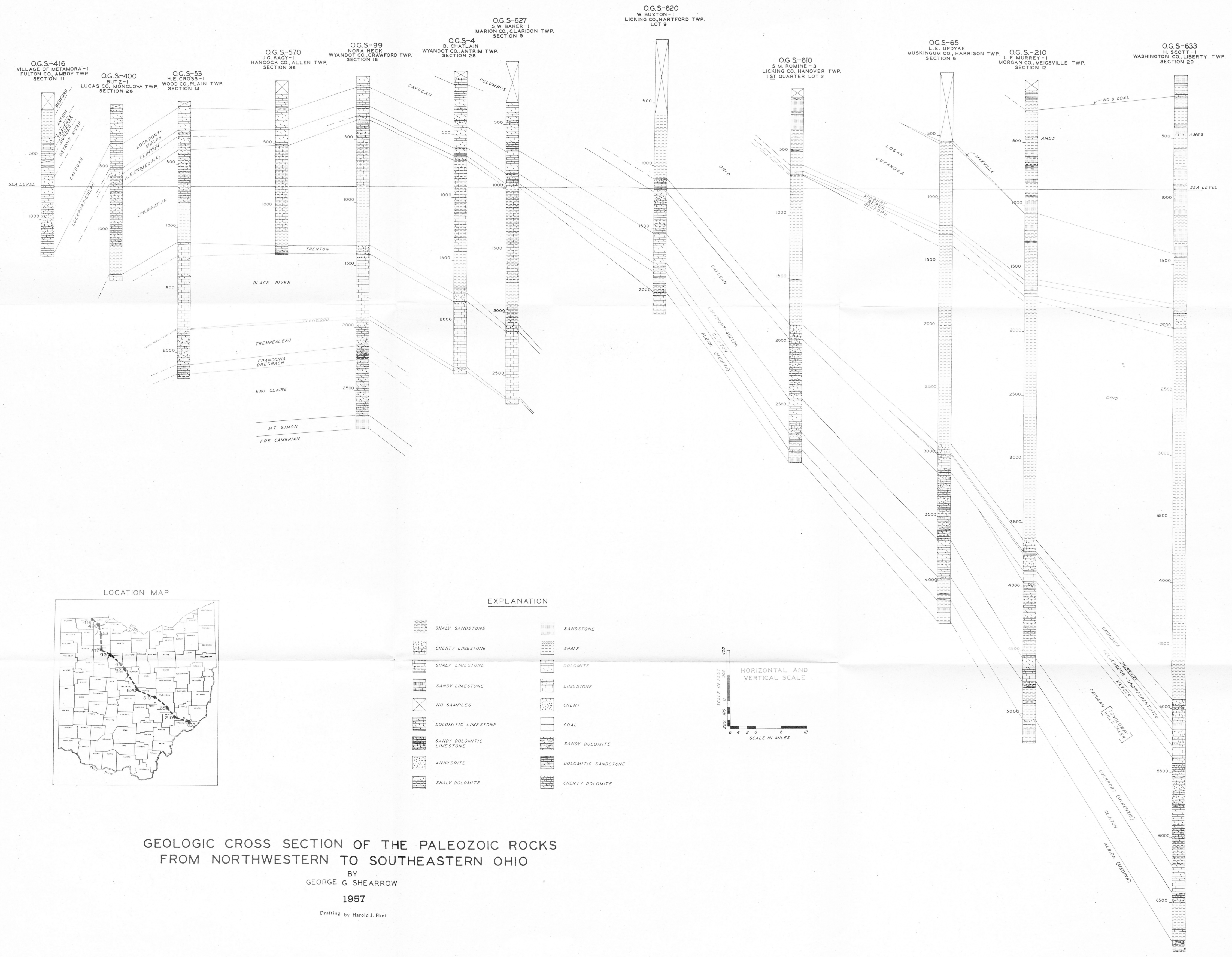
6, 410	6, 420	Limestone, gray-brown, crystalline, 40% gray shale.
6, 420	6, 430	Limestone, gray-brown, crystalline, 40% very fine grained, aggregate sand.
6, 430	6, 445	Limestone, gray-brown, crystalline, 30% very fine grained, aggregate sand, 5-10% brown shale.
6, 445	6, 452	Sandstone, very fine grained, aggregate, 30% dolomite.
6, 452	6, 456	Dolomite, gray-buff, crystalline, 25% very fine grained, aggregate sand, 15% gray shale.
6, 456	6, 471	Sandstone, very fine grained, aggregate, 25-30% dolomite.
6, 471	6, 484	No samples.
6, 484	6, 504	Sandstone, very fine grained, aggregate, 15-30% dolomite.
6, 504	6, 529	Shale, gray.
6, 529	6, 540	Shale, red, with minor amounts of gray shale.
6, 540	6, 560	Shale, red.
6, 560	6, 610	Shale, red, with minor amounts of gray and green shale.
6, 610	6, 652	Shale, red.
6, 652	6, 709	Shale, greenish gray.
6, 709	6, 717	Shale, greenish gray, 45% dolomite and traces of glauconite.
6, 717	6, 775	Shale, red.
6, 775	6, 784	Shale, green, traces of very fine grained, aggregate sand.

ALBION (MEDINA) SERIES

6, 784	6, 799	Shale, gray, 10-30% dolomite with traces of rough and smooth chert and silicified fossils.
6, 799	6, 815	Dolomite, gray, dense to crystalline, 30-40% gray shale, 10-15% rough and smooth chert.
6, 815	6, 827	Shale, gray.
6, 827	6, 835	Shale, gray, with minor amounts of gray-white, very fine grained, aggregate sand.
6, 835	6, 847	Sandstone, gray-white, very fine grained, aggregate, with minor amounts of gray shale.
6, 847	6, 852	Sandstone, red and white, very fine grained, aggregate, with minor amounts of gray shale,
6, 852	6, 855	Sandstone, red, very fine grained, aggregate, with minor amounts of green shale.
6, 855	6, 858	Shale, green.
6, 858	6, 860	Sandstone, white, very fine grained, aggregate, with minor amounts of green shale.



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**GEOLOGIC CROSS SECTION OF THE PALEOZOIC ROCKS
FROM NORTHWESTERN TO SOUTHEASTERN OHIO**

BY
GEORGE G SHEARROW

1957

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